

# Adolescent Overweight, Social Relationships and the Transition to First Sex: Gender and Racial Variations

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**CONTEXT:** Being overweight influences adolescents' relationships by increasing their likelihood of experiencing social alienation and discrimination. Its role in sexual development is relatively understudied, as are potential mechanisms through which weight may influence early sexual activity.

**METHODS:** Data from the National Longitudinal Study of Adolescent Health were used in discrete-time event history analyses investigating the association between body weight, social relationships and timing of sexual debut among 8,197 respondents who were in grades 7–12 in 1994–1995 (Wave 1) and were young adults in 2001–2002 (Wave 3). Subgroup analyses explored gender and racial and ethnic variations in the association.

**RESULTS:** Overweight adolescents were less likely than their normal-weight peers to report first intercourse between Waves 1 and 3 (odds ratio, 0.9). Characteristics reflecting social alienation, including having relatively few close friends and no experience with romantic relationships, were negatively associated with first intercourse among overweight youths. Results differed by gender and race and ethnicity. Overweight females had a lower likelihood than normal-weight females of experiencing first intercourse (0.8), but no such association was evident among males. Similarly, overweight white youths—but not those from other racial and ethnic groups—had reduced odds of sexual debut (0.7).

**CONCLUSIONS:** Future studies should seek to understand the broader implications of adolescent weight status for social relationships and subsequent development, and practitioners should apply this knowledge to prevention programs. Postponement of sexual activity may benefit youths, but potential benefits and risks may depend upon the social processes involved.

*Perspectives on Sexual and Reproductive Health, 2011, 43(1):6–15, doi: 10.1363/4300611*

Overweight and obesity have become increasingly prevalent during the past few decades in the United States. Between the period 1966–1970 and 2006, the prevalence of overweight among 12–19-year-olds more than tripled—from 5% to almost 18%.<sup>1</sup> Stigmatization of overweight children is pervasive,<sup>2</sup> and stigmatized children often encounter social exclusion, derogatory comments and bullying. With the increased prevalence of overweight, bias against overweight children has worsened over the past four decades.<sup>3</sup> This trend has motivated studies of how weight stigma mediates the impact of weight on a variety of outcomes, such as psychosocial adjustment, academic performance, socioeconomic attainment and physical health.<sup>2</sup> However, we know little about how being overweight shapes sexual experience during adolescence.

One critical aspect of sexual development is the timing of first intercourse. Associations have been documented between early sexual initiation and negative outcomes—for example, delinquency, early pregnancy and reduced educational attainment.<sup>4–7</sup> In contrast, young people who postpone sexual debut until their late teenage years or their early 20s have more successful outcomes, including higher socioeconomic attainment, than those who engage in sex early.<sup>8</sup> Although scholars and policymakers

have often assumed that early sex also has negative mental health consequences, research indicates that the effects of adolescent sex on mental health are contingent on subgroup norms about the timing of first sex and on the nature of the relationship between partners.<sup>9</sup> Notably, this research shows that the larger context of adolescent social relationships conditions teenagers' sexual behavior, as well as their interpretations of first sexual experiences.

About 80% of male teenagers in the United States and 90% of their female peers have their first sexual experience in a romantic relationship.<sup>10</sup> Such relationships typically evolve from interactions within mixed-gender peer groups.<sup>11</sup> Given that adolescent overweight increases the likelihood of peer exclusion,<sup>12,13</sup> overweight youths may have fewer opportunities than normal-weight youths to develop opposite-sex friendships and romantic relationships.<sup>14,15</sup> Social marginalization may be protective because it may reduce the risk of early sexual involvement, but it is problematic because it limits opportunities for the development of relationship skills that may provide a foundation for later committed relationships.

This study seeks to contribute to the limited literature on the relationship between weight status and the timing of first sex by addressing three major questions: First, what

is the association between adolescent weight status and the timing of first sex? Second, what mechanisms underlie this association? Finally, does this association vary by gender or by race or ethnicity? The last question is motivated by the fact that social norms regarding body size, sexual behavior and appropriate ages for key transitions vary by gender and race or ethnicity. It follows that the role of overweight in the timing of first sex may vary across groups. We utilize data from three waves of the National Longitudinal Study of Adolescent Health (Add Health) to examine these issues.

## **CONCEPTUAL FRAMEWORK**

A key developmental task during adolescence is to establish mature relationships with peers of both sexes.<sup>16,17</sup> Interpersonal interactions in adolescence shape the development of identity and prepare young people for the developmental tasks of early adulthood. As youths progress through the teenage years, they typically broaden their social networks from same-sex chums to mixed-gender groups and then move on to more exclusive dating relationships.<sup>11</sup> The peer context is an incubator for the emergence of romantic relationships.<sup>18,19</sup> The more friends of the opposite sex or friends from other schools adolescents have in their social networks, the more likely they are to have romantic relationships.<sup>18</sup> While opposite-sex friendship networks have a direct effect on romantic relationships, same-sex networks have an indirect effect.<sup>20</sup> Cavanagh showed that youths of both genders who are closer with their female friends are more likely than those who are not to initiate a romantic relationship, whether it is sexual or not;<sup>19</sup> results of other work indicate that this is partly because girls quickly integrate their friendship networks.<sup>21</sup> Furthermore, the deeper the involvement in peer groups (especially with friends of the opposite sex), the greater the odds of first sex within dating relationships.<sup>22</sup> And among white youths, closeness of relationships with both male and female friends is positively related to sexualized conceptions of romantic relationships.<sup>19</sup>

Overweight youths are often exposed to weight-based prejudice that is expressed in social alienation and discrimination. Empirical research suggests that weight-based teasing and victimization, instead of body weight per se, are the crucial factors leading to unfavorable outcomes for overweight youths.<sup>2</sup> Similar findings have been reported in studies of physical and psychological health, dating opportunities and socioeconomic outcomes.<sup>2</sup> However, existing research has not explored the role of weak social relationships in mediating the association between body weight and sexual development.

Being overweight may be associated with a reduced likelihood of having a romantic or sexual relationship,<sup>14,15,23</sup> yet little is known about the processes underlying this association. Adolescent overweight influences social relationships by increasing the likelihood of discriminatory treatment by peers.<sup>12,13</sup> Furthermore, overweight teenagers receive significantly fewer friendship nominations from others

(i.e., are identified as friends by fewer other teenagers) than normal-weight adolescents. Overweight teenagers are much more likely to receive no friendship nominations, and most of the ones they receive are from relatively unpopular youths.<sup>13</sup> If overweight adolescents have greater difficulties developing friendships than normal-weight youths do, they presumably will have fewer opportunities to meet romantic partners. As Thornton pointed out, the probability that an adolescent reports having had intercourse is related to the age at which first dating took place; the proportion of youths who have experienced intercourse increases significantly about one year after the start of the first steady dating relationship.<sup>24</sup> Thus, we hypothesize that overweight is associated with delayed onset of intercourse and that weaker peer relationships mediate the influence of body weight on sexual debut.

## **PRIOR RESEARCH**

### **Timing of First Sex**

One major theoretical framework for understanding sexual initiation in adolescence is problem behavior theory, which emphasizes psychosocial unconventionality.<sup>25,26</sup> Youths who engage in sex early have unconventional values with respect to family, religion and school.<sup>25</sup> Conventional values and behaviors, such as investment in education (e.g., better grades, stronger academic aspirations)<sup>25</sup> and religiosity<sup>27</sup> are associated with delayed first sex. Similarly, a positive family climate<sup>7</sup> predicts delayed sexual debut, and adolescents who perceive strong maternal disapproval of sex are more likely than others to postpone sexual activity.<sup>28</sup> In addition, youths who have permissive attitudes toward sexual behavior are more inclined than others to have sex at a young age.<sup>29</sup> The relationship between self-esteem and the timing of first sex is complex and related to adolescents' values.<sup>30</sup> While some studies show a positive relationship between self-esteem and early intercourse,<sup>27</sup> others find such a link only among youths who consider early first sex acceptable.<sup>31</sup>

### **Overweight and Sexual Development**

Very few studies have examined how weight relates to sexual behaviors in adolescence. Halpern and colleagues reported that in a sample of 200 white and black females, body fat was strongly and negatively associated with the likelihood of dating and reporting sexual experience; the association was mediated by the opportunities offered by dating.<sup>15</sup> A study of 5,487 female teenage Add Health participants showed that for every one-point increase in body mass index (BMI),\* the likelihood of being in a romantic relationship (with or without sexual intercourse) is lowered by 6–7%.<sup>14</sup> Similarly, a study conducted among 192 female college students aged 18–21 indicated that BMI was negatively associated with the likelihood of being in a steady relationship and of having had sexual intercourse.<sup>32</sup>

\*BMI is defined as weight in kilograms divided by the square of height in meters.

Because most studies of the relationship between weight and first sex have been based on convenience samples (typically restricted to females), little is known about the extent to which being overweight is linked to the timing of first sex at the population level. One exception is a study by Cawley and colleagues, who used the National Longitudinal Study of Youth 1997 (NLSY 97) and Add Health to examine how height, weight and BMI relate to dating and sexual activities in adolescence.<sup>23</sup> They reported that the Add Health data, but not those from the NLSY 97, suggest that overweight adolescents have a reduced likelihood of sexual debut. However, their study has two major limitations. First, the researchers used adult BMI cutoff standards to categorize adolescents as underweight, normal-weight, overweight or obese. Given the wide age range of the Add Health sample (11–21 in Wave 1) and the different developmental pace of males and females, using adult standards can result in misclassifying younger overweight adolescents as normal-weight.\* The Centers for Disease Control and Prevention's 2000 growth charts are better for establishing age- and sex-sensitive cut points for studying overweight in adolescence.<sup>33</sup> Second, Cawley and colleagues did not study the mechanisms underlying the association between weight and adolescent peer relationships.

### **Gender and Racial Variations in Ideal Body Weight**

Body weight affects male and female teenagers differently.<sup>34–36</sup> Sociocultural standards of an ideal male body equate masculinity with muscularity.<sup>37,38</sup> Even preteenage boys prefer to have a well-proportioned body and an average build, rather than a thin body.<sup>38</sup> While the literature on body image has focused mostly on young women, an emerging body of research shows that men, like women, suffer body image disturbances.<sup>37–39</sup> Given that peer experiences affect the formation of ideal body images among adolescents, being underweight can be as stigmatizing for adolescent boys as being overweight. Indeed, Falkner et al. found that underweight teenage boys experience many negative social, educational and psychological outcomes. For example, they are more likely than normal-weight boys to feel that friends care little or not at all about them, to dislike school and to report not having hung out with friends in the last week.<sup>40</sup> A hypothesis that has not been rigorously tested is that they also may be excluded from peer groups or considered less desirable as romantic partners, which in turn may affect their sexual development.

In contrast, it is well known that women are bothered by being overweight or even just by perceiving themselves to be overweight.<sup>35,36</sup> Women exhibit more weight-related behaviors, such as dieting, than men,<sup>41</sup> perhaps because men have lower tolerance for heavy women than vice versa. In one study, college students were asked to select

a potential sexual partner from six drawings, with captions, representing an obese partner, an armless partner, a healthy partner, a partner in a wheelchair, a partner with mental illness and a partner with a history of STDs. Men were more likely than women to rank the obese partner as the last choice.<sup>42</sup> Romantic popularity also is more strongly associated with physical attractiveness for women than for men.<sup>43</sup>

At the same time, ideals for body weight vary by race and ethnicity. Several studies have reported that blacks have a higher tolerance than whites for overweight individuals.<sup>41,44,45</sup> The majority of studies on this issue have found that black women are less dissatisfied with their bodies than their white counterparts, despite having higher body weight.<sup>46,47</sup> Cunningham and colleagues reported that black men are more likely to prefer female silhouettes with large buttocks than are white men.<sup>48</sup> Findings were similar in a study on adolescent black males' preferences.<sup>49</sup> Because of limited attention to these issues in studies of Hispanics and Asian Americans, we know less about their perceptions of ideal body types, but at least one study shows that whites and Hispanics have more weight-related body image disturbance than blacks and Asians.<sup>44</sup> In addition, very little research has explored possible racial and ethnic variation in the association between weight and sexual development. Using the 2005 Youth Risk Behavior Surveillance Survey, Akers and colleagues found only one difference: Overweight Latinos were more likely than their counterparts in other racial and ethnic groups to have first had sex before age 13.<sup>50</sup>

We hypothesize that the association between body weight and the timing of first sex varies by gender—specifically, that overweight status has a stronger delaying effect on females, and underweight status has a stronger effect on males. Furthermore, we hypothesize that the timing of first sex is influenced more strongly by overweight status among whites than among other racial and ethnic groups.

## **METHODS**

### **Data and Sample**

Add Health was designed to investigate the health behaviors of a cohort of adolescents who were in grades 7–12 during the 1994–1995 academic year. Students were selected from a representative sample of U.S. high schools with a known probability sampling method.<sup>51</sup>

The data were collected mainly through in-home interviews that gathered information about adolescents' daily activities, risky behaviors, intimate relationships, and other developmental and health indicators. At the time of the baseline interview, one parent of the sampled adolescents (usually the resident mother figure) completed a parent questionnaire. The first survey wave was conducted in 1994–1995, the second in 1996 and the third in 2001–2002, when respondents were young adults (approximately 18–25 years old). A final wave was conducted in 2007–2008; we did not use data from that

\*For example, a BMI of 24 is above the 85th percentile, and is categorized as "at risk of overweight," for a 14-year-old, but is considered normal-weight in the adult population.

wave because respondents' ages at that time (24–32) were beyond the focus of our study.

In addition to the interview data, our study uses network data that were constructed from adolescents' friendship nominations at Wave 1. The network data link friendship nominations sent and received by each respondent in an in-school questionnaire that was administered prior to the in-home interviews. This special data file provides important information regarding structural properties of friendship networks among adolescent peer groups. One noteworthy feature of the file is that it uses reports only from respondents who attended schools that had response rates of 50% or higher. It is generally difficult to offer reasonable estimates of the network structure if a school had a lower response rate.<sup>52</sup>

We analyzed data collected from adolescents who participated in Waves 1–3 and have valid longitudinal sample weights. In all, 11,621 respondents were interviewed in these three waves. Of these, 793 did not have a valid longitudinal sampling weight and were excluded from this study; 2,631 had had sex before the Wave 1 interview and were excluded. The final sample consists of 8,197 adolescents.

## Measures

•**Age at first sex.** The outcome variable is based on Wave 3 retrospective reports on age at first sexual intercourse; Wave 2 reports on this measure were used to check data consistency.\* We adopted several strategies to deal with a small number (27) of inconsistent reports. If an adolescent reported different ages at first sex in Waves 2 and 3, the Wave 2 report was used. If an adolescent reported age at first sex in Wave 2 but indicated in Wave 3 that he or she had never had sex, the Wave 2 report was used. After corrections for inconsistencies, 1,161 adolescents had never had sex by the Wave 3 interview.

•**Weight status.** We calculated BMI values from self-reported height and weight at Wave 1, and used age- and sex-adjusted standards published by the Centers for Disease Control and Prevention<sup>33</sup> to categorize adolescents' weight status. Adolescent are categorized as underweight if their BMI falls at or below the fifth percentile of the age- and sex-specific BMI distribution, as normal-weight if it is above the fifth and below the 85th percentile, as being at risk of overweight if it is at the 85th–95th percentile and as overweight if it is above the 95th percentile.

•**Socioeconomic characteristics.** Socioeconomic variables were constructed mainly from the Wave 1 in-home interview. Race is a four-category variable coded as white, black, Hispanic or other. We included maternal education (coded as less than high school, high school graduate, some college, and college or beyond) because of its positive association with delayed sexual debut.<sup>53</sup> Similarly, because living with two biological parents is protective against early first intercourse,<sup>27</sup> we included family structure (coded as families with two biological parents, step-families, single-parent families and other family types).

Finally, we included family income, as reported by parents at Wave 1.

•**Factors related to first sex.** Wave 1 characteristics that have established associations with initiation of first sex are also controlled for in the models. A number of these variables are composite measures based on items that use a five-point response scale rating level of agreement (1="strongly agree," 5="strongly disagree"); individual scores are summed (in most cases after being reverse-coded) to form the composite measures. School adjustment is based on six items: "You feel close to people at your school," "You feel like you are part of your school," "Students at your school are prejudiced," "You are happy to be at your school," "The teachers at your school treat students fairly" and "You feel safe in your school" (Cronbach's alpha, 0.72). Only the item on prejudice was not reverse-coded. Self-esteem is derived from seven items reflecting how much respondents agree that they "have a lot of good qualities," "are physically fit," "have a lot to be proud of," "like [themselves] just the way [they] are," "feel like [they] are doing everything just about right," "feel socially accepted" and "feel loved and wanted" (Cronbach's alpha, 0.85). Motivation to have sex reflects the degree to which respondents agree that having intercourse would make their friends "respect" them more, would give them "a great deal of physical pleasure," would "relax" them, would make them "more attractive to women/men" and would make them "feel less lonely" (Cronbach's alpha, 0.77). Perceived social consequences of sex reflects adolescents' agreement that if they had sexual intercourse, their partner would "lose respect" for them, they "would feel guilty afterward" and it would upset their mother (Cronbach's alpha, 0.67).

Positive family climate is measured as the sum of scores on three questions (Cronbach's alpha, 0.79), which asked how much adolescents feel that "people in your family understand you," "you and your family have fun together" and "your family pays attention to you"; response values ranged from 1 ("not at all") to 5 ("very much"). Academic performance is the average of self-reported grades in four subject areas: English, math, history and science. Religiosity is based on three items (Cronbach's alpha, 0.63) indicating how often respondents pray, attend religious services and attend youth religious activities; responses were scored on a scale of 1–4 ("never" to "once a week"). Finally, respondent's attractiveness is measured using the interviewer's response to the question: "How physically attractive is the respondent?" Responses were given on scale of 1–5 ("very unattractive" to "very attractive").

•**Social relationship characteristics.** We used five variables based on Wave 1 data to assess different aspects of adolescents' relationships with people around them.

\*Upchurch and colleagues used seven strategies to resolve inconsistencies and concluded that the inconsistencies are largely random and have limited impact on substantive conclusions about age at first sex (source: Upchurch DM et al, Inconsistencies in reporting the occurrence and timing of first intercourse among adolescents, *Journal of Sex Research*, 2002, 39(3):197–206).

**TABLE 1. Selected characteristics of participants in Waves 1–3 of the National Longitudinal Study of Adolescent Health (Add Health), by weight status**

Characteristic	All (N=8,197)	Underweight (N=198)	Normal-weight (N=5,613)	At risk of overweight (N=1,327)	Overweight (N=1,059)
<b>Weight status and sexual experience</b>					
Self-reported BMI, Wave 1 (range, 11.49–49.85)	22.2 (0.12)	15.5 (0.12)	20.1 (0.07)	24.9 (0.10)	31.1 (0.24)
Had first sex between Waves 1 and 3 (%)	86.1	75.7**	87.2	85.4	83.4*
Age at first intercourse (range, 12–25)	17.0 (0.07)	17.6 (0.21)**	17.0 (0.07)	17.0 (0.09)	17.1 (0.21)
<b>Socioeconomic</b>					
Age (range, 11–21)	14.7 (0.11)	14.8 (0.22)	14.8 (0.11)	14.6 (0.12)*	14.6 (0.14)
Gender (%)					
Male	49.6	61.3**	47.3	51.0	57.7***
Female	50.4	38.7	52.7	49.0	42.3
Race (%)					
White	69.6	68.6	71.8	65.6***	63.3***
Black	13.3	4.7*	11.9	16.3***	18.6***
Hispanic	11.7	15.8†	10.7	13.1*	14.6**
Other	5.3	10.9*	5.6	5.0	3.6
Family structure (%)					
Two biological parents	61.3	62.6	62.3	57.8*	60.5
Stepfamily	14.9	16.1	15.8	14.2	11.0**
Single-parent family	20.6	18.7	19.6	21.7	24.9**
Other	3.1	2.6	2.3	6.3***	3.7*
Maternal education (%)					
<high school	15.6	21.8†	13.9	18.0**	20.9***
High school	42.2	38.6	41.3	44.8†	44.6
Some college	17.6	20.3†	17.6	17.7	16.9
≥college	24.6	19.3	27.3	19.5***	17.7***
Family income (in 000s; range, 0–999)	49.8 (1.69)	48.1 (4.27)	52.6 (2.08)	44.6 (1.82)**	42.0 (1.67)***
<b>Factors related to first sex</b>					
Positive family climate (range, 3–15)	11.5 (0.06)	11.7 (0.24)	11.5 (0.06)	11.4 (0.10)	11.6 (0.12)
Self-reported grades (range, 1–4)	2.9 (0.02)	2.9 (0.08)	2.9 (0.02)	2.8 (0.03)***	2.7 (0.03)***
School adjustment (range, 6–30)	21.8 (0.12)	21.3 (0.46)	21.9 (0.12)	21.5 (0.17)**	21.6 (0.22)†
Self-esteem (range, 8–40)	32.9 (0.09)	33.1 (0.44)	33.3 (0.10)	32.3 (0.19)***	31.9 (0.17)***
Religiosity (range, 3–12)	8.7 (0.06)	8.6 (0.28)	8.7 (0.07)	8.8 (0.10)	8.6 (0.11)
Attractiveness (range, 1–5)	3.6 (0.02)	3.5 (0.08)*	3.7 (0.02)	3.5 (0.04)***	3.2 (0.04)***
Motivation to have sex (range, 5–25)	13.2 (0.08)	13.3 (0.44)	13.1 (0.08)	13.3 (0.15)	13.7 (0.18)**
Perceived social consequences of sex (range, 1–15)	8.5 (0.07)	8.6 (0.03)	8.5 (0.07)	8.6 (0.11)	8.5 (0.17)
<b>Social relationship</b>					
Feeling of social marginalization (range, 1–10)	2.2 (0.02)	2.5 (0.17)*	2.1 (0.02)	2.3 (0.06)**	2.4 (0.06)***
No. of received friendship nominations (range, 0–27)	4.9 (0.10)	4.6 (0.48)	5.3 (0.11)	4.4 (0.17)***	3.7 (0.14)***
Closeness with same-sex friends (range, 0–25)	8.1 (0.12)	7.2 (0.58)*	8.4 (0.14)	7.5 (0.22)***	7.4 (0.26)***
Closeness with opposite-sex friends (range, 0–25)	4.8 (0.11)	4.2 (0.50)	4.9 (0.13)	4.7 (0.20)	4.3 (0.19)*
Had romantic relationship by Wave 1 (%)	49.7	40.0	53.4	44.6***	37.9***

\*p<.05. \*\*p<.01. \*\*\*p<.001. †p<.10. Notes: BMI=body mass index. Differences by weight status were assessed in chi-square or t tests; the reference group was normal-weight participants. Unless otherwise noted, data are means and were collected at Wave 1; figures in parentheses are standard deviations. Ns are unweighted; percentages and means are weighted. Wave 1 of Add Health was conducted in 1994–1995, Wave 2 in 1996 and Wave 3 in 2001–2002.

Feeling of social marginalization is a scale formed by summing scores reflecting how often (0="never or rarely" to 3="most of the time or all of the time") respondents say they feel lonely, feel that people are unfriendly to them and feel disliked by people (Cronbach's alpha, 0.64). The next

three variables measure adolescents' friendships and involvement with peers. We took the total number of friendship nominations received by each respondent from the network file;\* this variable is used as a proxy for popularity. Closeness with same-sex friends and closeness with opposite-sex friends are constructed from data collected in the in-home interview. Adolescents were asked to nominate up to five male and five female friends, and to report their activities with these friends during the past week. A series of items asked whether in the past seven days, the respondent had gone to each nominated friend's house, met each after school "to hang out or go somewhere," spent time with each, talked to each about a problem and talked to each on the telephone. Responses to these questions were added to construct "activities with male friends" and "activities with female friends." Then, the respondent's gender was matched with each of these to construct scales measuring closeness with same-sex friends and closeness with opposite-sex friends (Cronbach's alphas, 0.68 and 0.70, respectively). Finally, a dichotomous variable measured whether respondents had ever had a romantic relationship.

### Analysis

We used the multiple imputation procedure (Proc MI) in SAS to handle missing data. Multiple imputation uses a Monte Carlo technique to replace missing values with several simulated versions.<sup>54</sup> In Rubin's method for repeated imputation inference, each simulated complete data set is analyzed by standard methods, and the results are combined to produce estimates and confidence intervals that incorporate missing data uncertainty.<sup>55</sup> In the analyses that follow, both descriptive statistics and the output for regression models are based on the combined outputs from five imputed data sets using Rubin's rule. The complex survey design of the Add Health data is taken into account using the SAS-callable SUDAAN program. Appropriate longitudinal sampling weights are applied to the statistical models. In addition, clustering and stratifying variables are both taken into account to adjust the standard errors.

Descriptive statistics are presented to provide an overview of the study sample; we also calculated similar statistics by race and by weight status. We performed t tests and chi-square tests to compare means and percentages across weight statuses, using the normal-weight category as the reference group. Discrete-time event history models were used to examine the association between weight status and the timing of the transition to first sex. A person-year file created for the event history analyses includes observations for each year of age between Wave 1 and the age at first intercourse. If a respondent never had sex, the last observation is the person-year of age in which the Wave

\*Because the network file uses reports only from respondents who attended schools with response rates of 50% or higher,<sup>51</sup> between about one-fifth and one-quarter of data on network variables is missing.

3 interview was conducted. A dichotomous outcome variable indicating whether a respondent experienced first sex at a given age was created to mark the transition. This variable is coded 0 until the age at first sex, when it is coded 1. A series of nested discrete-time event history models were fit. In particular, the set of social relationship variables was examined (using Baron and Kenny's procedure<sup>56</sup>) for its mediating role in the association between body weight and sexual debut. The critical role of romantic relationship experience was examined separately. We compared the model using only romantic relationship experience as a potential mediator with the model containing the entire set of social relationship variables. To investigate gender and racial and ethnic variations in the relationship between weight status and first sex, we further restricted the pooled person-year file by subpopulation and conducted separate event history analyses.

## RESULTS

### Descriptive Analysis

Eighty-six percent of all adolescents made the transition to first sex between Wave 1 and Wave 3 (Table 1). Overweight and underweight adolescents were significantly less likely than their normal-weight peers to do so (83% and 76%, compared with 87%).

Overweight teenagers were more likely than normal-weight teenagers to be male and black or Hispanic. A significantly higher proportion of overweight teenagers than of normal-weight youths came from single-parent families. Compared with normal-weight adolescents, overweight youths were significantly more likely to have a mother with less than a high school education and less likely to have a mother with a college degree. Overweight youths also tended to live in families with significantly lower family income than normal-weight youths. In contrast, underweight youths were not as disadvantaged socioeconomically as overweight teenagers.

Grades and self-esteem were lower among overweight adolescents than among normal-weight youths, and overweight adolescents were rated lower on physical attractiveness. Yet, they reported higher sexual motivation than normal-weight youths. They also reported a higher level of social marginalization than normal-weight teenagers, received fewer friendship nominations, reported less closeness with same-sex and opposite-sex friends, and were less likely to have had a romantic relationship.

The profile of youths at risk of overweight is similar to that of overweight adolescents. Underweight teenagers differed relatively little from normal-weight youths; most notably, the interviewer considered them less attractive, they felt more socially marginalized and they reported less closeness with same-sex friends.

### Transition to First Sex

**Pooled sample.** According to the baseline model of the event history analysis, overweight adolescents are significantly less likely than their normal-weight peers to have

**TABLE 2. Odds ratios from discrete-time event history analysis assessing characteristics associated with adolescents' likelihood of having first intercourse between Waves 1 and 3 of Add Health**

Characteristic	Model 1	Model 2	Model 3	Model 4	Model 5
<b>Weight status</b>					
Underweight	0.62***	0.62***	0.63**	0.70**	0.69**
Normal-weight (ref)	1.00	1.00	1.00	1.00	1.00
At risk of overweight	0.93	0.90†	0.93	0.97	0.98
Overweight	0.86*	0.83**	0.86*	0.95	0.96
<b>Socioeconomic</b>					
Age‡	1.15***	1.17***	1.19***	1.19***	1.21***
Male	0.99	1.00	0.77***	1.09*	0.85***
Race					
White (ref)	na	1.00	1.00	1.00	1.00
Black	na	1.18†	1.11	1.36***	1.30***
Hispanic	na	0.88†	0.81**	0.90	0.84*
Other	na	0.65***	0.67***	0.73**	0.74**
Maternal education					
<high school (ref)	na	1.00	1.00	1.00	1.00
High school	na	1.02	1.03	0.97	0.99
Some college	na	0.94	0.98	0.85†	0.89
≥college	na	0.77***	0.86*	0.68***	0.77***
Family structure					
Two biological parents (ref)	na	1.00	1.00	1.00	1.00
Stepfamily	na	1.51***	1.28***	1.43***	1.26***
Single-parent family	na	1.35***	1.12†	1.31***	1.11†
Other	na	1.32*	1.09	1.21	1.04
Family income	na	1.00	1.00	1.00	1.00
<b>Factors related to first sex</b>					
Positive family climate	na	na	0.94***	na	0.94***
Self-reported grades	na	na	0.80***	na	0.79***
School adjustment	na	na	0.99†	na	0.99**
Self-esteem	na	na	1.02**	na	0.99
Religiosity	na	na	0.99	na	0.98†
Attractiveness	na	na	1.18***	na	1.11***
Motivation to have sex	na	na	1.04***	na	1.03***
Perceived social consequences of sex	na	na	0.90***	na	0.91***
<b>Social relationship</b>					
Feeling of social marginalization	na	na	na	0.98	0.95**
No. of received friendship nominations	na	na	na	0.97***	1.03***
Closeness with same-sex friends	na	na	na	1.02**	1.02**
Closeness with opposite-sex friends	na	na	na	1.02**	1.01*
Ever had a romantic relationship	na	na	na	1.99***	1.81***
Intercept	0.03***	0.02***	0.05***	0.01***	0.03***
Person-years	30,850	30,850	30,850	30,850	30,850

\*p<.05. \*\*p<.01. \*\*\*p<.001. †p<.10. ‡Time-varying. Notes: ref=reference group. na=not applicable. Male and ever had a romantic relationship are dichotomous; all other characteristics for which no reference group is shown are continuous.

made the transition to first intercourse between Waves 1 and 3 of the survey (odds ratio, 0.9—Table 2). The association persists when background variables alone and when these and other factors related to first sexual intercourse are controlled for (0.8 and 0.9—models 2 and 3). However, when the social relationship variables are considered along with background characteristics (model 4) and when all controls are included in the calculations (model 5), the odds ratio for overweight status is nonsignificant.

The results in models 3–5 show that the association between weight status and the odds of first intercourse is mediated largely by social relationship factors; in particular, social alienation in peer relationships appears to be the driving force behind the delayed sexual debut of overweight adolescents. According to model 5, the

**TABLE 3. Odds ratios from discrete-time event history analysis assessing characteristics associated with adolescents' likelihood of having first intercourse between Waves 1 and 3 of Add Health, by gender**

Characteristic	Male (N=3,788)				Female (N=4,409)			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
<b>Weight status</b>								
Underweight	0.51***	0.50***	0.48***	0.53**	0.87	0.91	1.00	1.14
Normal-weight (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
At risk of overweight	1.00	0.96	0.99	1.06	0.87	0.83*	0.85†	0.91
Overweight	0.91	0.88	0.93	1.00	0.81*	0.77**	0.78***	0.89
Age‡	1.14***	1.16***	1.17***	1.20***	1.16***	1.18***	0.83***	1.24***
Intercept	0.03***	0.03***	0.03***	0.03***	0.03***	0.02***	0.05***	0.03***
Person-years	14,276	14,276	14,276	14,276	16,574	16,574	16,574	16,574

\*p<.05. \*\*p<.01. \*\*\*p<.001. †p<.10. ‡Time-varying. Notes: Model 1 is unadjusted. Model 2 includes controls for socioeconomic characteristics. Model 3 adds controls for factors related to first intercourse. Model 4 adds controls for social relationship characteristics. ref=reference group.

more socially marginalized adolescents feel, the lower their likelihood of initiating sex (odds ratio, 0.95). On the other hand, the odds of sexual debut are positively associated with adolescents' number of friendship nominations (1.03), closeness with same-sex friends (1.02) and with opposite-sex friends (1.01), and romantic relationship experience prior to Wave 1 (1.8). Furthermore, despite the apparently large effect of romantic relationship history, this variable alone does not seem to be responsible for the attenuation of the risk associated with overweight status: In additional analyses (not shown), the coefficient for overweight status becomes nonsignificant only when all five social relationship variables are entered, but not when romantic relationship experience is entered alone. Variables that are typically used in research on the timing of first sexual intercourse do not explain the relationship between body weight and the transition to first sex: Their significance in model 3 does not alter the relationship between overweight status and the risk of sexual debut.

**TABLE 4. Odds ratios from discrete-time event history analysis assessing characteristics associated with adolescents' likelihood of having first intercourse between Waves 1 and 3 of Add Health, by race and ethnicity**

Characteristic	White (N=4,689)				Black (N=1,536)	Hispanic (N=1,266)	Other (N=706)
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 1	Model 1
<b>Weight status</b>							
Underweight	0.69*	0.65**	0.63*	0.68*	0.67	0.39**	0.84
Normal-weight (ref)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
At risk of overweight	0.93	0.89†	0.94	1.01	1.13	0.86	1.05
Overweight	0.74***	0.71***	0.76**	0.87	1.00	0.92	1.14
Age‡	1.18***	0.84***	1.21***	0.80***	1.10***	1.14***	1.15***
Male	0.99	0.98	0.71***	0.78***	0.98	1.26**	0.84
Intercept	0.02***	0.02***	0.03***	0.02***	0.08***	0.03***	0.02***
Person-years	17,861	17,861	17,861	17,861	5,217	4,699	3,073

\*p<.05. \*\*p<.01. \*\*\*p<.001. †p<.10. ‡Time-varying. Notes: Model 1 is unadjusted. Model 2 includes controls for socioeconomic characteristics. Model 3 adds controls for factors related to first intercourse. Model 4 adds controls for social relationship characteristics. Models 2–4 were not fitted for blacks, Hispanics and other racial and ethnic groups because overweight status was not associated with sexual debut in the unadjusted model for these groups. ref=reference group.

•**Gender differences.** Body weight is related to the timing of first sex differently for males and females (Table 3). Underweight male teenagers experience delayed sexual debut, and this association remains strong even when social relationship variables are taken into account. Across the four models in Table 3, underweight males' odds of sexual debut between Waves 1 and 3 are about half those of their normal-weight peers. Among males, we do not observe an association between being overweight and the odds of becoming sexually active. In contrast, the odds of first sex are about 20% lower for overweight female youths than for their normal-weight peers, but this relationship is no longer statistically significant when social relationship variables are taken into account (model 4). Thus, relatively low levels of integration into peer groups and limited romantic relationship experiences of overweight females are associated with a decreased likelihood of their becoming sexually active.

•**Racial and ethnic differences.** Overweight status is strongly associated with delayed onset of sexual experience in the baseline model for white adolescents (odds ratio, 0.7—Table 4). Once again, however, the relationship becomes nonsignificant when the social relationship variables are included (model 4). For blacks, Hispanics and other races, the baseline model indicated no negative association between overweight status and the transition to first sex, so we did not fit models adding controls. Additional descriptive statistics show that overweight white youths are more susceptible to social alienation and limited romantic relationship experience than are normal-weight white youths (not shown). A similar pattern of weaker social integration among overweight teenagers is not found for blacks, Hispanics and adolescents who belong to other racial groups.

## DISCUSSION

The findings show that overweight adolescents are likely to have their first sexual experience later than normal-weight adolescents. Being overweight delays the transition to first sexual intercourse in part because of social exclusion from peer groups. Overweight adolescents are less likely to have close friendship ties, more likely to feel marginalized socially and less likely to experience romantic relationships than their normal-weight peers. These are key factors in the relatively late sexual debut. The findings here are similar to those of Bingham and Crockett, who showed that postponers (teenagers remaining sexually inexperienced at 12th grade) had the poorest quality peer relationships.<sup>7</sup> At the same time, postponers reported the most positive family relationships, the highest religiosity and the strongest attachment to schools. We did not observe a similarly favorable profile of conventional values among the overweight teenagers in this study. In fact, on average, these teenagers had lower grades than their normal-weight peers.

The subanalyses by gender and racial and ethnic group present an interesting twist, showing that the transition to

first sex is delayed among females who are overweight and among males who are underweight. Underweight males may simply have slower pubertal development than their normal-weight peers, and this may explain why the peer relationship context does not account for their later onset of sexual activity. For females, the role of overweight status in delaying first sex is largely explained by poor social relationships. Overall, these findings show that excess weight is far more limiting for females than for males. Findings from the separate analyses of the four racial and ethnic groups are consistent with the conclusions of prior studies that prejudice against overweight individuals is stronger for whites than for blacks.<sup>41,44,45</sup> Furthermore, they suggest that the findings about the role of weak social relationships in explaining the association between body weight and the timing of first sex apply more to whites than to the other racial and ethnic groups.

Studies of adolescent sex have begun to emphasize the importance of identifying a trajectory of healthy sexual development, rather than viewing teenage sex as necessarily problematic or risky.<sup>57,58</sup> Risk prevention programs are most likely to be effective when both causes of risk and factors leading to healthy development are well researched. Prevention programs typically target youths who are vulnerable to risky early sex, but overweight youths (particularly females and white teenagers) who delay sex well beyond the ages when involvement in intimate relationships becomes normative might also be facing issues that hinder healthy sexual development. Peer relationships in adolescence are building blocks for the development of interpersonal relationship skills that will carry into adulthood.<sup>17</sup> Social exclusion and a lack of romantic relationships can contribute to a negative self-appraisal and a poor body image among overweight youths, elevating the risk of later adjustment problems.<sup>59</sup> The development of social competence and overall psychological well-being may be compromised. Later problems in forming unions, such as cohabitation or marriage, can emerge because of poor self-image and a lack of developmentally appropriate intimate relationship experience.<sup>60</sup> Overweight adolescents may also experience later problems interacting with fellow students in schools or colleagues in workplaces, which can hinder their socioeconomic attainment.

The findings here also reveal the importance of the nationwide campaign to fight against childhood obesity, as it has a negative long-term impact not only on health, but also on sociodevelopmental outcomes. In addition to reducing the prevalence of obesity, decreasing weight stigma and teaching coping strategies to overweight youths are important. School programs that fight against weight prejudice are still uncommon, despite the prevalence of obesity and the ubiquity of weight bias in daily life. The goal of reducing weight stigma should be incorporated into existing diversity education that focuses on raising awareness and tolerance of differences in race, religion, gender or sexual orientation. Educators should also be knowledgeable about effective coping strategies,

and be willing and able to provide consulting services to stigmatized youths. More efforts must be made to create an environment in which overweight youths feel physically, psychologically and socially accepted. Such efforts might promote the social inclusion of overweight youths, thereby improving their chances for healthy social and sexual development.

Our study has several limitations that should be addressed in future research. First, several social relationship variables were included as indirect measures of weight stigma. More direct questions that ask about perceived weight discrimination would be helpful for assessing how it mediates the impact of body weight on the timing of sexual debut. Second, the Add Health data do not permit examination of contraceptive use during first sex for all respondents. (Relevant data are available for those who made the transition prior to Wave 2, but not for those who did so between Waves 2 and 3.)

Using longitudinal data from a large national sample of U.S. adolescents, our study reveals the critical role of social relationships in shaping first sexual partnerships. Even though the prevalence of overweight has been increasing over the past few decades, presumably making excess weight more normative, widespread weight prejudice still influences important aspects of adolescents' lives. The results also highlight important gender and racial and ethnic variations in the role of weight in adolescent sexual development. Given recent trends in overweight and obesity—and the relatively high prevalence of overweight among black females and Hispanic males and females<sup>1</sup>—the sexual development and later adult adjustment of overweight youths of different genders and racial and ethnic backgrounds warrant more attention from the health research community.

## REFERENCES

1. National Center for Health Statistics, *Health United States, 2009: With Special Feature on Medical Technology*, Hyattsville, MD: National Center for Health Statistics, 2010, Table 73, <<http://www.cdc.gov/nchs/data/hus/hus09.pdf#073>>, accessed June 15, 2010.
2. Puhl RM and Latner JD, Stigma, obesity, and the health of the nation's children, *Psychological Bulletin*, 2007, 133(4):557–580.
3. Latner JD and Stunkard AJ, Getting worse: the stigmatization of obese children, *Obesity Research*, 2003, 11(3):452–456.
4. Hofferth SL, *Risking the Future: Initiation of Sexual Intercourse*, Washington, DC: National Academy Press, 1987.
5. Steward NR, Farkas G and Bingenheimer JB, Detailed educational pathways among females after very early sexual intercourse, *Perspectives on Sexual and Reproductive Health*, 2009, 41(4):244–252.
6. Armour S and Haynie DL, Adolescent sexual debut and later delinquency, *Journal of Youth and Adolescence*, 2007, 36(2):141–152.
7. Bingham CR and Crockett LJ, Longitudinal adjustment patterns of boys and girls experiencing early, middle, and late sexual intercourse, *Developmental Psychology*, 1996, 32(4):647–658.
8. Jessor R et al., The time of first intercourse: a prospective study, *Journal of Personality and Social Psychology*, 1983, 44(3):608–626.
9. Meier AM, Adolescent first sex and subsequent mental health, *American Journal of Sociology*, 2007, 112(6):1811–1847.

10. Ryan S, Manlove J and Franzetta K, The first time: characteristics of teens' first sexual relationships, *Child Trends Research Brief*, Washington, DC: Child Trends, 2003, No. 2003-16.
11. Connolly JA et al., Mixed-gender groups, dating, and romantic relationships in early adolescence, *Journal of Research on Adolescence*, 2004, 14(2):185-207.
12. Pearce MJ, Boergers J and Prinstein MJ, Adolescent obesity, overt and relational peer victimization, and romantic relationships, *Obesity Research*, 2002, 10(5):386-393.
13. Strauss RS and Pollack HA, Social marginalization of overweight children, *Archives of Pediatrics and Adolescent Medicine*, 2003, 157(8):746-752.
14. Halpern CT et al., Body mass index, dieting, romance, and sexual activity in adolescent girls: relationships over time, *Journal of Research on Adolescence*, 2005, 15(4):535-559.
15. Halpern CT et al., Effects of body fat on weight concerns, dating and sexual activity: a longitudinal analysis of black and white adolescent girls, *Developmental Psychology*, 1999, 35(3):721-736.
16. Havighurst RJ, *Developmental Tasks and Education*, third ed., New York: David McKay Company, 1972.
17. Hartup WW, The company they keep: friendships and their developmental significance, *Child Development*, 1996, 67(1):1-13.
18. Brown BB, "You're going out with who?" Peer group influences on adolescent romantic relationships, in: Furman W, Brown BB and Feiring C, eds., *The Development of Romantic Relationships in Adolescence*, New York: Cambridge University Press, 1999, pp. 291-329.
19. Cavanagh SE, The social construction of romantic relationships in adolescence: examining the role of peer networks, gender, and race, *Sociological Inquiry*, 2007, 77(4):572-600.
20. Connolly JA, Furman W and Konarski R, The role of peers in the emergence of heterosexual romantic relationships in adolescence, *Child Development*, 2000, 71(5):1395-1408.
21. Feiring C, Other-sex friendship networks and the development of romantic relationships in adolescence, *Journal of Youth and Adolescence*, 1999, 28(4):495-512.
22. Sieving RE et al., Friends' influence on adolescents' first sexual intercourse, *Perspectives on Sexual and Reproductive Health*, 2006, 38(1):13-19.
23. Cawley J, Joyner K and Sobal J, Size matters: the influence of adolescents' weight and height on dating and sex, *Rationality and Society*, 2006, 18(1):67-94.
24. Thornton A, The courtship process and adolescent sexuality, *Journal of Family Issues*, 1990, 11(3):239-273.
25. Costa FM et al., Early initiation of sexual intercourse: the influence of psychosocial unconventionality, *Journal of Research on Adolescence*, 1995, 5(1):93-121.
26. Jessor R and Jessor SL, *Problem Behavior and Psychosocial Development: A Longitudinal Study of Youth*, New York: Academic Press, 1977.
27. Crockett LJ et al., Timing of first sexual intercourse: the role of social control, social learning, and problem behavior, *Journal of Youth and Adolescence*, 1996, 25(1):89-111.
28. Dittus PJ and Jaccard J, Adolescents' perceptions of maternal disapproval of sex: relationship to sexual outcomes, *Journal of Adolescent Health*, 2000, 26(4):268-278.
29. Buhi ER and Goodson P, Predictors of adolescent sexual behavior and intention: a theory-guided systematic review, *Journal of Adolescent Health*, 2007, 40(1):4-21.
30. Whitbeck LB et al., Early adolescent sexual activity: a developmental study, *Journal of Marriage and Family*, 1999, 61(4):934-946.
31. Miller BC, Christensen RB and Olson TD, Adolescent self-esteem in relation to sexual attitudes and behavior, *Youth & Society*, 1987, 19(1):93-111.
32. Wiederman MW and Hurst SR, Body size, physical attractiveness, and body image among young adult women: relationships to sexual experience and sexual esteem, *Journal of Sex Research*, 1998, 35(3):272-281.
33. Ogden CL et al., Centers for Disease Control and Prevention 2000 growth charts for the United States: improvements to the 1977 National Center for Health Statistics version, *Pediatrics*, 2002, 109(1):45-60.
34. Jones DC, Body image among adolescent girls and boys: a longitudinal study, *Developmental Psychology*, 2004, 40(5):823-835.
35. Green KL et al., Weight dissatisfaction and weight loss attempts among Canadian adults: Canadian Heart Health Surveys Research Group, *Canadian Medical Association Journal*, 1997, 157(Suppl. 1):S17-25.
36. Fallon AE and Rozin P, Sex differences in perceptions of desirable body shape, *Journal of Abnormal Psychology*, 1985, 94(1):102-105.
37. Mishkind ME et al., The embodiment of masculinity, in: Johnston JR, ed., *The American Body in Context: An Anthology*, Wilmington, DE: Scholarly Resources, 2001, pp. 103-121.
38. Labre MP, Adolescent boys and the muscular male body ideal, *Journal of Adolescent Health*, 2002, 30(4):233-242.
39. McCabe MP and Ricciardelli LA, Sociocultural influences on body image and body changes among adolescent boys and girls, *Journal of Social Psychology*, 2003, 143(1):5-26.
40. Falkner NH et al., Social, educational, and psychological correlates of weight status in adolescents, *Obesity Research*, 2001, 9(1):32-42.
41. Neumark-Sztainer D et al., Ethnic/racial differences in weight-related concerns and behaviors among adolescent girls and boys: findings from Project EAT, *Journal of Psychosomatic Research*, 2002, 53(5):963-974.
42. Chen EY and Brown M, Obesity stigma in sexual relationships, *Obesity Research*, 2005, 13(8):1393-1397.
43. Feingold A, Gender differences in effects of physical attractiveness on romantic attraction: a comparison across five research paradigms, *Journal of Personality and Social Psychology*, 1990, 59(5):981-993.
44. Altabe M, Ethnicity and body image: quantitative and qualitative analysis, *International Journal of Eating Disorders*, 1998, 23(2):153-159.
45. Nollen N et al., Correlates of ideal body size among black and white adolescents, *Journal of Youth and Adolescence*, 2006, 35(2):276-284.
46. Crago M, Shisslak CM and Estes LS, Eating disturbances among American minority groups: a review, *International Journal of Eating Disorders*, 1996, 19(3):239-248.
47. Story M et al., Ethnic/racial and socioeconomic differences in dieting behaviors and body image perceptions in adolescents, *International Journal of Eating Disorders*, 1995, 18(2):173-179.
48. Cunningham MR et al., "Their ideas of beauty are, on the whole, the same as ours": Consistency and variability in the cross-cultural perception of female physical attractiveness, *Journal of Personality and Social Psychology*, 1995, 68(2):261-279.
49. Thompson SH, Sargent RG and Kemper KA, Black and white adolescent males' perceptions of ideal body size, *Sex Roles*, 1996, 34(5):391-406.
50. Akers AY et al., Exploring the relationship among weight, race, and sexual behaviors among girls, *Pediatrics*, 2009, 124(5):e913-e920, <<http://pediatrics.aappublications.org/cgi/reprint/124/5/e913>>, accessed June 15, 2010.

- 51.** Harris KM et al., *The National Longitudinal Study of Adolescent Health: Research Design*, 2003, Chapel Hill, NC: Carolina Population Center, <<http://www.cpc.unc.edu/projects/addhealth/design>>, accessed June 15, 2010.
- 52.** Moody J, *Add Health Network Structure Files*, Chapel Hill, NC: Carolina Population Center, University of North Carolina, 2005.
- 53.** Manlove JS, Ryan S and Franzetta K, Risk and protective factors associated with the transition to a first sexual relationship with an older partner, *Journal of Adolescent Health*, 2007, 40(2):135–143.
- 54.** Rubin DB, *Multiple Imputation for Nonresponse in Surveys*, New York: J. Wiley & Sons, 2004.
- 55.** Schafer JL, The multiple imputation FAQ page, University Park, PA: Pennsylvania State University, <<http://www.stat.psu.edu/~jls/mifaq.html#ref>>, accessed June 15, 2010.
- 56.** Baron RM and Kenny DA, The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations, *Journal of Personality and Social Psychology*, 1986, 51(6):1173–1182.
- 57.** Diamond LM, Introduction: in search of good sexual-developmental pathways for adolescent girls, *New Directions for Child and Adolescent Development*, 2006, 2006(112):1–7.
- 58.** Halpern CT, Reframing research on adolescent sexuality: healthy sexual development as part of the life course, *Perspectives on Sexual and Reproductive Health*, 2010, 42(1):6–7.
- 59.** Bagwell CL et al., Friendship and peer rejection as predictors of adult adjustment, *New Directions for Child and Adolescent Development*, 2001, 2001(91):25–49.
- 60.** Raley RK, Crissey S and Muller C, Of sex and romance: late adolescent relationships and young adult union formation, *Journal of Marriage and Family*, 2007, 69(5):1210–1226.

### Acknowledgments

Support for this research was provided by grant R01-HD045309 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD). Support services were provided by the Population Research Institute, Pennsylvania State University, which has core support from NICHD grant R24-HD41025. This research uses data from Add Health, a program project designed by J. Richard Udry, Peter S. Bearman and Kathleen Mullan Harris, and funded by grant P01-HD31921 from the NICHD, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwistle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516–2524 (<[addhealth@unc.edu](mailto:addhealth@unc.edu)>). No direct support was received from grant P01-HD31921 for this analysis.

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