

Will daughters walk mom's talk? The effects of maternal communication about sex on the sexual behavior of female adolescents

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Abstract Numerous social marketing campaigns exhort parents to talk to their children about sexual abstinence, pregnancy risk, and sexually transmitted disease prevention. The effectiveness of these conversations is difficult to ascertain if parents are more likely to broach discussions related to sexual activity with adolescents who have greater propensities to engage in these risky behaviors. Our baseline empirical results indicate that female adolescents whose mothers communicate more about sex are more likely to have sexual intercourse, practice unsafe sex, and engage in casual sex. However, once we control for the adolescent's environment and peers through the use of school fixed effects and for the daughter's own propensity to engage in such behaviors through a rich set of adolescent-specific covariates, the effect of a mother's talk on her daughter's behavior is reduced dramatically indicating that mother's talk is endogenous to the daughter's sexual behavior. Models employing sister fixed effects to control for family-level unobservables, although imprecisely estimated, confirm this finding.

Keywords Maternal sex talk · Sexual intercourse · Unsafe sex · Casual sex

JEL Classification I13 · J12

1 Introduction

Although teen pregnancy rates in the U.S. are at an all-time low (Hamilton and Ventura 2012), the U.S. still has the highest teen pregnancy rate among developed

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countries (Centers for Disease Control 2011). Currently about one-third of girls will give birth before age 20 (National Campaign to Prevent Teen Pregnancy 2011). Furthermore, recent estimates indicate that rates of unintended pregnancy are highest amongst those aged 15–19 years old (Finer 2010). In 2008, births to teen mothers cost taxpayers (federal, state, and local) approximately \$11 billion (National Campaign to Prevent Teen Pregnancy 2011).

But a much wider range of concerns regarding adolescent sexual activity—including health, social, economic, and even moral ramifications—continue to motivate involvement by parents, professionals, and policy makers. A variety of programs are in place to attempt to delay the sexual debut of adolescent women and/or teach them about contraceptive use (Lindberg et al. 2006). Among these interventions are informational campaigns targeting parents and encouraging them to speak to their children about sex.¹ The Department of Health and Human Services' "Parents Speak Up" emphasizes an abstinence-first message, for example. The National Campaign to Prevent Teen Pregnancy, on the other hand, supports parents in providing more "comprehensive" information and even provides discussion guides for use with MTV's popular television show *16 and Pregnant*. On top of big budget campaigns like these, child-development experts advise age-appropriate and continuing dialogue between parents and children regarding sex (Bernstein 2011).

Despite the widespread support for parent-child communication about sex, the effect of these conversations, and thus the efficacy of the social marketing campaigns, is unknown. The effect is difficult to ascertain because those parents who are most likely to talk to their adolescents about these issues may also be those who have the most reason to be concerned about their child's behavior. Therefore, in this research we carefully consider the possible endogeneity of parent-child communication to adolescent sexual activity. Specifically, we use data from the National Longitudinal Study of Adolescent Health (AddHealth) to examine the influence that mother-daughter discussions (hereafter, maternal "talk") have on a female adolescent's decision to engage in sexual intercourse or safe sex practices (e.g., condom use). Using the AddHealth's rich data on other aspects of parenting and parental attitudes, the adolescent's home and school environment, and individual adolescent characteristics, we investigate the statistical relationship between talk and adolescent behavior in a sample of mother-daughter pairs. We also use a sample of sisters (and their mothers) from the AddHealth to estimate fixed effects models controlling for family-specific unobserved heterogeneity and employ an instrumental variables approach as an additional robustness check. Ours is the first research to try to isolate the effect of maternal talk on a teen's propensity for sexual activity from other aspects of parenting including a mother's parenting style, age at first birth, relationship status, and expectations for her daughter.

¹ These campaigns are not dissimilar from long-standing social marketing campaigns like The Partnership for a Drug Free America's *TimeToTalk* initiative aimed at adolescent substance use or a newer campaign by Children Now which encourages parents to address a range of topics from terrorism to HIV and to "talk to your kids before everyone else does."

Our concept of maternal talk is novel in the economics literature, although numerous social scientists have explored related issues.² Theoretical models in the sociological and developmental psychology literature have linked high levels of parental supervision and discipline with positive outcomes and a reduced propensity of adolescents to engage in risky behavior (Fletcher et al. 1995; Amato and Rivera 1999; Amato and Fowler 2002; Browning et al. 2005). Increased supervision and monitoring are hypothesized to limit the opportunities and incentives for engaging in risky behavior. Others have found empirical correlations that they interpret as support for these hypotheses (for example, Richardson et al. 1993; Vandell and Ramanan 1991). Expressing concern that the findings described above might be endogenous if levels of supervision are driven by unobservable parent characteristics, Aizer (2004) found that an increase in adult supervision reduced truancy, alcohol and marijuana use, theft, and fighting among school-age children.

There is little empirical research in adolescent risky behavior on parental inputs other than basic parent characteristics and supervision and even less that attempts to uncover the causal relationship between parenting activities and adolescent outcomes. If a mother expects risky behavior from her child or foresees negative influences from her daughter's peer group, she may find more incentive to talk to her child. If a parent is aware of school curricula that effectively discourage risky behaviors, she may choose to talk to her child about similar things less frequently or less forcefully. If any of these potential scenarios is true, estimation of a simple production function of adolescent risky behavior will return biased estimates of the true effect of maternal talk.

Our baseline OLS regressions indicate that maternal talk is associated with a higher probability of having sex, having unsafe sex, and engaging in sexual activities outside of a romantic relationship (hereafter, "casual sex"). However, as we control for additional characteristics of the child's school, home, and especially the daughter's attributes and attitudes, we find strong evidence that maternal talk is likely endogenous and that the most naïve OLS models are likely biased upward with respect to the effect of maternal talk. Our sister fixed effects models provide further support that mothers do, in fact, talk more to daughters who are uniquely prone to sexual activity.

1.1 The costs and consequences of various sexual activity

We explore a variety of sexual behaviors in adolescent girls. Before discussing our model and data, we provide a brief overview of some of the consequences of adolescent sex as well as evidence that the sexual behaviors we examine are particularly salient for adolescent girls.

The consequences and costs of adolescent sex are well documented, particularly in the case of unprotected sex and multiple sexual partners—behaviors that are often termed "risky." Pregnancy, sexually transmitted diseases (STDs), and even

² See, as examples, Swain et al. (2006), a discussion of the predictors of the extent and content of parent communication, and Blake et al. (2001), a small scale experimental study of parent involvement with school-based sex education curriculum.

depression are potential costs associated with risky sexual activity. Sabia and Rees (2008) use an instrumental variables approach to find that sexually active females, especially those not utilizing contraceptives, exhibit more symptoms of depression. STDs are also of considerable concern for women. The Centers for Disease Control reports that 1 in 4 young women between the ages of 14 and 19 in the U.S. is infected with at least one of the most common STDs (human papillomavirus (HPV), Chlamydia, herpes simplex virus, and trichomoniasis) (CDC 2010). Women are more likely to contract an STD than men when they have sex with an infected partner and do not use a condom, and women who are infected are more likely than infected men to be asymptomatic, which can lead to serious health complications. Furthermore, STDs may have more negative consequences for women as compared to men. These include the possibility of an ectopic pregnancy, Pelvic Inflammatory Disease, and cervical cancer (Landry and Turnbull 1997).

Sexual intercourse with condoms (sometimes referred to as “safer sex”) may have negative consequences as well. First, many teenagers do not use condoms correctly and consistently (Santelli et al. 1998). Within our sample from the AddHealth, fewer than 1 % of sexually active adolescents report using condoms at every sexual encounter. If condoms are not used at all times correctly, intercourse is not without the physical risks noted earlier.

A large interdisciplinary literature suggests that adolescent sex, even when condoms are used, can lead to adverse consequences. Among the small number of causal analyses in this area, Sabia and Rees (2011) find that females have a higher probability of high school graduation if they abstain from sex. Additionally, it is clear from the AddHealth that mothers at least perceive moral ramifications as well as consequences among their child’s peer group of their daughters’ sexual activity, since they report discussing these concerns with their adolescents. While sexual intercourse might increase self-esteem among males, non-virgin females are at increased risk for poor self-esteem (Sabia and Rees 2008).

We take advantage of the richness of the AddHealth data, described in more detail below, by using three measures of adolescent sexual activity each of which speaks to distinct research questions and policy debates. First, we consider whether the adolescent has ever engaged in sexual intercourse, or “has had sex.” This is our broadest measure and is directly relevant to the debate regarding “abstinence only” education and the relevance of abstinence as an alternative choice. In some cases though, parents and/or policy makers may be more concerned about “risky sex” which we characterize in two ways: participation in sexual activity outside of a romantic relationship, i.e., “casual sex,” and having “unsafe sex,” which is defined as using condoms less than “most of the time” when engaging in vaginal intercourse.³

³ Unfortunately, although we would have liked to include data on other types of sexual activity including anal and oral sex, the AddHealth did not collect data on anal sex until wave 2 (and then only for girls who are in a relationship) and did not collect data on oral sex until wave 3 (at which time the respondents are young adults). Given that our primary variable of interest is mother’s talk about sex, which is only measured at wave 1, we must limit our analyses to vaginal sexual intercourse except in the case of casual sex where the survey question does not distinguish between sexual activity generally and intercourse specifically.

1.2 Other related literature: the effects of sex education

To our knowledge, this research is novel within economics in its focus on parental communication. However, there are some similarities between our topic and the substantial economics literature regarding sex education. Oettinger (1999) provides a thorough theoretical framework for the myriad potential influences of sex education on teen sexual activity. He refers to three types of sexual education, “risk altering,” “utility-altering,” and “risk revealing” which provide information to teens that can help them reduce the risks of teen pregnancy, inform teens of the different utilities they might expect to follow from their various choices, and understand the probability of becoming pregnant, respectively.⁴ Parental communication may be similarly varied. Some parents may address all of these topics and others only some. Intensity and effectiveness of parental communication in these dimensions can also vary. Oettinger’s theory provides a useful context to our work, but our goal is to explore the possibility that parent communication is different than sex education curricula. Maternal talk may be better targeted and more personalized, less well informed, and/or more consistent and persistent. One potentially important difference we can imagine between parent and school communication is the value-forming potential of parental communication. Like school curriculum, parents can inform teens on *expected* utility from various choices/outcomes, but parents may also have a particular influence on the utility a teen derives from a given choice/outcome through something more fundamentally shaping of their utility function.⁵

A more recent study by Sabia (2006) approaches similar questions about the effectiveness of sex education but with newer data and a greater variety of empirical approaches. To identify the causal relationship between sex education and adolescent sexual behavior, Sabia employs Propensity Score Matching, Difference in Differences, and Instrumental Variables. Because his focus is in-school sex education curricula, he instruments for the availability/offering of sex education with proxies for the school’s budget (hypothesizing that sex education is not as essential to the curriculum as other academic fields and is therefore likelier to be offered when budgets are higher, other things held constant.) Sabia employs a variety of empirical strategies, ultimately demonstrating that careful attention to selection on observables is not sufficient for identifying the true effect of sex education. While we hypothesize that maternal talk may be very different than institutional sex education, our empirical results that follow are consistent with Sabia’s. He concludes that, while sex education is positively correlated with adolescent sexual activity, the relationship does not appear to be causal.

⁴ While Oettinger does not focus on STDs, social, or moral consequences of sexual activity, we can easily extend his framework to incorporate information regarding STD prevention, the costs of contracting an STD or incurring social stigma, and the probability of such outcomes.

⁵ Oettinger also empirically tests his theory, using sibling pairs to identify the effect of sex education, and finds that sex education in the 1970s had some effect on teen outcomes through “risk altering” information.

2 The model

In the production process of adolescent behavior, both mothers and daughters are decision-makers. A parent makes a set of choices in order to maximize her utility which may include investments in children, labor market participation, schooling, marriage, and leisure. Her maternal investments, including talk, may influence her child in two distinct ways. She may influence the resource constraint that the adolescent faces, commonly thought of as punishment. She may also influence her child's values; i.e., alter the fundamentals of the adolescent's utility function. Possessing a utility function that is, in part, shaped by parental values and a resource constraint that is largely determined by an endowment from her parent, an adolescent maximizes her utility over choices of risky behaviors. In this research we estimate reduced form production function models of adolescent risky-behaviors with a special focus on observed maternal inputs while recognizing that the choice of a parent's inputs is very likely correlated with her expectations of her daughter's behavior.

In our empirical work, we are interested in estimating the effects of maternal inputs on child outcomes related to sexual behavior. Our empirical model can be stated as follows:

$$R_i = \alpha PT_i + \beta' F_i + \gamma' X_i + \varepsilon_i, \quad (1)$$

where PT_i represents the amount of communication the adolescent's mother reports having with her child about sex, F_i is a vector of mother and family characteristics (importantly including other maternal investments and attitudes as well as family size and birth order dummy variables⁶), and the vector X_i contains a variety of other controls including child demographics (age, race, and religion), her attitudes and activities, and physical development. R_i is one of our three dichotomous measures of adolescent sexual activity.

The AddHealth's school-based sampling design allows us to identify multiple adolescents across many schools. Previous research has identified individual-invariant school effects that include student peer group (Gaviria and Raphael 2001) and school curriculum and policies, including sex education (Oettinger 1999). Thus, we further refine our model to portion out the variation in adolescent behavior due to unobserved factors of the adolescent's school by adding school fixed effects, denoted s_j below (where j indexes schools). This is particularly important in the context of our research question because it eliminates a potential source of endogeneity of maternal talk. One might expect that the talk behavior of a parent is affected by her expectations of what the child is hearing at school about risky behaviors through both informal and formal channels. Controlling for school fixed effects has the added bonus of eliminating the need to identify which school policies are, in fact, effective in reducing adolescent risky behavior while

⁶ Existing research has documented the role of family size and birth order in the production of risky adolescent behavior. See for example, Rodgers et al. (1992), Argys et al. (2006), and Averett et al. (2011).

allowing that such factors still may have significant influence on the adolescent's outcomes.⁷ School fixed effects may also capture some of the influence of an adolescent's peer group. These groups and the social interactions they facilitate can have significant effects on risky behavior (Ali and Dwyer 2011; Fletcher 2009; Kawaguchi 2004).

Yet school fixed effects cannot eliminate any family-specific or child-specific unobserved heterogeneity that may continue to confound the estimated effect of maternal talk. Therefore, we exploit observations of siblings in the AddHealth and estimate sister fixed effects models to capture family-specific unobserved heterogeneity. If k indexes families, our model is as follows:

$$R_{ik} = \alpha PT_{ik} + \beta_2' F_{ik} + \gamma' X_{ik} + v_k + \varepsilon_{2ik}, \quad (2)$$

Such a model will eliminate any family-specific unobserved heterogeneity as a potential source of endogeneity of talk, but it cannot address endogeneity resulting from individual-specific unobserved heterogeneity. In particular, we are concerned that a mother may choose to talk more to one daughter about sexual activity precisely because she believes that daughter has a greater proclivity for becoming sexually active or engaging in risky sexual activity. If this is true, sister fixed effects may only exacerbate the upward bias of the coefficient on talk.

3 Data

The AddHealth is a nationally-representative survey of roughly 90,000 adolescents who were in 7th through 12th grade during the 1994–1995 academic year. Our data derive from Wave 1 of the in home portion of the study when 20,745 students and their parents were asked about the adolescent's health, relationships, family setting, and socioeconomic background, as well as school and neighborhood characteristics. Since the vast majority of parent respondents are mothers, we chose to focus on mother–daughter interactions as cross-gender communication may be of a different nature (e.g., less likely to occur than same-sex communication or more prevalent in single-parent homes). Furthermore, as discussed earlier, adolescent females are more likely to suffer the negative physical and emotional consequences of sexual behavior.

Our final sample for analysis consists of 3,182 women aged 14–18 years old whose biological mother filled out the parental questionnaire administered at Wave

⁷ Trenholm et al. (2008) use data from an abstinence-only education experiment and find some indication of greater awareness and knowledge about STDs, condoms, and birth control. However, they uncover no significant impact of the same program on adolescent behaviors including sexual activity and unprotected sex or outcomes like teen pregnancy, giving birth, and STD diagnosis. Conversely, Cannonier (2012) finds a significant effect at the state-level on teen childbirth rates with increased funding for abstinence education.

1.⁸ Our sample differs in a number of ways from the overall AddHealth sample of adolescent females aged 14–18 whose mother's completed the parent questionnaire.⁹ Our selected sample is significantly less likely than the larger sample of adolescent females to have had sex, to practice unsafe sex, and to have engaged in casual sex. It is also the case that our average sample member is generally more advantaged than the average female in the AddHealth in that she is less likely to live in a single parent home, has higher family income, and is less likely to live in an urban area. Furthermore, our sample members are more likely to have been breastfed, to want to attend college, and have mothers who would be disappointed if the daughter had sex at this stage in her life. Thus, our empirical results should be interpreted with caution as they reflect the experience of adolescent females who live with their biological mothers and may not be generalizable to all adolescent females.

3.1 Index for parenting style

Because the AddHealth asked parents a large number of questions that can be construed as relating to their parenting style, we use Multiple Correspondence Analysis (MCA) to create an index of maternal strictness or, more generally, parenting style. MCA has recently been used by economists to measure health (Kohn 2012) and is closely related to principal components analysis which is often used by development economists to create indices of socioeconomic status (Vyas and Kumaranayake 2006). MCA reduces the dimensionality of our set of categorical variables that indicate parenting style.¹⁰ MCA computes weights to maximize the correlation in these data across all the categories. Thus, rather than several potentially highly correlated variables measuring parenting style, we use one measure that is a combination of all of these.¹¹

In Table 4 of the Appendix, we present the weights generated by MCA in the creation of our parenting index. A negative sign indicates that the factor is correlated with being a lenient parent while a positive sign indicates a more strict parenting style. The signs on our variables are as we might expect. For example, parents who are more likely to supervise their children are stricter and those who

⁸ From the 20,745 respondents in wave one of the AddHealth, we drop those without a valid sample weight (1,821), males (9,290) as well as adolescents whose parent survey was completed by someone other than a biological mother (2,440). We limit our analyses to those aged 14–18 (dropping 1,255). We eliminated others for missing key variables including having had sex (44), the measures of maternal talk about sex (135), mother's age at first birth (1,764), and missing values on other covariates (813). Since we use school fixed effects in many of our models, we also eliminated one adolescent because she was the only respondent in her school. Rather than eliminating respondents who are missing income data, we impute income and include a binary variable in the models to indicate these observations. We are left with 3,182 female adolescents in 129 schools.

⁹ A table of means for each sample is available upon request.

¹⁰ These variables include indicators that the mother allows the daughter to decide her curfew, who to hang out with, what to wear, how much TV to watch, weeknight bedtime, and what to eat as well as indicators that the mother never drinks, feels it is most important that her daughter is well behaved and indicators that a parent supervises the daughter before school, after school, and before bed.

¹¹ More details on construction of the index are available upon request.

allow their daughter to make her own decisions about, say, her curfew are more lenient. We normalize this index to lie between zero and 100.

3.2 Specifications for maternal talk

The empirical results that follow take advantage of the full set of questions asked of the parents of the adolescents in the AddHealth data set about what they have ever discussed with their children regarding sexual activity. One set of questions asks parents about the specific subject matter of their discussions about sex including: How much have you and {NAME} talked about his/her having sexual intercourse and:

- the negative or bad things that would happen if she become pregnant (he got someone pregnant)?
- the dangers of getting a sexually transmitted disease?
- the negative or bad impact on his/her social life because he/she would lose the respect of others?
- the moral issues of not having sexual intercourse?

Each response was given on a four-point Likert Scale ranging from “not at all”, “somewhat”, “a moderate amount,” and “a great deal”. We have constructed the index using Stata’s *alpha* command. Higher values of our index reveal that the mother has talked more extensively with her adolescent about the potential costs or risks of sexual intercourse.

Two additional questions were aimed at the frequency of the parent’s discussions with the child about birth control and sex, respectively. Each response was given, again, on the four-point Likert scale described above. Our second index of maternal talk combines the talk of risks index with the frequency of these sex-related discussions.

3.3 Indexes for daughter attitudes and emotional/mental state

While we cannot expect to observe everything about a daughter that her mother does, we include a vast array of adolescent-specific traits as well as three indexes reflecting her degree of impulsiveness, self esteem, and depression.¹² First, following Regnerus (2009) we create an index of “strategic orientation” (p. 257) which includes the following questions where responses are coded on a Likert scale from 1 (strongly agree) to 5 (strongly disagree).

- When making decisions, you usually go with your “gut feeling” without thinking too much about the consequences of each alternative.
- When you have a problem to solve, one of the first things you do is get as many facts about the problem as possible.
- When you are attempting to find a solution to a problem, you usually try to think of as many different ways to approach the problem as possible.

¹² All three of these indexes, also constructed using the *alpha* command in Stata, are included in any model containing daughter characteristics.

- When making decisions, you generally use a systematic method for judging and comparing alternatives.
- After carrying out a solution to a problem, you usually try to analyze what went right and what went wrong.

The coding on the first item was reverse coded so that higher values of this index indicate greater impulsiveness (or, less strategic behaviors).

Second, we include an index of the daughter's self-esteem. Adolescents are asked to state their agreement with the following statements

- You have a lot of good qualities
- You have a lot to be proud of
- You like yourself just the way you are
- You feel socially accepted
- You feel loved and wanted

Responses range from 1 (strongly agree) to 5 (strongly disagree) so that higher values of the index indicate lower self-esteem.

Finally, the AddHealth asks respondents 18 of the 20 questions from the Center for Epidemiologic Studies Depression (CES-D) Scale. The CES-D Scale, developed by Radloff (1977), is a widely used screening test for depression. In addition to the 18 CES-D questions, the AddHealth respondents also are asked one question concerning depression which is not on that scale, "life was not worth living". Following Fletcher (2010), we constructed an index of depression using these 19 items gauging the daughter's agreement with statements like "[she] didn't feel like eating," "felt that [she] could not shake off the blues, even with help from [her] family and your friends," "felt depressed", and "felt lonely." Responses were coded from 0 (rarely or never) to 3 (most or all of the time) so higher values of the index reflect more depression.¹³ We include these indices in our fully specified models but caution that they are likely endogenous and hence we do not attribute a causal interpretation to them.

3.4 Descriptive statistics

Table 1 reports the means and standard deviations for each of the variables in our sample. Approximately 34 % of our sample has had sexual intercourse, 8 % have had unsafe sex, and 18 % have engaged in casual sexual contact.

In Table 1 we also report the percent of females in a group identified by one variable (e.g., teenage mother, age 18, Black, or only child) who have had sex. These percentages can be compared informally to the percent of all females who have had sex to get an idea of correlations between observed characteristics of adolescents and the propensity to have sex. Finally, the table also displays means within two segments of our sample, those who have not had sex and those who have, and denotes statistically significant differences in the means across groups. While we focus on maternal talk in our discussion of results, we provide a full set of

¹³ The full set of questions for this index is available from the authors upon request.

Table 1 Summary statistics

	Percent in category who have had sex	All N = 3,182			Has had sex N = 1,073			Has not had sex N = 2,109			Significant difference?
		Mean	SD	Min	Max	Mean	SD	Mean	SD		
<i>Dependent variables</i>											
Has had sex	33.72	0.3372	(0.4728)	0	1	0.4687	(0.4993)	0.0337	(0.1804)	***	
Casual sex		0.18	(0.3842)	0	1					***	
Unsafe sex		0.0846	(0.2784)	0	1					***	
<i>Talk</i>											
Talk about risks of sex		3.0129	(0.7849)	1	4.1667	3.229	(0.7215)	2.9027	(0.7930)	***	
Frequency of talk and risks		3.0685	(0.8191)	1	4.000	3.2509	(0.7517)	2.9756	(0.8364)	***	
<i>Demographics</i>											
Age (in years)		15.7957	(1.3004)	14	18	16.3140	(0.03716)	15.5320	(0.02747)	***	
Black	45.97	0.1989	(0.3993)	0	1	0.2712	(0.4448)	0.1622	(0.3687)	***	
Other race	31.01	0.0993	(0.2991)	0	1	0.0913	(0.2882)	0.1034	(0.3045)	***	
Hispanic	27.16	0.1816	(0.3856)	0	1	0.1463	(0.3536)	0.1996	(0.3998)	***	
Lives in urban area	34.81	0.3602	(0.4801)	0	1	0.3719	(0.4835)	0.3542	(0.4784)	***	
Lives in rural area	35.05	0.2492	(0.4326)	0	1	0.2591	(0.4383)	0.2442	(0.4297)	***	
<i>Household background/family characteristics</i>											
Age of mother, years		41.3592	(5.0778)	24	33	40.9534	(5.0929)	41.5657	(5.0589)	***	
Lives with one parent	45.22	0.2467	(0.4312)	0	1	0.3308	(0.4707)	0.2039	(0.403)	***	
Lives with two parents, one not biological	33.50	0.0566	(0.2311)	0	1	0.0624	(0.2421)	0.0536	(0.2252)	***	
Lives with family members but not a parent	53.33	0.0047	(0.0685)	0	1	0.0075	(0.0861)	0.0033	(0.0575)	***	
Lives with both biological parents	29.20	0.6920	(0.4617)	0	1	0.5992	(0.4902)	0.6920	(0.4617)	***	
Parent's education is college	27.37	0.3903	(0.4878)	0	1	0.3168	(0.4654)	0.4276	(0.4948)	***	
Parent's educ. is some college	37.75	0.2131	(0.4095)	0	1	0.2386	(0.4264)	0.2001	(0.4002)	***	

Table 1 continued

	Percent in category who have had sex	All N = 3,182			Has had sex N = 1,073			Has not had sex N = 2,109			Significant difference?
		Mean	SD	Max	Mean	SD	Mean	SD			
Parent's educ. is high school graduate	38.63	0.2668	(0.4424)	0	1	0.3057	(0.4609)	0.2470	(0.4314)	***	
Parent's educ. is less than high school	37.21	0.1106	(0.3137)	0	1	0.1221	(0.3275)	0.1048	(0.3064)		
Parent received welfare	38.01	0.105	(0.3066)	0	1	0.1184	(0.3232)	0.0982	(0.2976)	*	
Family income		42.5713	(48.912)	0	999	39.425	(44.011)	44.1721	(51.1617)	***	
Has an older sibling	32.76	0.5544	(0.4971)	0	1	0.5387	(0.4987)	0.5624	(0.4962)	***	
Is an only child	55.88	0.0107	(0.1028)	0	1	0.0177	(0.1319)	0.0071	(0.0841)	***	
Lives in a two child family	39.42	0.4598	(0.4985)	0	1	0.4762	(0.4997)	0.4514	(0.4978)		
Lives in a three child family	34.29	0.3162	(0.4650)	0	1	0.3215	(0.4673)	0.3134	(0.4640)		
Lives in a four or more child family	29.16	0.2133	(0.4097)	0	1	0.1845	0.3880	0.2280	(0.4196)		
<i>Mother investments/attitudes</i>											
Mother was a teen mother	47.77	0.1835	(0.3872)	0	1	0.2600	(0.4388)	0.1446	(0.3518)	***	
Mother has never been married	43.44	0.0383	(0.1920)	0	1	0.0493	(0.2167)	0.0327	(0.1779)	**	
Religion important to mother	32.03	0.6288	(0.4832)	0	1	0.5974	(0.4907)	0.6449	(0.4787)	***	
Mother is a smoker	43.62	0.2564	(0.4367)	0	1	0.3318	(0.4711)	0.2181	(0.4131)	***	
Mother disapproves of sex even with a special partner	25.52	0.5852	(0.4928)	0	1	0.4492	(0.4976)	0.6543	(0.4757)	***	
Mother disapproves of daughter' having sex at this time	25.88	0.6562	(0.4751)	0	1	0.4967	(0.5002)	0.7373	(0.4402)	***	
Mother chose neighborhood because of low crime	31.68	0.5893	(0.492)	0	1	0.5536	(0.4974)	0.6074	(4884)	***	
Mother is a member of the school PTA	48.17	0.3573	(0.4793)	0	1	0.3029	(0.4597)	0.3850	(0.4867)	***	
Index of parental strictness		26.182	(18.5832)	0	100	22.9461	(16.9701)	27.8284	(19.1474)		
Mother would be very disappointed if no college	31.20	0.4733	(0.4994)	0	1	0.4380	(0.4964)	0.4912	(0.5)	***	
Mother thinks best friend is a bad influence	56.25	0.0302	(0.1711)	0	1	0.0503	(0.2187)	0.0199	(0.1397)	***	
Mother reports daughter is a smoker	73.88	0.0566	(0.2311)	0	1	0.1240	(0.3297)	0.0223	(0.1476)	***	
Mother reports daughter drinks at least once per month	72.38	0.033	(0.1787)	0	1	0.0708	(0.2567)	0.0138	(0.1165)	***	

Table 1 continued

	Percent in category who have had sex	All N = 3,182			Has had sex N = 1,073			Has not had sex N = 2,109			Significant difference?
		Mean	SD	Max	Mean	SD	Max	Mean	SD		
Mother always wear seatbelt in the car	31.76	0.6926	(0.4615)	0	0.6524	(0.4764)	0	0.7131	(0.4524)	***	
Mom breastfed	27.09	4547	(0.498)	0	3653	(0.4817)	0	5002	(0.5001)	***	
<i>Daughter characteristics</i>											
HS GPA at time of interview		2.9165	(0.7421)	1	2.7109	(0.719)	1	3.0212	(0.7319)	***	
Smoked cigarettes in past 30 days	54.75	0.2216	(0.4154)	0	0.3597	(0.4801)	0	0.1513	(0.3584)	***	
Smoked marijuana in past 30 days	68.52	0.1119	(0.3153)	0	0.2265	(0.4187)	0	0.0536	(0.2252)	***	
Drank weekly during past 12 months	60.59	0.0638	(0.2444)	0	0.1146	(0.3187)	0	0.0379	(0.1911)	***	
Attends church at least monthly	30.08	0.6194	(0.4856)	0	0.5527	(0.4975)	0	0.6534	(0.476)	***	
Has no religious affiliation	46.31	0.0937	(0.2914)	0	0.1286	(0.3349)	0	0.0759	(0.2648)	***	
Religion is catholic	28.97	0.3146	(0.4644)	0	0.2703	(0.4443)	0	0.3371	(0.4728)	***	
Almost certain I will live to age 35	29.99	0.5773	(0.4941)	0	0.5135	(0.5001)	0	0.6098	(0.4879)	***	
Wants to attend college	30.93	0.8746	(0.3312)	0	0.8024	(0.3984)	0	0.9113	(0.2843)	***	
Body is more developed than peers	40.29	0.3869	(0.4871)	0	0.4623	(0.4988)	0	0.3485	(0.4766)	***	
Years since menarche		3.417	(1.8501)	1	4.0848	(1.7933)	10	3.0773	(1.7852)	***	
Depression index		-0.0106	(0.4116)	-0.6315	0.0964	(0.4429)	2.1052	-0.0650	(0.3836)	***	
Low self esteem index		1.8918	(0.5927)	1	1.9473	(0.5923)	5	1.8635	(0.591)	***	
Less playful decision making index		1.1106	(0.5444)	-0.200	1.1783	(0.5534)	3.6	1.0762	(0.5366)	***	

Our regression models also include controls for missing income, parental education, religious affiliation, PTA membership, GPA and church attendance. These means are not shown in the table to conserve space

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

summary statistics associated with all our variables to reveal the extensiveness of our covariate list and underscore the importance of these variables as controls in our model.

4 Results

We present our results in two tables within which each column represents a different model specification and each row focuses on a different dependent variable and/or a different measure of maternal talk. In all cases the standard errors are clustered at the school level to account for arbitrary heteroscedasticity as well as potentially correlated errors between students within a school. We proceed by first discussing the degree to which environmental and family factors, if left unaccounted for, might represent sources of bias in the effect of talk (Table 2). Later we discuss models including a variety of daughter characteristics as well to determine whether these individual-specific items are still important even after addressing environmental and family factors (Table 3). In each table we present results separately for models estimated on our largest selected sample (i.e., our overall sample, Panel A) and a smaller sample comprised of sisters (Panel B).

4.1 Environmental and family influences on sexual activity: overall sample

Table 2 Panel A reports the estimated coefficients on maternal talk from models of adolescent sexual intercourse, unsafe sex, and casual sex in models that account for an increasing number of factors into the production of adolescent sexual activity. The first column is an OLS model including only the measure of talk and the adolescent's basic demographics. We add, in this order, school fixed effects, family background and household characteristics, and maternal investments and attitudes. Across the specifications, both measures of maternal talk appear to increase the probabilities that female adolescents have had sex, unsafe sex, and casual sex. Although, accounting for more observed heterogeneity ultimately reduces the magnitude of the estimated coefficients on talk. Once we account for all of the environmental, family, and particularly mother's characteristics, the estimated coefficient on talk decreases between Column 1 and Column 4 anywhere from 6 % in the case of unsafe sex to 41 % in the case of casual sex. It is still true, for each dependent variable and either measure of talk, that adolescents who have had more discussions with their mothers about more sex-related topics and/or with more frequency seem more likely to have had sex and more likely to engage in risky sex. However, we interpret the large decrease in the magnitude of the estimated coefficient as evidence that maternal talk is endogenous.¹⁴ Even with the benefit of the rich AddHealth data, accounting only for school- and family-level observables is likely insufficient for identifying the effect of talk.

¹⁴ The positive correlation between talk and adolescent sexual activity corroborates the findings of Khurana and Cooksey (2012) which, like these baseline models, do not deal with the endogeneity of parental talk.

Table 2 The role of environmental and family factors (coefficients on talk)

	Panel A Overall sample N = 3,182				Panel B Sister sample N = 234 (116 families)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Had sex</i>								
Talk about risks	0.1011*** (0.012)	0.0846*** (0.011)	0.0730*** (0.012)	0.0734*** (0.011)	0.0874** (0.039)	0.1579 (0.097)	0.1422 (0.105)	0.0560 (0.111)
Talk about risks and frequency	0.0779*** (0.012)	0.0634*** (0.011)	0.0546*** (0.011)	0.0625*** (0.011)	0.0686* (0.039)	0.0855 (0.090)	0.0721 (0.096)	0.0467 (0.100)
N = 3,178								
<i>Casual sex</i>								
Talk about risks	0.0517*** (0.008)	0.0448*** (0.007)	0.0373*** (0.007)	0.0307*** (0.007)	0.0744*** (0.025)	0.1177 (0.083)	0.1076 (0.088)	0.0568 (0.098)
Talk about risks and frequency	0.0402*** (0.007)	0.0343*** (0.007)	0.0287*** (0.007)	0.0258*** (0.006)	0.0759*** (0.022)	0.0824 (0.077)	0.0817 (0.080)	0.0540 (0.088)
N = 2,363								
<i>Unsafe sex</i>								
Talk about risks	0.0379*** (0.008)	0.0351*** (0.007)	0.0309*** (0.008)	0.0316*** (0.008)	0.0507 (0.036)	0.1393* (0.071)	0.1791** (0.076)	0.2542** (0.059)
Talk about risks and frequency	0.0329*** (0.008)	0.0307*** (0.008)	0.0277*** (0.008)	0.0308*** (0.008)	0.0397 (0.032)	0.0941 (0.063)	0.1338* (0.069)	0.2422*** (0.052)
Demographics?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School fixed effects?		Yes	Yes	Yes				
Sister fixed effects?						Yes	Yes	Yes
Family background?			Yes	Yes			Yes	Yes
Mother investments/attitudes?				Yes				Yes

Descriptions of the covariates included in each grouping can be found in Table 1. Standard errors are clustered by school (129 schools/clusters in the overall sample)

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

In the interest of space, we do not present the full models, but can report that the other estimated coefficients are what we might expect.¹⁵ (In Appendix Table 5 we do present the full set of estimated coefficients for one outcome, sexual intercourse, and one measure of talk, as a reference.) For example, girls living with only one parent are in most models more likely to engage in these behaviors, a finding established in many previous studies (e.g. Menning et al. 2007; Manlove et al. 2009; Averett et al. 2011). Before including more detailed maternal investments, girls who have an older sibling or who are only children are also more likely to report having had sexual intercourse as also reported by Argys et al. (2006) and Averett et al. (2011). Hispanic girls are significantly less likely to have had sex, a result comparable to Manlove et al. (2009) and Khurana and Cooksey (2012), and are also less likely to have had casual sex. Girls with more educated parents are less likely to have had sex as has been found by others (e.g. Averett et al. 2011; Manlove et al. 2009). Finally, older girls are more likely to have been sexually active.

4.2 Environmental and family influences on sexual activity: sister fixed effects

Also in Table 2 Panel B we estimate Model 2 on a sample of sisters in the AddHealth. As in models employing our larger sample, we add increasing numbers of control variables—in this case starting with sister fixed effects (which account for family-level unobserved heterogeneity), then adding in daughter-specific family background and household characteristics, and maternal investments and attitudes. Although our sample sizes are relatively small and, therefore, point estimates are less precisely estimated than those in our full sample, we can gain some insight on the importance of unobserved heterogeneity in models aimed at understanding the link between talk and adolescent sexual activity.

First, in most cases adding more control variables to a given model reduces the magnitude of the estimated coefficient. (The decrease in the estimated coefficient on talk between Columns 5 and 8 ranges from 24 % for casual sex to 36 % for had sex.) This is consistent with the pattern of results in Panel A of the same table. (The notable exception among the sister sample models is when we add covariates to the sister fixed effects models of unsafe sex which results in larger point estimates.)

Second, the magnitude of the coefficients increases when (in Column 6) we first add sister fixed effects. (Though not shown, we have found this to be the case no matter at which point in the additive process we first include sister fixed effects.) This is not surprising when we consider the source of identification for the effect of talk in these models, which is sister pairs where the mother talks more to one daughter than the other.¹⁶ In short, it appears there is negative selection into talking even within families (that is, mothers are likely talking more to daughters who are riskier).

It is clear that observable and unobservable environmental and family factors are important components of the production of adolescent risky behavior as evinced in

¹⁵ These full models are available from the authors upon request.

¹⁶ One advantage of the talk indexes we construct, in that they are continuous, is we get more leverage out of our small sisters sample than we would, for example, with dichotomous measures of talk.

the changing coefficients on talk as we add additional covariates to our model. The control variables in columns 4 and 8 of Table 2 include characteristics of the mother as well as her attitudes including about her daughter's potential sexual activity. Since the mother is choosing the frequency of her talk, this is a predictable source of bias if ignored. But the notable result within the sample of daughters that adding sister-fixed effects actually increases the correlation between talk and sexual activity suggests that daughter-specific characteristics are also important.

4.3 Daughter characteristics

In Table 3 we present results demonstrating the additional importance of an individual daughter's characteristics for both our overall sample and sample of sisters. It is here we see some of the largest reductions in the magnitude of the estimated coefficients on talk. For example, adding daughter characteristics to models of casual sex in our larger sample reduces the estimated coefficient by roughly 20 % of the original baseline estimate in Column 1 of Table 2 (compared to an approximately 40 % reduction from all of the environmental and family factors combined). In the sister sample, adding daughter-specific characteristics causes the estimated coefficient of one measure of talk to become negatively correlated with casual sex (though this estimate is not significantly different from 0). That the estimates decrease further with the additional daughter covariates even after controlling for so many other factors suggests that mothers are likely targeting their talk according to their daughter's own characteristics and, perhaps, her risk proclivity.

Again, though not displayed in Table 3, Appendix Table 5 provides an example of the full OLS results with estimated coefficients for every control variable. Focusing on the final column where a full set of daughter characteristics are included, we see that the results indicate girls who engage in other risky behaviors including cigarette smoking, alcohol and marijuana use are also more likely to have sex. This finding is consistent with Grossman et al. (2004).¹⁷ Respondents with low self-esteem are less likely to have sex as are those who are more impulsive in their decision making. Finally, those with more depressive symptoms are more likely to have sex, a finding consistent with previous research (e.g. Averett and Wang 2012).

In the end, comparing our most fully specified models in Columns (2) and (4) of Table 3 to the most parsimonious models in Columns (1) and (5) of Table 2, the magnitude of the coefficient decreases up to 60 % in the overall sample looking at casual sex and around 40 % for had sex. In the sample of sisters, despite the increase in the estimated coefficient following the inclusion of sister-fixed effects, the coefficient decreases by up to 131 % for casual sex and 43 % for had sex.

The evidence presented thus far suggests that mothers are making the decision to talk based partly on the characteristics of their daughters. However, none of these models controls for daughter-specific *unobserved* heterogeneity. Given the sister fixed effects result that controlling for family unobserved heterogeneity only increases the point estimates within the sister sample, it seems any study of the true

¹⁷ While their final results indicate that substance use may not be causally related to adolescent sexual intercourse, they find a positive correlation in models that do not account for the endogeneity of these behaviors.

Table 3 The importance of daughter characteristics (coefficients on talk)

	Panel A Overall sample N = 3,182		Panel B Sister sample N = 234 (116 families)	
	(1)	(2)	(3)	(4)
<i>Had sex</i>				
Talk about risks	0.0734*** (0.011)	0.0590*** (0.10)	0.0560 (0.111)	0.0497 (0.125)
Talk about risks and frequency	0.0625*** (0.011)	0.0496*** (0.010)	0.0467 (0.100)	0.0400 (0.114)
	N = 3,178		N = 232 (115 families)	
<i>Casual sex</i>				
Talk about risks	0.0307*** (0.007)	0.0206*** (0.007)	0.0568 (0.098)	0.0107 (0.108)
Talk about risks and frequency	0.0258*** (0.006)	0.0169** (0.006)	0.0540 (0.088)	-0.0237 (0.099)
	N = 2,363		N = 161 (80 families)	
<i>Unsafe sex</i>				
Talk about risks	0.0316*** (0.008)	0.0278*** (0.008)	0.2542** (0.059)	0.2041*** (0.068)
Talk about risks and frequency	0.0308*** (0.008)	0.0277*** (0.008)	0.2422*** (0.052)	0.2118*** (0.060)
Demographics?	Yes	Yes	Yes	Yes
School fixed effects?	Yes	Yes		
Sister fixed effects?			Yes	Yes
Family background?	Yes	Yes	Yes	Yes
Mother investments/attitudes?	Yes	Yes	Yes	Yes
Daughter characteristics?		Yes		Yes

Descriptions of the covariates included in each grouping can be found in Table 1. Standard errors are clustered by school (129 schools/clusters in the overall sample)

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

effect of talk on adolescent sexual behavior is unlikely to be entirely satisfying with respect to establishing causality unless it makes efforts to account for individual-level unobserved heterogeneity.

4.4 Instrumental variables

As an alternative to our sister fixed effects specification and as an additional robustness check of the above evidence that talk is likely endogenous, we also estimate our models using Two-Stage Least Squares (2SLS). We employ a pair of instruments, Z_i , that evince the mother's proclivity for conversations outside the

home and are plausibly related to maternal talk but potentially orthogonal to adolescent sexual behavior once we control for our rich set of covariates in estimating the following system of equations¹⁸:

$$\begin{aligned} PT_i &= \alpha_1 Z_i + \beta'_1 F_i + \gamma'_1 X_i + s_{1j} + \varepsilon_{1i} \\ R_i &= \alpha_2 \widehat{PT}_i + \beta'_2 F_i + \gamma'_2 X_i + s_{2j} + \varepsilon_{2i}, \end{aligned} \quad (3)$$

where ε_{1i} and ε_{2i} are both mean zero errors but are presumed to be correlated allowing that $C(\varepsilon_{1i}, \varepsilon_{2i}) \neq 0$. Our instruments, found in the parent survey, aim to capture the general proclivity of the mother to confront issues of concern or generally get involved in her adolescent daughter's relationships. One instrument is a measure of the number of parents of her child's friends to whom the mother has spoken within the last four weeks. The other is an indicator reflecting a proclivity of the mother to speak to a neighbor if that neighbor's child was getting in trouble.

We undertake the standard tests for weak instruments and exogeneity of the instruments, but we are also aware that it is difficult to establish the exogeneity of such instruments, especially in a dynamic relationship like that of parents and children which evolves over time and includes repeated interactions of many types. We therefore include the results from these models in Table 6 of Appendix and remain measured in our interpretation of the results. In comparison to our OLS models, we note that in our 2SLS models there are no longer any statistically significant coefficients on maternal talk in models of any outcome or for either measure of maternal talk. Still we are unable to consider these models as dispositive proof that mothers' talk has no effect on adolescent sexual activity.

5 Conclusions

In this paper, we aim to isolate the effect of a mother's talk about sex on her daughter's probability of engaging in several outcomes. Using two measures of maternal talk and three outcomes related to sexual behavior, our results suggest that, whatever the measure of maternal talk, it is positively correlated with greater prevalence of adolescent sexual activity, unsafe sex, and casual sex. But taking a comprehensive view of our results, it is clear that unobserved, individual-specific heterogeneity plays a crucial role in the relationship between maternal talk and adolescent sexual activity. As we add more controls to our OLS models—school fixed effects, family and mother characteristics—the magnitude of the estimated coefficients on talk diminish. The reduction is particularly dramatic when we add in a variety of daughter characteristics. Moreover, evidence from sister fixed effects models illuminates the upward bias in the estimated coefficient on talk of models identified off of mothers who talk

¹⁸ Following the advice of Murray (2006), we include a large set of independent variables, in both the first and second stage of our 2SLS models to reduce the potential that our instruments are mediating the effects of other unobserved factors that influence adolescent sexual behavior.

more to one daughter than another, probably because of individual-specific unobserved heterogeneity. In short, the positive and significant coefficients on talk in our OLS models appear to be driven by unobserved heterogeneity and it is this daughter specific information, available to mothers but not data analysts, that is likely driving the sister fixed effects results too. Combined with instrumental variable analyses, the overall resulting picture is much more nuanced with respect to the influence of maternal talk on adolescent sexual activity than unadjusted mean comparisons would first suggest.

Ours is the first research to attempt to disentangle the influence of a mother's communication about sex on her daughter's behavior from so many other difficult to measure, if not unmeasurable, influences. Our findings have at least three major implications. First, much more research is needed to uncover the causal connection between talk and adolescent behavior. While we find many indications that important unobservables are likely still unaccounted for in our models and that not capturing enough of the daughter's characteristics, in particular, is problematic, we are not able to address this to our satisfaction with available data. The ideal data should include something approximating an experiment, perhaps superior instruments to those available in the AddHealth.

Second, we have only examined the effect of an aggregate measure of mother's talk but encourage future research exploring the content of talk in more detail. Since the types of talk mothers engage in are unlikely to be independent and probably occur simultaneously in many parent conversations, it may be necessary to consider this added dimension separately from the causality question or only after an identification strategy has been perfected. A more in-depth analysis of the content of talk will present its own challenges, but also potentially return especially applicable, perhaps even prescriptive, conclusions.

Finally, our findings underscore the importance of not basing policy decisions on OLS models or correlations that are not well understood by policymakers. Unadjusted mean comparisons and cross section regressions that naively compare outcomes of adolescents who have received more or less "talk" appear to support what might be no more than a persistent old wives' tale: that discussions about sex with adolescents could actually encourage, legitimize, or facilitate related risky behaviors. Taking into account increasing numbers of observable factors correlated with maternal talk and adolescent sexual activity and unobservables at the family level provides a more nuanced interpretation of the relationship between mother's talk and daughter's sexual activity. It stands to reason that, if the mother's characteristics are correlated with both talk and the daughter's sexual activity, that the unobserved traits of the daughter—the target and recipient of the talk—are likely important as well.

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Appendix

See (Tables 4, 5, 6).

Table 4 Results from MCA analysis of parenting style

Variable	Categorical Response	MCA weight ^a	Percent responding "Yes" (%)
Mom lets daughter decide on curfew	No	0.458	29.9
	Yes	-1.113	
Mom lets daughter decide who to hang out with	No	3.085	84.5
	Yes	-0.485	
Mom lets daughter decide what to wear	No	4.683	90.2
	Yes	-0.431	
Mom lets daughter decide how much TV to watch	No	3.613	83.4
	Yes	-0.666	
Mom lets daughter decide weeknight bedtime	No	2.893	78.4
	Yes	-0.727	
Mom lets daughter decide what to eat	No	1.925	68.1
	Yes	-0.800	
Mom never drinks alcohol	No	-0.495	45.0
	Yes	0.598	
Mom feels having a well behaved daughter is most important quality	No	-0.315	24.7
	Yes	0.951	
A parent supervises daughter before bed	No	-0.732	92.5
	Yes	0.030	
A parent supervises daughter after school	No	-0.664	56.7
	Yes	0.460	
A parent supervised daughter before school	No	-0.220	80.3
	Yes	0.042	

^a Positive weights indicate stricter parenting

Table 5 Fully specified OLS models (Y = 1 if adolescent has had sex)

Variables	(1)	(2)	(3)	(4)	(5)
School fixed effects?	No	Yes	Yes	Yes	Yes
Talk about risks of sex	0.1011*** (0.012)	0.0846*** (0.011)	0.0730*** (0.012)	0.0734*** (0.011)	0.0590*** (0.010)
Age 15 years	0.0868*** (0.020)	0.0740*** (0.026)	0.0777*** (0.026)	0.0617** (0.025)	0.0301 (0.023)
Age 16 years	0.2298*** (0.021)	0.2173*** (0.026)	0.2197*** (0.026)	0.1788*** (0.026)	0.1272*** (0.024)
Age 17 years	0.3210*** (0.021)	0.3021*** (0.026)	0.3148*** (0.025)	0.2466*** (0.027)	0.1879*** (0.025)
Age 18 years	0.3947*** (0.028)	0.3816*** (0.031)	0.3979*** (0.031)	0.2827*** (0.029)	0.2167*** (0.034)
Black	0.1061*** (0.025)	0.0660** (0.029)	0.0391 (0.028)	0.0775*** (0.025)	0.0882*** (0.025)
Other race	0.0462 (0.040)	0.0530 (0.041)	0.0526 (0.035)	0.0641* (0.033)	0.0562 (0.036)
Hispanic	-0.0950*** (0.028)	-0.0582 (0.039)	-0.0743* (0.038)	-0.0863* (0.045)	-0.1077** (0.044)
Lives in urban area	0.0216 (0.021)	0.0125 (0.019)	0.0113 (0.019)	0.0056 (0.020)	0.0101 (0.020)
Lives in rural area	0.0322 (0.025)	-0.0154 (0.024)	-0.0105 (0.024)	-0.0086 (0.023)	-0.0042 (0.022)
Age of mother, years			-0.0068*** (0.002)	-0.0020 (0.003)	-0.0028 (0.002)
Lives with one parent			0.1008*** (0.022)	0.0485** (0.022)	0.0320 (0.021)
Lives with two parents, one not biological			0.0729** (0.030)	0.0402 (0.030)	0.0094 (0.029)
Lives with family members but not a parent			0.0714 (0.089)	0.0794 (0.073)	0.0812 (0.072)
Parent's educ. is some college			0.0598*** (0.023)	0.0289 (0.022)	0.0127 (0.021)
Parent's educ. is high school graduate			0.0465** (0.021)	0.0105 (0.021)	-0.0108 (0.021)
Parent's educ. is less than high school			0.0741** (0.029)	0.0150 (0.029)	-0.0136 (0.030)
Parent's educ. unknown			0.0242 (0.063)	-0.0200 (0.062)	-0.0219 (0.066)
Parent received welfare			-0.0117 (0.033)	-0.0246 (0.030)	-0.0261 (0.027)
Family Income			0.0001 (0.000)	-0.0000 (0.000)	-0.0001 (0.000)
Family Income unknown			-0.0439** (0.018)	-0.0461** (0.018)	-0.0541*** (0.016)

Table 5 continued

Variables	(1)	(2)	(3)	(4)	(5)
School fixed effects?	No	Yes	Yes	Yes	Yes
Has an older sibling			0.0548*** (0.020)	0.0221 (0.019)	0.0069 (0.016)
Is an only child			0.2062** (0.082)	0.1061 (0.065)	0.1058* (0.060)
Lives in a two child family			0.0781*** (0.027)	0.0518* (0.028)	0.0441* (0.023)
Lives in a three child family			0.0500* (0.028)	0.0318 (0.028)	0.0333 (0.026)
Mother was a teen mother				0.0583* (0.032)	0.0520* (0.029)
Mother never been married				-0.0409 (0.046)	-0.0518 (0.041)
Religion important to mother				-0.0347* (0.019)	-0.0299 (0.019)
Mother is a smoker				0.0315* (0.018)	0.0033 (0.018)
Mom disapproves of sex even with a special partner				-0.0484*** (0.016)	-0.0358** (0.015)
Mom disapproves of daughter having sex at this time				-0.1408*** (0.021)	-0.1315*** (0.018)
Mom chose neighborhood because of low crime				-0.0088 (0.015)	-0.0029 (0.014)
Unknown if mom chose n-hood due to low crime				0.1050* (0.058)	0.0798 (0.054)
Mom is a member of the school PTA				-0.0130 (0.019)	-0.0055 (0.020)
Unknown if mom joined the PTA				0.0284 (0.088)	0.0186 (0.093)
Index of parental strictness				-0.0015*** (0.000)	-0.0014*** (0.000)
Mother would be very disappointed if no college				-0.0104 (0.015)	0.0072 (0.015)
Mother thinks best friend is a bad influence				0.1697*** (0.050)	0.1179** (0.047)
Mother reports daughter is a smoker				0.2164*** (0.044)	0.0239 (0.040)
Mother reports daughter drinks at least once per month				0.1493*** (0.037)	0.0940** (0.040)
Mother always wears seatbelt in the car				-0.0226 (0.018)	-0.0138 (0.018)
Mom breastfed				-0.0231* (0.013)	-0.0193 (0.013)

Table 5 continued

Variables	(1)	(2)	(3)	(4)	(5)
School fixed effects?	No	Yes	Yes	Yes	Yes
HS GPA at time of interview					-0.0333*** (0.011)
GPA unknown					0.0956* (0.058)
Smoked cigarettes in past 30 days					0.1001*** (0.021)
Smoked marijuana in past 30 days					0.2051*** (0.028)
Drank weekly during past 12 months					0.0769** (0.034)
Attends church at least monthly					0.0019 (0.019)
Church attendance unknown					-0.2578*** (0.057)
Has no religious affiliation					0.0486 (0.033)
Religious affiliation unknown					-0.0136 (0.072)
Religion is catholic					0.0128 (0.021)
Almost certain I will live to age 35					-0.0021 (0.015)
Wants to attend college					-0.0741** (0.030)
Body is more developed than peers					0.0697*** (0.015)
Years since menarche					0.0239*** (0.005)
Depression					0.0880*** (0.021)
Low self esteem					-0.0329** (0.014)
Less planful decision-making					0.0533*** (0.014)
Constant	-0.1786*** (0.038)	-0.1016** (0.040)	0.0724 (0.087)	0.1715 (0.105)	0.2992** (0.120)
Observations	3,182	3,182	3,182	3,182	3,182
R ²	0.133	0.090	0.113	0.187	0.261
Number of schools		129	129	129	129

Robust standard errors in parentheses

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Table 6 2SLS estimates (with school fixed effects)

Variables	Had sex N = 3,182	Casual sex N = 3,178	Unsafe sex N = 2,363
<i>Coefficients on mother's talk in second stage</i>			
Talk about risks of sex	0.0298 (0.079)	-0.0234 (0.074)	0.0046 (0.074)
Frequency of talk and risks	0.0313 (0.080)	-0.0242 (0.075)	0.0046 (0.075)
R ²	0.267	0.160	0.137
	Talk about risks of sex	Frequency of talk and risks	Talk about risks of sex
	Frequency of talk and risks	Talk about risks of sex	Frequency of talk and risks
<i>Coefficients on instruments in first stage</i>			
Mother would report to a neighbor about neighbor's child getting in trouble	0.1132*** (0.028)	0.1132*** (0.028)	0.1027*** (0.036)
Number of child's friends' parents mother talked with	0.0393*** (0.007)	0.0390*** (0.007)	0.0371*** (0.009)
Number of Schools	129	129	129
Hansen's J statistic	0.375	0.484	0.769
F statistic on instruments in first stage	23.62	23.08	12.32
	Frequency of talk and risks	Frequency of talk and risks	Frequency of talk and risks
	Frequency of talk and risks	Frequency of talk and risks	Frequency of talk and risks

Each model includes the full set of covariates as shown in Table 1. These include adolescent demographics, school fixed effects, family background, mother's investments and attitudes and detailed daughter characteristics. Standard errors are clustered at the school level

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

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