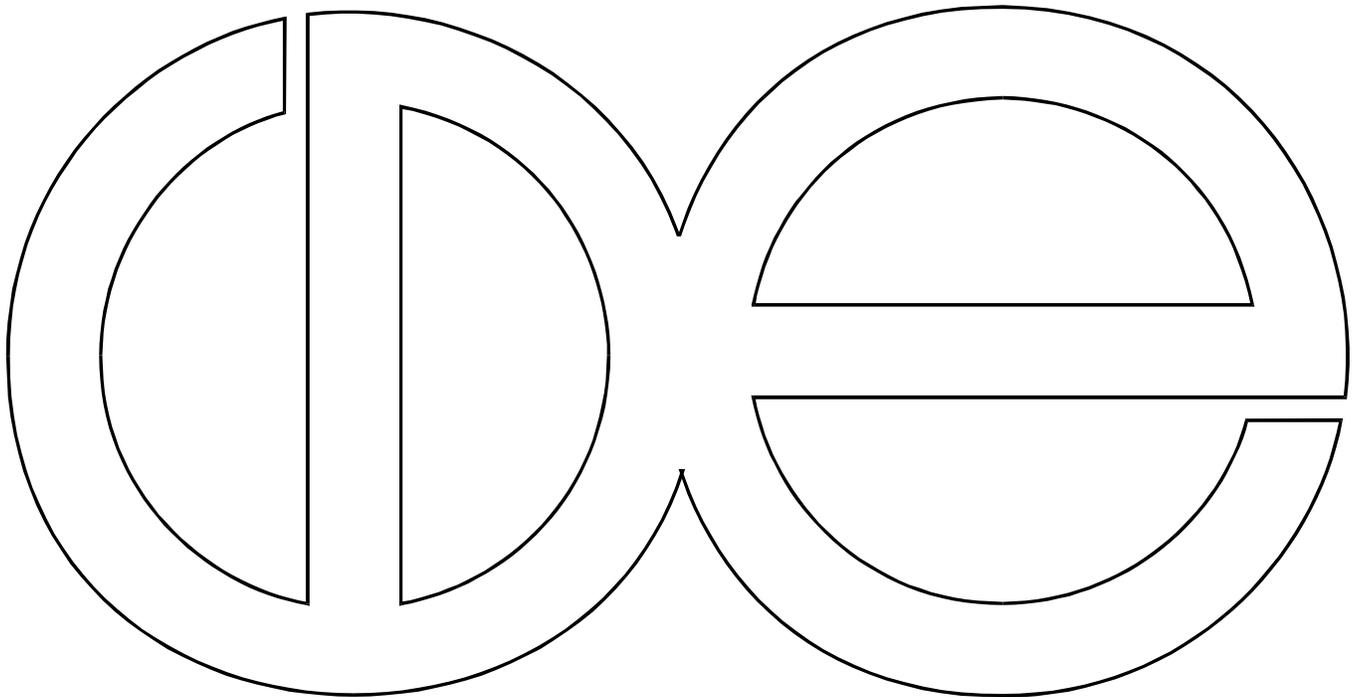


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**Adolescents' Transition to First Intercourse, Religiosity and
Attitudes about Sex**

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Abstract

Using two waves of the National Longitudinal Study of Adolescent Health, this study examines two sets of relationships between attitudes, religiosity and first sex among adolescents. First, I estimate the effects of religiosity and attitudes about sex on the likelihood of engaging in first sex. Then, I estimate the effect of having sex on subsequent religiosity and attitudes. The findings are consistent with past research that finds attitudes are a significant predictor of sexual activity. The effect of religiosity on first sex is mediated by attitudes about sex. Regarding reciprocal effects, having sex for the first time has a significant effect on later attitudes, but not religiosity. This study highlights the importance of going beyond traditional, recursive models that consider only one side of a causal relationship.

Adolescents' Transition to First Intercourse, Religiosity and Attitudes about Sex

Until very recently, the average age at which young people began having sex had steadily decreased. Now, most American adolescents report that they have had sex by the time they graduate from high school (Singh and Darroch 1999). Naturally, this trend has generated a good deal of policy and research interest over the past several decades. Political and moralistic arguments often cite a degeneration of values as the source of the trend toward earlier sex. Arguments of this tenor implicate detachment from religion as fundamental to this downward shift in age at first sex. These arguments are not purely rhetoric. Empirical evidence confirms that American's attitudes toward pre-marital sex have become more permissive over time and the influence of religiosity on these beliefs has deteriorated (Petersen and Donnerwerth 1997). Furthermore, to the extent that religiosity still influences sexual attitudes and behavior, people are less likely to attend church today than in past decades (Hadaway et al. 1993). It is with this backdrop that the following study examines the relationship between religiosity, attitudes and first sex among adolescents.

Many studies have examined the influence of religiosity on adolescent sex. Most of this research finds that religious individuals have first sex at a later age than those who are less religious (Brewster et al. 1998; Ku et al. 1993; Lammers et al. 2000; Resnick et al 1997). These studies have arrived at the significant association between religiosity and first sex using cross-sectional data. Several prospective studies document the protective effect of church attendance and strength of convictions in shaping attitudes about sex (Miller et al 1997; Thornton and Camburn 1987, 1989). Other studies show that attitudes about sex influence sexual behavior (Miller and Moore 1990; Moore et al. 1986; Musick and Bumpass 1999; Whitbeck et al. 1999). Thus, the literature on religiosity, attitudes and sex offers two causal propositions. First, a low

degree of religiosity leads to more permissive attitudes about sex. Second, more permissive attitudes lead to earlier first sex. Few studies have combined religiosity and attitudes in the same conceptual model to predict sexual behavior.

The consistent association between religiosity and adolescent sex is often interpreted as the influence of religiosity on whether or not to have sex. Likewise, the relationship between attitudes and first sex is assumed to be the influence of attitudes on sex. However, the relationships between religiosity and attitudes on the one hand and first sex on the other may not be uni-directional. That is, religiosity may affect sex, but having sex may also affect subsequent religiosity. Thus, reported associations between religiosity and sex using cross-sectional data include both of these possible relationships, although they are rarely specified separately. The same non-recursive relationship is possible between attitudes about sex and sexual behavior. There are very few studies that have explored possible reciprocal relationships between religiosity and first sex or attitudes and first sex.

The following study answers two questions with regard to adolescent sex. First, how do religiosity and attitudes about sex operate together to influence the probability of first sex? Second, what is the extent of the causal relationships between religiosity and first sex and attitudes and first sex? Using prospective data from the National Longitudinal Study of Adolescent Health, I measure religiosity and attitudes about sex for a sample of adolescents at two points in time (in 1995 and again in 1996). While initially all virgins, some in my sample have first sex between interview waves while others do not.¹ This unique data structure affords the opportunity to closely examine the full causal relationship between religiosity and attitudes and first sex.

Religiosity, Attitudes and First Sex

As noted above, there are a number of studies that have established a correlation between religiosity and adolescent sexual activity. In these studies the measures of religiosity and sexual activity vary greatly. The majority of the evidence suggests that strength of religious convictions and participation in religious activities are more important than religious denomination or affiliation in predicting whether or not an adolescent has sex (Ku et al 1993; Miller and Moore 1990; Thornton and Camburn 1989). Where studies demonstrate important differences by denomination, these differences are most prevalent in sex attitudes and contraceptive use, not first sex (see Brewster et al 1998 for an exception)².

In two separate studies, Thornton and Camburn (1987 and 1989) investigate the effect of religiosity on attitudes about sex and sexual behavior. In their 1987 study, Thornton and Camburn find that church attendance is one of the strongest predictors of restrictive attitudes about sex. They find affiliation with a fundamentalist religion lessens permissive attitudes, but has little effect on whether or not teens have sex. In their 1989 study, the authors confirm that both denomination and church attendance affect attitudes about sex, but only church attendance affects whether or not an adolescent has first sex. Thus, they conclude that religious participation is important in determining attitudes and behavior. In a more recent study, Whitbeck and colleagues (1999) use a small, local sample to show that church attendance and importance of religious beliefs have no effect on first sex net of attitudes about sex and other factors. However, religiosity and attitudes are two of the many factors considered in the authors' developmental model of early sex, and thus the relationships between the three factors are not fully explored.

The literature on the role of attitudes in determining adolescent sexual activity often considers the effects of parental attitudes (Fisher 1989; Moore et al. 1986; Musick and Bumpass 1999; Small and Luster 1994). In studies where the adolescents' own attitudes are examined,

they are often treated as dependent variables with parental attitudes as the primary covariates (Thornton and Camburn, 1987), or they are seen as a mechanism for the transfer of parental attitudes about adolescent sexual behavior (Fisher 1989; Moore et al. 1986). Developmental psychologists describe adolescence as a time when children go through a process of individuation whereby they try to establish their own identity apart from others, including their family (Blos 1967). Thus, it is important to explore adolescents' own attitudes and their effects on sexual behavior net of their parents' attitudes. Using prospective data from a sample of virgins, Whitbeck and colleagues (1999) find that permissive adolescent attitudes about sex predict having sex.

To summarize, the existing literature on religiosity, attitudes and sex establishes a clear relationship between religiosity and attitudes about sex, but a less clear relationship between religiosity and first sex. This body of work also demonstrates that attitudes about sex affect first sex. The two sets of findings suggest a model of the combined relationship of religiosity and attitudes with sexual behavior. While religiosity should lower the probability of early sex, these effects will be attenuated by attitudes. Attitudes about sex should attenuate the religiosity effect because these attitudes are at a higher level of correspondence with sexual activity than is religiosity. Religious values provide a perspective towards life that should hold for most types of behavior. That is, while some religions may have ideas about the permissibility of adolescent sexual activity, most of their prescriptions can be applied to a number of different behaviors including, but not limited to sexual activity. On the other hand, attitudes about sex make prescriptions with references to the specific behavior of interest - sex. It is with this specific reference that attitudes about sex correspond more closely with sexual behavior than do religious values. This should make attitudes mediate the effect of religiosity on first sex.

How might sex affect subsequent religiosity? Thornton and Camburn's 1989 study used structural equation modeling to examine two relationships that partially address this question. First, they tested the reciprocal relationship between religiosity and attitudes about sex. They find that religiosity affects attitudes, and attitudes affect religiosity. Second, they tested the reciprocal relationship between religiosity and first sex. They find that religiosity affects first sex, but having sex for the first time does not influence subsequent religiosity. They do not examine the reciprocal relationship between attitudes about sex and sexual behavior.

While few studies examine the reciprocal relationship between religiosity, attitudes about sex and sexual behavior (see Thornton and Camburn 1989 for an exception), there is a more substantial, although still relatively young history of such studies with respect to attitudes, values and family formation (Bumpass 2000; Lesthaeghe and Moors 2000; Moors 1995; Thomson 2000). From this literature, I borrow terminology to describe the processes at work between attitudes and religious values and sexual activity. The first part of the causal relationship – where religious values affect behavior – can be called the *religiosity effect*.³ The second part of the causal relationship, where behavior affects subsequent religiosity, is labeled *religiosity adaptation* meaning that the behavior causes the individual to change his or her religiosity. The role of attitudes can be conceptualized in the same way – *attitude effect* and *attitude adaptation*.

Because premarital sex is against the doctrine of most religions, it seems reasonable to expect adolescent sex should lead to a decrease in religiosity as those who have sex attempt to reconcile their religiosity and behavior. This post-event adjustment may also apply to attitudes. That is, an adolescent with fairly restrictive attitudes toward sex may adjust his or her attitudes to correspond with their behavior after they have sex. However, another way that events can change attitudes is by providing new information that may persuade one's attitude about a given

object (Schuman 1995). This new information could be good or bad. Several studies find that male adolescents are more likely than females to have positive reactions to having sex (Guggino and Ponzetti 1997; Martin 1996). While the attitude change associated with first sex may operate in either direction, it seems most likely that it will tend toward more permissive post-sex attitudes, especially for boys.

Thornton and Camburn (1989) made great progress in accurately representing the causal connections between religiosity and sexual attitudes and behavior. However, their panel data also has shortcomings for addressing these relationships. They use a sample of approximately 900 white, Detroit area mothers and their 18-year-old children in 1980. Mothers were interviewed at five earlier points in time dating back to the 1960s, but children were only interviewed in 1980. This limits their study in several ways. First, because the sample includes only whites from the Detroit area, it is not representative of the entire adolescent population. Next, because children were interviewed at only one point in time (1980), it is not possible to directly measure the effects of their religiosity prior to the time of the first interview. Third, because the authors do not have measures of the child's sexual activity before 1980, they use the child's recall of his or her sexual activity. The literature on the data quality of retrospective event reports indicates that we should be cautious of reporting errors, especially as the duration from the event increases (Wu, Martin and Long 1999).⁴ Finally, Thornton and Camburn do not examine the relationship between attitudes and behavior. In addition to these limitations, more than a decade has passed since these authors conducted their research. It is time to revisit this topic especially in light of the high level of public attention and programming aimed at adolescent sexual activity.

Given the empirical literature on religiosity, attitudes and first sex and the conceptual work on value and attitude effects and adaptation, this study tests the following hypotheses:

1. *Religiosity Effect Hypothesis* – Higher levels of adolescent *religiosity* will decrease the probability of having sex.
2. *Attitude Effect Hypothesis* – More permissive adolescent *attitudes* towards sex will increase the likelihood that adolescents will have sex and mediate the effect of religiosity on sex.
3. *Religiosity Adaptation Hypothesis* – Having sex will result in lower levels of *religiosity* among adolescents.
4. *Attitude Adaptation Hypothesis* – Having sex will generate more permissive *attitudes* about sex among adolescents. This effect will be stronger than the adaptation effect for religiosity.

Data, Measures and Methods

Data

The failure of many prior studies on first sex to account for potential reciprocal causation between religiosity, attitudes and behavior is due in part to a lack of sufficient data. In many studies, data on both religiosity and attitudes and behavior were collected at one point in time, so that causal links between religiosity and attitudes on the one hand, and behavior on the other, could be running in both directions. There are few surveys that measure adolescent religiosity, attitudes and behaviors at multiple points in time. Predicting the reciprocal relationship between any factor and the transition to first sex is even more difficult since there are few data sets that capture religiosity and attitudes before and after first sex for a substantial number of adolescents.

This analysis uses the 1995 and 1996 waves of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a school-based cluster sample that produced approximately 15,000 core respondents to in-home interviews in both 1995 and 1996.⁵ One parent was interviewed for each respondent in 1995 (see Bearman, Jones, and Udry 1997 for

more on study design). My sample consists of adolescents ages 15 to 18 who were virgins at time one, never married by time two, and who had not experienced forced sexual activity by time two (N=4948). The minimum age of 15 is imposed because questions regarding attitudes about sex were asked only of respondents older than 14 years at the time of the first interview. I conduct all analyses separately for males and females because there is substantial evidence that girls and boys experience sexual initiation differently (Guggino and Ponzetti 1997; Martin 1996).

There are several advantages to using the Add Health study. First, an audio computer assisted self- interview (CASI) is used for the section on sexual activity in order to elicit honest responses without the stigma of interviewer reaction. Second, adolescents are asked if they have had sexual intercourse at both time one and time two. Taking the two waves of data collection together, it is possible to establish a subset of individuals who first had sex between the two interview waves. This is a particularly useful design for studying the consequences of an event because it introduces a situation similar to an experiment (see Allison 1994). During the course of the “experiment,” some are exposed to the treatment and others are not. The two groups can be compared to measure the effect of having sex for the first time. A third advantage of using this data is that respondents were queried at two relatively close points in time – 1995 and again one year later in 1996. This provides a narrow window within which changes in attitudes and religiosity may have happened regardless of the onset of sexual activity. This minimizes the threat of violating the assumption of temporal stability. Finally, the short recall window of just one year minimizes recall error associated with duration from the event.

Measures

I use a dichotomous variable to indicate whether or not adolescents first had sex between time one and time two. Since all respondents in my sample are virgins at time one, those who

report having sex at the second interview are coded as having first sex between waves.⁶ Table 1 shows weighted descriptive statistics for variables used in the analysis. The first panel represents the full sample, and the second and third panels represent the variables of interest for males and females respectively. Approximately 19 percent of 15- to 18-year-olds who were virgins in 1995 had sex by their second interview approximately one year later.

<Table 1 about here>

As noted above, the balance of empirical evidence finds little difference in the probability of having first sex by adolescents of different religious affiliations (Miller and Moore 1990). Initial measures of adolescent religiosity tested for differences in first sex by religious affiliation for this study, and no significant differences were detected. Add Health contains a brief section on religion with four variables that tap strength and participation. The questions ask about the importance of religion and the frequency of church attendance, prayer, and youth group participation. The four measures are highly correlated with one another and load heavily onto one factor in a principle components factor analysis. The scale alpha reliability of the four items is 0.86. They are summed to form a composite measure of religiosity ranging from 0 to 12.⁷ A higher score indicates a higher level of religiosity. The same variables are available from the wave two interview and they were treated in the same way. Parents' religiosity is a dichotomous variable with '1' indicating high religiosity.⁸ The responding parent was almost always the child's mother, so from here forward I refer to mother's religiosity.

According to Fishbein and Ajzen (1975:6), an attitude is "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object." In this case, the "object" is having sex. Further, they assert that an attitude is an underlying variable that is assumed to guide or influence behavior (1975:8). Adolescents' attitudes about sex are

measured by two composite variables created from a section of seven questions tapping attitudes about sex. The questions ask how the adolescent would feel about having sexual intercourse at this time in his or her life. The seven attitude variables were entered into a principle components factor analysis that produced two component factors. Four variables loaded heavily on one factor that taps attitudes regarding the *personal* costs or benefits of having sex. The four questions are prefaced by, “If you had sexual intercourse...” and followed by each of the following, “your friends would respect you more,” “it would give you great physical pleasure,” “it would make you more attractive to women/men,” and “you would feel less lonely.” The remaining three variables loaded heavily on a second factor that taps the *relational* costs or benefits of having sex (i.e. how your relationship with others would be affected by sex). Again, the three questions are prefaced by, “If you had sexual intercourse....” and followed by “your partner would lose respect for you,” “afterward, you would feel guilty,” and “it would upset your mother.” The response options for all questions range from 1 to 5 indicating strongly disagree to strongly agree. These variables were all coded so that a higher score represents more permissive or positive attitudes about sex. The variables were summed to form two attitude composites – one representing personal attitudes about sex and the other representing relational attitudes about sex.⁹ The alpha reliabilities of the personal and relational attitude scales are 0.70 and 0.66 respectively. The same variables were available in the T2 data, and they again loaded on the same two factors with nearly identical alpha reliabilities. The items were summed for the same two composite measures at T2.

Parents’ attitudes about adolescent sexual activity were measured by a single question that asks parents to indicate how strongly they agree or disagree with the following statement, “You disapprove of (your daughter/son) having sexual intercourse at this time in (his/her) life.”

Again, most reporting parents are mothers. Because responses were highly skewed, this variable was dichotomized so that those who disagreed or strongly disagreed with the above statement were coded as having permissive attitudes about her child having sex.

I include age because the transition to first sex and attitudes about sex are almost linearly related to age. Because my sub-sample uses a narrow age range, I include indicators for whether adolescents are relatively younger (15-16 years old) or older (17-18 years old). Finally, a series of dichotomous variables indicating dating status are included to proxy for the availability of a sexual partner. In most of the literature on adolescent sexual activity a good deal of attention is paid to what leads adolescents to engage in, or conversely resist sexual activity. However, there are actually two components that lead to sexual activity – motivation and opportunity. Those who do not engage in sexual activity in the adolescent years may have resisted (via motivation against) sexual activity or they may not have had the opportunity (via a potential partner) to become sexually active. Thus, there are three variables measuring romantic relationship involvement. The first indicator, “no date,” indicates that the respondent was not dating at T1. The second indicator, “date, but broke up,” indicates the respondent was dating at T1, but had ended that relationship and was not dating anyone at T2. The final dating indicator, “date, still together,” indicates that the respondent was dating at T1, reported no break-up, and was dating at T2. The dating indicators can be broadly considered as measures of exposure to the opportunity for sex. I also include controls for race, family structure, log of family income, and mother and father’s education.¹⁰

Methods

Table 2 shows the bivariate relationships between first sex and religiosity and attitudes at T2. The table shows that for all indicators, there are significant difference between those who

had first sex between interview waves and those who did not. This is the sort of relationship often found in analysis with cross-sectional data. The most conventional approach to explaining this relationship would be to estimate a multivariate model predicting first sex with religiosity and attitudes as the primary covariates. The relationships shown in Table 2, however, represent more than the effect of religiosity and attitudes on first sex. They also represent the effect of first sex on subsequent religiosity and attitudes. The analysis strategy described below separately estimates the two sides of this relationship.

<Table 2 about here>

In the first part of the analysis, I estimate the effects of religiosity and attitudes about sex on having sex between interview waves. I use maximum-likelihood probit estimation with “first sex” as the dichotomous outcome variable. Because there is self-selection into my sample of virgins (that is, a sample of virgins is *not* random), I consider this selection by estimating a Heckman selection model simultaneously with the probit estimation.¹¹ Because all subjects selected into my sample are virgins at the time of the first interview, their T1 religiosity and attitudes are temporally prior to the outcome of first sex.¹²

In the second part of the analysis, I address the effect of having sex on subsequent religiosity and attitudes about sex.¹³ I estimate the effects of sex on religiosity and attitudes using change score models.¹⁴ Change score models regress the change in the dependent variable between T1 and T2 on whether or not the adolescent had first sex. The coefficient for “had sex” is the effect of first sex on a change in attitudes or religiosity relative to the change experienced by those who did not have sex. Again, unlike a true experiment, “first sex” is *not* assigned to a random sub-sample of virgins. Instead, adolescents self-select themselves into sex.¹⁵ Allison (1990, 1994) advocates using the change score modeling approach because it can deal directly

with unmeasured selectivity. In random-effects models, it is typical to assume that unobserved differences across individuals are uncorrelated with any of the predictor variables, including the event of interest. However, the unobserved differences may very well induce a correlation between the effects being measured for those who experienced the event and those that did not. This makes estimates generated by ordinary least squares regression inefficient with biased estimates of standard errors. However, estimating a change score model controls for the effects of all constant observed and unobserved differences between individuals who experience the event and those who do not.¹⁶

Results – Effect of Religiosity and Attitudes on the Transition to First Sex

Table 3 shows results for three models run separately for males and females. The models estimate the effects of religiosity, attitudes about sex and the control variables on the probability of first sex between T1 and T2. Model 1 tests for the effects of religiosity net of mothers' religiosity and control variables; Model 2 tests for the effects of personal and relational attitudes about sex net of mothers' attitudes and control variables; and Model 3 tests for the effects of both religiosity and attitudes net of each other, mother's religiosity and attitudes, and control variables. The models displayed in this table test the religiosity and attitude effect hypotheses. That is, they test whether or not those with lower levels of religiosity and/or more permissive attitudes are more likely to have sex. In addition, the final model tests whether or not the effect of religiosity on first sex is attenuated by the inclusion of the attitudes measures which are at a higher level of correspondence with first sex.

<Table 3 about here>

The estimates show that higher religiosity reduces the probability of having sex for both boys and girls, but the effect is larger for girls (Model 1). These findings confirm the religiosity

effect hypothesis that lower levels of religiosity influence teens' decision to have sex for the first time. Model 2 shows that adolescents' own attitudes are important, even net of their parents' attitudes. This supports the assertions of developmental psychologists who argue that adolescence is a time of individuation when young people try to establish an identity apart from their parents. However, this does not mean that parent attitudes are not important. Preliminary analyses (not shown) included only parent attitudes in a model predicting first sex. This model produced significant effects of parent attitudes, but these effects were eliminated with the inclusion of child's own attitudes. This indicates that instead of operating via policing of their child's sexual behavior, parent attitudes operate via influence on the child's own attitudes about sex. Model 2 shows that both personal and relational attitudes have significant effects for boys and girls. The effects of relational attitudes are more significant than personal attitudes among boys. This model confirms the attitude effect hypothesis that more permissive attitudes about sex lead adolescents to have sex.

Model 3 shows results for the full model combining adolescents' religiosity and attitudes. Compared to Model 1, the effect of religiosity on first sex is diminished when the more proximate attitudes are considered. The effect of religiosity for males is no longer significant, and the effect for females is reduced by about 15 percent (from -0.032 to -0.027) but remains significant. For both males and females, more permissive or positive personal and relational attitudes about sex remain highly significant predictors of first sex. Moreover, the inclusion of the religiosity indicators does little to reduce the magnitude of the attitude effects. Taken as a whole, the evidence in Table 3 supports the religiosity effect hypothesis for girls, but not boys, and the attitude effect hypothesis for both boys and girls.

The other variables in the models operate similarly across all models. First sex is more likely among older boys, but there is no significant effect of age for girls in this sample of 15- to 18-year-old virgins. With regard to dating status, those who dated at all (even those who broke up between interviews) were more likely to have first sex than those who were not dating at T1. Those who were dating continuously from T1 to T2 had the highest probability of first sex, followed by those who were in a dating relationship at T1, but had broken up by T2. Those who were not dating at T1 had the lowest probability of first sex. Clearly, exposure to the opportunity for sex plays an important role. More important for this analysis, however, is the recognition that religiosity for girls and attitudes for both boys and girls have effects on the probability of first sex net of the strong effects of being in a dating relationship. Income and father's education do not significantly affect the probability of first sex. As mother's education increases, the probability of having sex decreases, but only for girls. In all models, Asian boys and girls are consistently less likely than their white counterparts to have sex. Family structure has no effect on first sex net of attitudes, religiosity and other controls.

The magnitude of the effects of religiosity and attitudes on first sex seems relatively small, especially compared to the effects of opportunity for sex as measured by dating status. However, predicted probabilities of first sex given differing levels of attitudes demonstrate that they can have substantial effects. Based on Model 3 of Table 3, Figure 1 shows the size of the attitude effect for three groups of adolescent girls – those who were not dating at T1, those who were dating at T1 but broke up by T2, and those who were dating consistently from T1 to T2. All are based on models with a white girl with a mean level of religiosity, parent's education and family income. The reference teen is in the 15 to 16-year-old age group and from an intact, two-

parent family. Both personal and relational attitudes are considered and categorized into most restrictive, fairly restrictive, fairly permissive and most permissive.

<Figure 1 about here>

Figure 1 demonstrates several points. A change from most restrictive to most permissive attitudes is quite substantial for all three dating status groups. Because there are few adolescents in the most restrictive and the most permissive categories, it makes more sense to focus on the two middle categories where a shift in attitudes is more plausible. For those who were not dating at T1, a shift from fairly restrictive to fairly permissive attitudes leads to a more than doubling of the probability of having sex (from 0.021 to 0.050). Among those who have consistently dated, the same shift in attitudes from fairly restrictive to fairly permissive is associated with a 10 percentage point increase in the probability of first sex (0.159 to 0.267). Similarly, the same shift in attitudes for those who dated but broke up prior to T2 leads to a shift in the probability of first sex from 0.099 to 0.181. Figure 1 clearly demonstrates that the effect of being in any dating relationship (one that remained intact or one that dissolved), leads to a greater probability of having sex at all levels of attitudes. Clearly both attitude motivation and opportunity influence whether or not a teen has sex.

Results – Effect of First Sex on Religiosity and Attitudes

Now I turn to part two of the analysis – how having first sex influences subsequent religiosity and attitudes. Table 4 shows the results of three change score models testing for the reciprocal effect of having sex on adolescents' religiosity (Model 1), personal attitudes (Model 2) and relational attitudes (Model 3). Model 1 tests the religiosity adaptation hypothesis while Models 3 and 4 test the attitude adaptation hypothesis. Recall that these are change score models where the T1 to T2 change in the dependent variable (religiosity or attitudes) is regressed on

whether or not the teen had first sex. This type of model should produce conservative estimates of the effect of first sex because it nets out all prior, stable observed and unobserved differences between those who did and those who did not have sex. A change in dating status is one characteristic that may significantly influence post-sex religiosity and attitudes. Because dating status changes between interview waves for a third of my sample, it is important to include an indicator for whether the teen experienced a relationship break-up in the change score models. Model 1 shows that experiencing first sex between the two waves has no significant effect on religiosity for boys or girls. This contradicts the prediction of the religiosity adaptation hypothesis. Model 2 shows that personal attitudes are altered after having sex for girls, but not for boys. Similarly, relational attitudes change significantly for girls who have had sex compared to those who did not. The effect of having sex on a change in relational attitudes for boys approaches significance (it is significant at $p < 0.10$ level), but it is still only less than one-third the size of the same effect for girls.

<Table 4 about here>

Several key features of these estimates should be noted. First, the indicator for relationship break-up was not significant in any of the models. This indicates that ending a relationship did not affect the change in attitudes. Second, where attitudes change as a result of first sex, they change to become more permissive. Finally, for girls the effect of first sex on the change in relational attitudes is twice as large as the effect of first sex on the change in personal attitudes. These last two points run counter to the idea that boys, who generally have more positive reactions to sex, should thus have a greater change than girls towards more permissive attitudes after sex (Martin 1996, Guggino and Ponzetti 1997). Instead, I find that while boys start out with more permissive attitudes about sex, having sex does not significantly change these

attitudes. Girls are more affected by the event of first sex. Furthermore, contrary to predictions based on qualitative literature that girls have *less* positive reactions to sex, having sex induces a change towards *more* positive or permissive attitudes in girls.

Conclusion

The two parts of this analysis leave clear results with regard to the four hypotheses set forth earlier in this article. First, there is a *religiosity effect* on first sex, but only for girls. Second, there are substantial *attitude effects* on first sex for both boys and girls. The attitude effects on first sex are stronger with regard to relational attitudes than personal attitudes. Third, there is no evidence of *religiosity adaptation* after first sex. That is, there is no significantly different change in religiosity between T1 and T2 for those who had sex as compared to those who remained virgins. Finally, there is substantial *attitude adaptation* after first sex. The strongest adaptation happens with regard to relational attitudes for girls. This finding indicates that when deciding to have sex, girls consider the costs and benefits to those with whom they are close (e.g. their romantic partner or their parents). Likewise, the occurrence of first sex has the largest impact on their attitudes that concern others to whom they are close. Having sex makes attitudes about sex more permissive. What remains unknown is whether this change is due to new information about sex that adolescents gather as a result of having sex, or whether subsequent attitudes are merely a reflection of post-hoc justification of an event.

The finding that attitudes about sex are more strongly related than religiosity is to first sex both as cause and consequence is perhaps of little surprise. As noted earlier, attitudes are at a higher level of correspondence than is religiosity with first sex. In Table 3 we see that attitudes about sex mediate the relationship between religiosity and first sex. Table 4 shows that having sex influences the change in these attitudes. Thornton and Camburn's work showed that attitudes

about sex influence subsequent religiosity. Taken together these two findings suggest that perhaps the effect of first sex on religiosity is also mediated by the more proximate attitude.

This article set out to explore the relationship between religiosity and attitudes on the one hand, and first sex on the other. One goal was to investigate the degree to which religiosity and attitudes influence first sex. Another goal was to show the dynamic process of religiosity and attitude change. This research makes several important additions to the existing literature on adolescent sex and offers implications for researchers continuing work in this area or with similar data. First, I look directly at adolescents' religiosity and attitudes, rather than using parental religiosity and attitudes as the primary indicators. My results indicate that adolescents' own religiosity and attitudes are more important predictors of sexual behavior than those of their parents. This is not to say that parents attitudes do not influence adolescent attitudes, but rather that parent attitudes are not the best attitude indicators to predict behavior for adolescents who are defining themselves separately from their parents. In the future, researchers conducting analyses of adolescents' religiosity and attitudes should consider adolescents' own religiosity and attitudes where measures are available. Second, I include relationships status as an indicator of opportunity to have sex. All of my models show a strong and consistent effect of dating relationships on first sex. However, my key finding is that attitudes and religiosity remain important predictors net of opportunity. Still, the strong relationship between opportunity and first sex should not be ignored in future research on adolescent sexual activity. Third, and most importantly, I consider the full causal processes between religiosity and first sex and attitudes and first sex. In doing so, I find that the attitude-sex relationship is non-recursive – effects operate in both directions. This study shows one way that researchers can approach problems of multi-directional causation with panel data and appropriate methodological techniques.

This study partially validates the assertion of Thornton and Camburn (1987) that reciprocal models must be specified in order to account for the full causal process between religiosity, attitudes and sex among adolescents. Because social scientists often question the direction of causation in cross sectional studies, it is important to take advantage of longitudinal studies like Add Health to test the direction and possible reciprocity between variables of interest. The design of the Add Health study, with two waves of data collection close together and an intervening event for some but not others, is a great advantage to establishing causal inference.

Endnotes

1. The Add Health data is not a sample of only virgins. However, I sub-sample the full Add Health sample so that my sample for analysis contains only time one virgins.
2. When denominational differences are found, these differences often hold only for specific gender or race groups (see Thornton and Camburn 1987 for differences by gender and Ku et al 1993 for differences by race). Some studies report the largest differences between those with any affiliation and those with none. Other studies find differences between fundamentalists and all others. Still, take as a whole, the evidence suggests a more important role for religious participation and importance than for denomination.
3. What I term the “religiosity effect” is called “value selection” in the literature on values, attitudes and family formation. However, I use the term “effect” rather than “selection” because the term “selection” signals a spurious relationship to unmeasured variables has caused the behavior of interest. In my study, however, I propose that the measured religiosity actually affects the decision to have sex. In addition, because I utilize and discuss “selection” models in my analysis, I do not want to confuse readers with yet another type of “selection.”
4. According to these authors, recall error increases with the duration from the time of the event and decreases with the respondent’s aptitude because recalling a date requires remembering how many years/months ago it happened and then calculating the year and month of the event. The short duration between interview waves in Add Health minimizes the risk of recall error owing to both duration and aptitude.
5. All analyses herein adjust for the complex sampling design of Add Health.
6. Add Health also asks respondents for the month and year of their first sex. If adolescents respond with a date earlier than the time of the first interview, they are excluded from my sample

because this second report conflicts with their first interview report of being a virgin. However, I allow for a one-month recall error window so that those who reported having sex for the first time one month before the time of their first interview are still considered transitioned to first sex between waves.

7. A recent study using the Add Health data indicates that there may be two religiosity constructs – private and public religiosity (Nonnemaker, McNeely and Blum 2002). I found little difference in my results for first sex when treating religiosity as one v. two constructs.

8. Parents' religiosity is measured at time one with the same questions as the adolescents are asked about the importance of religion and the frequency of church attendance and prayer. There is no question for parents equivalent to the adolescent question about youth group participation. The three available measures were factor analyzed, and they all load heavily onto one factor. The individual variable scores are summed to form one composite measure of mother's religiosity (0-9), but this summary measure was highly skewed, therefore it was dichotomized to indicate mothers with a high level of religiosity (those whose score on the composite measure was greater than 5).

9. The religiosity and attitude indicators were also subjected to a principle components factor analysis separately for males and females. The indicators performed almost identically across these two samples.

10. Several variables included in the analysis had missing values for a substantial portion of cases. Family income was missing in approximately 21 percent of cases (not dissimilar from other surveys); parent's religiosity and parent's sex attitudes were missing in approximately 10 percent of the cases (primarily because approximately 10 percent of parents did not respond to the interview); mother's and father's education is missing in approximately 17 and 35 percent of

cases, respectively. However, while parent reports of their education are missing in a large percentage of cases, it can be estimated from adolescents' reports of their parents' education on several survey segments (in-school, in-home re: resident parents, in-home re: non-resident parents). Combining all of this information leaves less than 1 percent of cases are missing information on mother's education and about 3 percent on father's education.

11. Maximum-likelihood probit estimation with selection is achieved using the STATA statistical computing command "heckprob" with the dependent variable in the estimation equation being "had first sex between T1 and T2" and the dependent variable in the selection equation being "virgin at T1." The selection equation is not discussed in this paper because of space constraints. However, it included all of the same variables as the estimation equation plus additional indicators of whether or not a respondent did or did not have sex prior to wave one. Many of the additional variables are not included in the estimation equation for purposes of parsimony and because they are less influential than those selected for the estimation equation.

12. There are three primary criteria for establishing causality: 1) a correlation between the two variables; 2) correct temporal ordering –cause precedes effect; and 3) ability to rule other (spurious) causes. The first two criteria are met for my analysis of the effects of religiosity and attitudes on first sex. The third criteria is the most difficult to establish in any analyses. However, in my analysis, I have included other variables that are consistently implicated as causes of early sex, and that might also influence attitudes and religiosity. In doing so, I believe I have considered the most important possible "third" variables while maintaining a parsimonious model. This does not guarantee that an unmeasured "third" variable remains.

13. I conducted analyses of religiosity by age with the full age range available and attitudes by age with those 15 to 18 for single years of age. These results indicate that religiosity decreases

and permissive attitudes about sex increase with age in the adolescent years. My analysis investigates whether first sex further weakens religiosity or leads to even more permissive attitudes.

14. In my analysis, change score models are similar to “individual level fixed-effects” or “difference-in-differences” models. Allison (1994) shows why these models are superior to the regressor variable method where Y2 is regressed on X and Y1.

15. There are actually two stages of selection that need to be considered in these models. First, a sample of adolescent virgins at time one is a select sample. The use of a Heckman selection model addresses this stage of selection in my analysis. Second, those virgins who have sex between interview waves are a selected group based on a number of characteristics (as evidenced by the models in Table 3). The change score models address this kind of selection.

16. Note that the change score model assumes that the effects of stable characteristics (such as race) are fully represented in their effects on the outcome of interest at T1 and will not have differential effects on the change in that outcome. This assumption is fairly reasonable given the time between interview waves is short (1 year). Most, if not all, of the effects of stable characteristics should be adequately represented by their effects on the outcome of interest at time one.

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Table 1: Descriptive Statistics for Variables Included in the Analysis (Weighted)^a

Full Sample = 4948					
		<u>Percent</u>		<u>Percent</u>	
Age =	15-16	74.04	Not dating at T1	38.66	
	17-18	25.96	Dating, but broke up	33.44	
			Dating, still together	27.90	
Family =	Both Parents	64.21	Mother's Religiosity - High	77.35	
	Stepfamily	11.73	Mother's Religiosity - Low	22.65	
	Single-Parent	20.72	Mother permissive sex atts	6.79	
	Other Structure	3.34	Mother restrictive sex atts	93.21	
Race =	White	69.26		<u>Mean</u>	<u>Range</u>
	Black	10.45	Log of Family Income	3.65	0 - 6.9
	Hispanic	13.17	Mother's Education	13.25	0 - 18
	Asian	5.67	Father's Education	13.02	0 - 18
	Other Race	1.46			
First Sex Between Waves		19.14			
Males Only = 2414					
		<u>Mean</u>		<u>Mean</u>	
T1 Religiosity (range 0-12)		6.462	T1 Personal Sex Att (r 0-16)	7.429	
T2 Religiosity (range 0-12)		6.204	T2 Personal Sex Att (r 0-16)	7.534	
			T1 Relational Sex Att (r 0-12)	4.878	
First Sex Between Waves		17.3%	T2 Relational Sex Att (r 0-12)	5.317	
Females Only = 2534					
		<u>Mean</u>		<u>Mean</u>	
T1 Religiosity (range 0-12)		7.285	T1 Personal Sex Att (r 0-16)	5.031	
T2 Religiosity (range 0-12)		7.004	T2 Personal Sex Att (r 0-16)	5.083	
			T1 Relational Sex Att (r 0-12)	3.871	
First Sex Between Waves		20.9%	T2 Relational Sex Att (r 0-12)	4.444	

^aStatistics are adjusted for complex sampling design of the Add Health survey.

Table 2: Bivariate Relationship Between Religiosity and Attitudes and First Sex for Males and Females^a

Post-Sex Measures	Males		Females	
	Had Sex	No Sex	Had Sex	No Sex
religiosity ^b	5.739	6.437 **	6.204	7.255 **
personal attitudes ^c	8.044	7.483 **	5.723	4.854 **
relational attitudes ^d	6.309	5.146 **	5.834	4.075 **

**p<0.01; *p<0.05

^aStatistics are adjusted for complex sampling design of the Add Health survey.

^bReligiosity ranges from 0 to 12 with a higher score indicating more religious.

^cPersonal attitudes about sex range from 0 to 16 with a higher score indicating more permissive personal attitudes

^dRelational attitudes about sex range from 0 to 12 with a higher score indicating more permissive relational attitudes.

Table 3: Influence of Religiosity and Attitudes about Sex on the Probability of Experiencing First Sex between 1995 and 1996^{abc}

Variable	Model 1		Model 2		Model 3	
	Males	Females	Males	Females	Males	Females
Religiosity ^d	-0.022 *	-0.032 **			-0.013	-0.027 *
Personal Sex Attitudes ^e			0.024 *	0.042 **	0.023 *	0.040 **
Relational Sex Attitudes ^f			0.062 **	0.052 **	0.058 **	0.045 **
Mother High Religiosity	0.072	-0.016			0.089	-0.009
Mother Permiss. Sex Att.			-0.027	0.067	-0.032	0.071
Age 15-16 (omitted)						
Age 17-18	0.175 *	-0.037	0.182 *	-0.034	0.188 *	-0.022
T1 not dating (omitted)						
Dating at T1, broke up by T2	0.557 **	0.701 **	0.549 **	0.721 **	0.558 **	0.735 ***
Dating at T1, still together T2	0.881 **	0.975 **	0.891 **	0.999 **	0.904 **	1.028 **
Family Income (logged)	0.077	0.011	0.052	-0.012	0.052	-0.017
Mother's Education	-0.002	-0.038 **	0.001	-0.041 **	0.001	-0.042 **
Father's Education	0.000	-0.003	-0.002	-0.005	-0.001	-0.003
Two-Parent (omitted)						
Stepfamily	0.081	0.068	0.060	0.097	0.066	0.094
Single-Parent Family	0.212	0.133	0.165	0.155	0.172	0.143
Other Family Structure	0.127	0.175	0.093	0.210	0.094	0.197
White (omitted)						
Black	0.078	0.020	0.051	-0.041	0.060	0.021
Hispanic	0.104	-0.174	0.084	-0.199	0.080	-0.187
Asian	-0.317 **	-0.210 *	-0.300 **	-0.227 *	-0.303 **	-0.201 *
Other Race	-0.065	-0.267	-0.032	-0.283	-0.063	-0.282

**p<0.01; *p<0.05

^aControls were also included to indicate mean substitution on variables where there are missing values (see endnote 13 for details)

^bUsing Heckman selection methods for probit models, estimates account for selection into the sample based on "never had sex" at time one. Selection equation estimates (not shown) are available from the author upon request.

^cEstimates are adjusted for complex sampling design of the Add Health survey.

^dReligiosity ranges from 0 to 12 with a higher score indicating more religious.

^ePersonal attitudes about sex range from 0 to 16 with a higher score indicating more permissive personal attitudes

^fRelational attitudes about sex range from 0 to 12 with a higher score indicating more permissive relational attitudes.

Table 4: The Effect of First Sex on Subsequent Religiosity and Attitudes - Change Score Method^{ab}

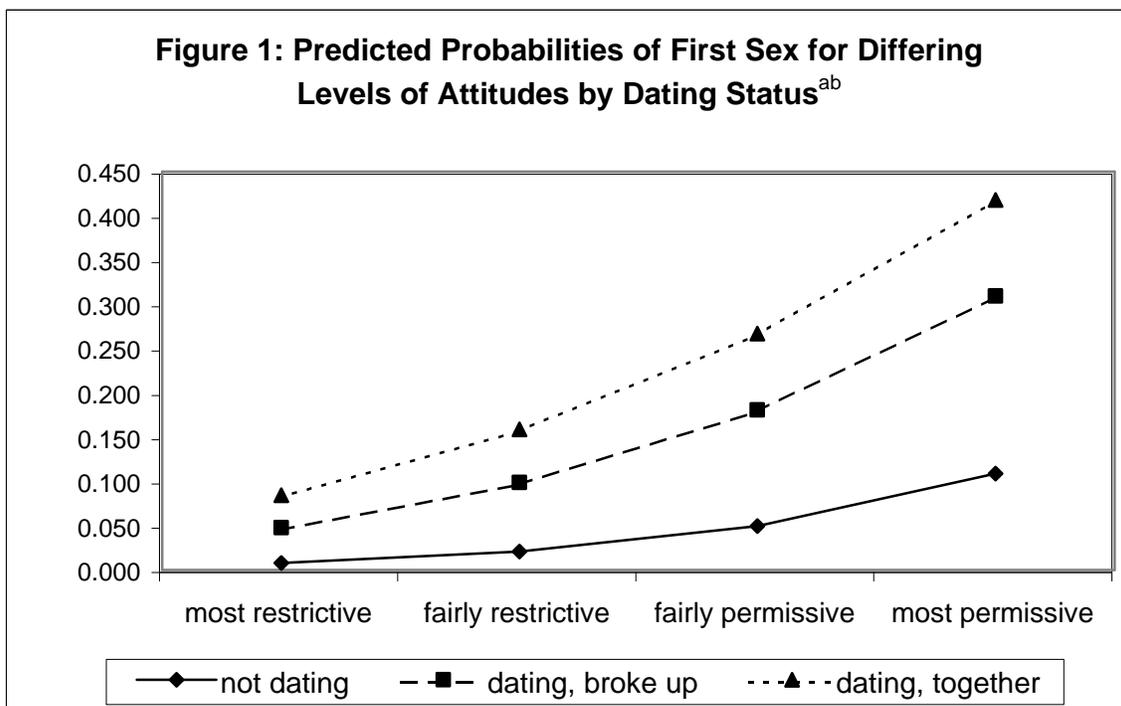
	Religiosity		Personal Sex Atts		Relational Sex Atts	
	Males	Females	Males	Females	Males	Females
Had Sex	0.043	0.008	0.200	0.341 *	0.228	0.759 **
Dating, broke up	-0.074	-0.060	0.222	0.195	-0.131	-0.150
Constant	-0.299 **	-0.442 **	0.254 **	0.134	0.522 **	0.411 **

**p<0.01; *p<0.05

^aUsing Heckman selection methods, estimates account for selection into the sample based on "never had sex" at time one. Selection equation estimates (not shown) are available from the author upon request.

^bEstimates are adjusted for complex sampling design of the Add Health survey.

Figure 1: Predicted Probabilities of First Sex for Differing Levels of Attitudes by Dating Status^{ab}



^a Estimates are adjusted for complex sampling design of the Add Health survey.

^b For the predicted probabilities of having sex, four points are used to demonstrate the change in predicted probability based on differing levels of attitudes about sex. Most restrictive is defined at a score of 0 on relational and 0 on personal attitudes. Fairly restrictive is defined at a score of 4 on relational and 5 on personal attitudes. Fairly permissive represents a score of 8 on relational and 10 on personal attitudes. Finally, most permissive is defined at a score of 12 on relational and 16 on personal attitudes.

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