Young Women's Sexual Behavior and Contraceptive Use Amidst Conflicting Beliefs and Desires

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Acknowledgments: This research was supported by grant, P2CHD042849, Population Research Center, awarded to the Population Research Center at The University of Texas at Austin by the Eunice Kennedy Shriver National Institute of Child Health and Human Development. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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Abstract

In the transition to adulthood, most young adults experience competing beliefs and desires, yet sociologists rarely examine the cognitive dissonance that ensues. This article integrates life course and cognitive social decision-making theories to examine cognitive dissonance about premarital sex and its behavioral implications among women aged 18 to 22. Analyzing a weekly panel of unmarried young women, we show that cognitive dissonance about premarital sex is common and often intensifies over time. By recognizing cognitive dissonance as theoretically meaningful, we shed light on how it not only affects sex and contraceptive use. When young women disapprove of premarital sex, they are less likely to have sex and to use contraception, in part because they possess lower desire for sex. However, as desire increases, disapproving beliefs toward premarital sex lose their grip over behavior. Conceptualizing and modeling cognitive dissonance reveal much about how young adults experience and maneuver socially contentious decisions.

Keywords: *Sexual behavior, Transition to Adulthood, Moral beliefs, Desires for Sex, Cognitive Dissonance, Contraception*

Introduction

Young women's beliefs about sex are socially determined and controlled through their social environment, such as in religious organizations, family environment, schools, and romantic relationships. These environments determine the messaging adolescents receive about their moral belief systems and appropriate behavior. On the one hand, young women are often tacitly discouraged from having sex and/or from using contraception through abstinence only sex education and social norms that esteem chastity, and are further explicitly discouraged from having sex through "slut shaming" and stigmatization (Bay-Cheng 2015, Renold and Ringrose 2011, Guzzo and Hayford 2012, Lamb 2013). On the other hand, young women are bombarded with sexual images in the media, experience implicit peer pressure to have sex when their friends become sexually active, and face explicit pressure from partners who want to have sex (Ward et al. 2016, Hamilton and Armstrong 2009, Ali and Dwyer 2011). These contradictory messages and pressures are especially pronounced during the transition to adulthood—a critical developmental period during which sexual experimentation is concentrated and new friendships and relationships take hold (Arnett 2000, Raley, Crissey, and Muller 2007).

Drawing on social environmental and psychosocial determinants of moral beliefs and desires for sex, this paper explores how these jointly operate to influence sexual behavior and contraceptive use. Social context and exposure to normative belief systems powerfully contribute to one's personal beliefs and desires through mechanisms of social control (Udry 1988, Bearman and Brückner 2001, Crockett et al. 1996, Longmore et al. 2009). Women whose moral beliefs come into conflict with their desire for sex experience cognitive dissonance about how to approach their own behavior (Festinger 1957). Despite extensive research documenting different mechanisms by which women's sexuality and reproductive health are socially controlled, and studies suggesting that young women's desire for sex is socially produced (at least in part) (Fine and McClelland 2006, Guzzo and Hayford 2012, Azjen 2002), researchers continue to know little about what happens behaviorally when young women's moral attitudes about premarital sex come into conflict with their desire to have sex. In response to this lacuna, we ask: *How consistent are young women's moral beliefs about premarital sex and desire for it, and how does this change throughout the transition to adulthood? How do young women's sexual and contraceptive behaviors vary with these moral beliefs and desires? And, what happens*

behaviorally when moral beliefs and desires come into conflict?

In this study, we focus on young women during the transition to adulthood, a critical developmental period in which women experience shifts in social supports as they transition away from their childhood social environment (Arnett 2000, Elder 1979). Leaving secondary school and entering higher education or the workforce, potentially away from home, may simultaneously affect women's moral beliefs about and desires for sex. Both likely affect women's behavior, but surprisingly little is known about when these two opposing forces come into conflict.

To explore the combined effects of moral beliefs and desire for sex on subsequent sexual behavior and contraceptive use, we draw on a unique panel of weekly journal data from the Relationship Dynamics and Social Life (RDSL) study. These data include measures of sexual and contraceptive behaviors updated weekly among 1,003 women aged 18 to 22. In addition, they include information on young women's moral beliefs and desires that was updated every twelve weeks, thus allowing us to capture dynamic change and conflict in these psychosocial dimensions as women progress through the transition to adulthood. Leveraging these novel data, we describe how beliefs and desires co-evolve, and estimate a rigorous set of logistic regressions with random effects, controlling for a wide range of potential confounders. This allows us to uniquely assess the extent which desire for sex both mediates and moderates the effects of moral beliefs on sex and contraceptive use and provides new insight into the complex relationship between moral beliefs and reproductive behaviors, which is especially salient to understanding persistently high rates of unintended pregnancy among young adults.

Background

During adolescence and the transition to adulthood, a young woman's social environment strongly contributes to her trifecta of beliefs, desires, and behaviors. Younger cohorts of Americans have increasingly approving attitudes towards premarital sex (Pampel 2016). On the contrary, the American proscription of adolescent sexuality as dramatized and operating within either an abstinence-only framework or a risk prevention framework (Schalet 2004, 2011).

Pervasive narratives are transmitted through the social environment through social control mechanisms such as socialization, stigma, and surveillance (Davidson 2008). Institutions, including schools, the family, and religious organizations, then influence young women on these narratives, which shapes their beliefs and desires about sex and in what context sex and contraceptive use is appropriate (Mollborn 2017).

For example, teens graduate from high school, may leave the home to pursue work or higher education, and may develop new relationships with individuals outside of their childhood social network. These common transitions are salient in shifting belief systems and behaviors over time (Elder 1979). Women's acceptance of premarital sex and desire for sex increases as she is exposed to additional risk of having sex (Meier 2003, Levine 2003). Prior research indicates four particular institutions as especially relevant to the development of moral beliefs, desires, and sexual behavior: religious organizations, the family, schools and peers, and relationships. Each of these environmental contexts may shift during the transition to adulthood.

Social environmental influences in childhood and adolescence

Religious organization influence

Religious institutions maintain an active presence in American life: over 77% of Americans report identifying with a particular religion and about two thirds of religiously affiliated people report that their religion is very important to them (Pew Research Center 2015). Christianity remains the dominant religion in the United States (ibid). Christian teachings beginning early in childhood emphasize the central tenets of leading a "good" life and following moral ideals (Pew Research Center 2017). These ideals extend to fertility; in particular, one central message aimed at adolescents is the limitation of sexual activity to monogamous marital relationships (Bearman and Brückner 2001, Halpern et al. 2006, Hayford and Morgan 2008, Landor and Simons 2014).

Prior research has found that religiosity is a strong predictor of sexual beliefs and behaviors (Meier 2003, Lefkowitz 2010). In one study, individuals who reported daily religious practices reported conservative sexual attitudes, such that sex is not merely a physical act but meaningful with your partner, and did not believe that condoms were protective (Lefkowitz et al. 2010).

Family influence

Family life is the earliest source of influence for children and remains important throughout the life course (Elder 1979, 1995, Shanahan 2000). Family composition and parental involvement are important factors in delaying sexual engagement (Pearson et al. 2006). Further, according to social learning theory and the theory of planned behavior, family history plays an important role in determining beliefs and behaviors around sex and contraceptive use, as well as pregnancies (Azjen 2002, Longmore 2009, Compernolle 2017). For example, individuals born to teen mothers are more likely to become teen mothers as well (Barber 2001), suggesting that exposure to young child rearing may serve to normalize sex and childbearing during the teen years.

The joint effects of parental communication and perceptions of parents' attitudes toward sex continue throughout adolescence and affect college-bound teenagers' own beliefs and behaviors. Among virgins, parental discussion about sex is situated in a moral, avoidance framework of maintaining abstinence, whereas sexually active teens perceive that parental discussion is related to safety and pregnancy avoidance (Sennott and Mollborn 2011). Teens tend to reflect parental narratives in their own beliefs, suggesting that this messaging is formative for this population (Longmore et al. 2009).

School and peer influence

As adolescents transition to adulthood, family influence becomes a less salient predictor of beliefs and behavior than peer networks (Arnett 2000). Adolescents spend almost a third of their time in school, where peer networks surround them. The school environment can further affect adolescent beliefs on premarital sex and desire to have sex both through education provided to students and through social norms and knowledge among peer groups (Mollborn et al. 2014). Health education regarding puberty often begins in elementary schools, and vary widely across states and even across individual school districts.

In addition to formal curriculum (or lack thereof) in the school setting, social networks are a powerfully influential predictor of beliefs, desires, and behaviors during adolescence. Schools in particular contain microcosms of culture that can transmit norms about sexual debut, contraceptive use, and pregnancy. Peers influence teens' attitudes toward sex based on norms

about being old enough or mature enough to initiate sex, or to continue having sex in a safe way (Sennott and Mollborn 2011). Regarding contraceptive use, increases in contraception among students has a diffusion effect and subsequently increased contraceptive use among peers (Ali et al. 2011). Further, a pregnancy within a social circle was associated with an increased risk of pregnancy for another member of that network within two years (Balbo and Barban 2014).

As individuals graduate high school and transition to college or the workforce, social networks expand and change. Extant research shows that college students adopt more accepting norms around sex, often embracing casual sex and "hook up" behaviors as a first step to relationship development (Manning, Giordano, Longmore 2006; Armstrong, England, and Fogarty 2012). This behavior extends to contraceptive use as well: as college students adapt to an elite college setting, they follow an elite college norm of unprotected sex (Bearak 2014).

Relationship Context

Romantic relationships during the transition to adulthood are highly salient experiences and are influential for young women's future relationships (Raley, Crissey, and Muller 2007). Individuals are likely to partner with others who share common beliefs, values, and attitudes (Kalmijn and Flap 2001; Luo 2017), suggesting that young women may find partners who share moral beliefs about premarital sex. However, as young adults complete puberty and experience increased sexual drive, and as they spend more time with a partner to whom they are attracted, regardless of moral beliefs, they are likely to experience an increased desire for sex (Levine 2003).

In addition to shaping desires, relationships are important predictors of behavior. Partners powerfully influence physical behavior and health outcomes, such as eating patterns and weight (Luo 2017). This influence extends to the decision to have sex and to use contraception, which both require communication and negotiation (Kusunoki and Upchurch 2011).

Psychosocial influences

The socialization of adolescents and young adults through the social environment provides a complex framework for understanding how their life should progress. This is in part determined by exposure to familial norms and communication, religious beliefs, and participation in school and the workforce. Common norms expressed around sexual behavior include a *moral model*, that sex is wrong before marriage, as well as *risk model*, that sex is dangerous (Schalet 2011). Given the prevalence of these narratives, adolescents develop schemas, or normative practices, for their own lives (Johnson-Hanks 2011, Bachrach and Morgan 2013). As adolescents transition to adulthood, their schemas regarding morality of sex and desire for sex may shift as they are exposed to different beliefs about having sex and using contraception.

Individual schemas

Prior research suggests that the social environment determines individual schemas through the theory of conjunctural action (Johnson-Hanks et al. 2011). Individuals form schemas for how their own life should proceed based on the social environment, including family background and geographic location, informs one's worldview and shape preferences and desires. For women raised in a highly religious environment where sanctity is placed on sex within marriage, opposition to premarital sex remains common. If an unmarried woman accepts the schema that premarital sex is morally wrong, then she should not have a desire for sex, either.

Based on schemas about how the world works, individuals construct their behavior to match the schemas to which they were exposed. In a sample of urban and rural Malawian women, relationship schemas powerfully affect relationship quality (Frye and Trinitapoli 2015). Individuals form specific ideals about relationship activities that should occur prior to having sex with a partner. Congruence between women's own ideals about relationship progression and its actual progression, specifically the transition to sex, more strongly predicts relationship quality than congruence between normative, community-level ideals, such as campaigns for abstinence or knowing ones' HIV status, and her relationship progression (Frye and Trinitapoli 2015). This pattern extends to adolescents in the United States as well. In a clinic sample of urban, Black adolescents, Paradise and colleagues demonstrate personal ideals about abstinence were

important for both virgins and those who experienced a period of sexual inactivity following sex. Adolescent women preferred to wait until they are older or married to have sex (2001).

We might expect that individual schemas will include contraceptive use as well. Women with strong moral opposition to premarital sex may decide against using contraception because it signals an intention to have sex and runs contrary to their professed beliefs (Frost, Lindberg, and Finer 2012, Bader et al. 2014, Guzzo and Hayford 2018).

Cognitive dissonance

Sometimes, however, desires are incongruent with moral beliefs, leading to cognitive dissonance. Cognitive dissonance describes the presence of conflicting ideas and values that shape behavior (Festinger 1957, Joule and Beauvois 1997, Ariely and Loewenstein 2006). Generally, people will find a way to reduce the dissonance through one of three mechanisms: (1) changing one of the beliefs or values that results in dissonance; (2) obtain new information that reduces dissonance; or (3) reduce the importance of the beliefs (Festinger 1957). With respect to premarital beliefs about sex, cognitive dissonance is possible if a young person who believes premarital sex is morally wrong is exposed to others who view sex and contraception favorably, and subsequently wants to have sex despite their longstanding beliefs. Following Festinger's mechanisms of reducing cognitive dissonance, a person could either change their belief about premarital sex or change their desire for sex; obtain new information that , or reduce the importance of the moral belief.

Psychologist Daniel Kahnemann's explanation of automatic and deliberate thinking provides a clear framework for understanding how young women may decide to have sex and contracept in situations of cognitive dissonance. Automatic thinking is intuitive, and involves all of the day-to-day activities that one completes but does not necessarily consciously consider. Deliberate thinking, on the other hand, is reflective and thoughtful, occurring when an individual must focus on a new task or argument in order to process the full scope of information available to them (2011). This type of thinking is difficult and uses lots of energy, and generally the brain will prefer a cognitive shortcut. In cases of cognitive dissonance, where moral beliefs conflict with

the desire for sex, a young woman may take a short cut in the moment of deciding whether to have sex and use contraception.

An example of deliberate thinking could be considering oral contraception, which requires planning and consistent use in order to be effective. Women experiencing cognitive dissonance may feel unwilling to navigate the slow thinking processes of planning for hormonal contraception and rather rely on fast thinking in the moment when they decide to have sex. Previous research thus indicates that women who experience high desire for sex but oppose premarital sex should be less likely to use hormonal methods of contraception, which requires careful planning and coordination with a physician, since they are not actively planning to have sex. Individuals who do not plan for sex or communicate with their partner about sex, feel they are too young to have sex, or are reluctant to admit they desire sex are less likely to purchase hormonal methods, which require a prescription and consistent use (Manlove, Ryan, Franzetta 2007, Bader et al. 2014, Grindlay and Grossman 2016). However, they may also be less likely to use coital contraceptive methods, such as condoms or diaphragms, at the time of sex, if sex is not planned or is believed to be morally wrong (Bader et al. 2014).

However, should the woman have sex, she may use coital methods, such as condom or withdrawal, which only require negotiation with a partner at the time of the event and less planning.

Given the social environment and psychosocial effects on young women's moral beliefs, desires, and behaviors, we anticipate that moral beliefs are fairly constant, having been shaped as a result of compounding and reinforcing social environments that resulted in schemas about the appropriate contexts for sex (Hypothesis 1a). Further, we hypothesize that sexual desire will change over time as a result of exposure to new groups of people and ideas, as well as entry into romantic relationships, as individuals move away from their childhood environment (Hypothesis 1b). We expect that moral beliefs and desires will strongly predict young women's sexual behavior and use of hormonal and coital contraceptive methods, with stronger moral beliefs associated with lower likelihoods of sex and contraceptive use (Hypothesis 2). For those who experience cognitive dissonance between their moral beliefs and desires, we anticipate increased

sex and decreased contraceptive use, as these women may not have planned for sex to happen (Hypothesis 3).

Data and Methods

Sample

Data for this analysis come from the Relationship Dynamic and Social Life (RDSL) study, an intensive longitudinal study of 1,003 women who were aged 18 or 19 years old and residing in Genesee County, Michigan at baseline (Barber et al. 2016a). Other research compares outcomes of pregnancy, educational attainment, and other demographics among this sample and a national sample, finding similar results and enhancing our confidence in the generalizability of our results (Clark 2018). Specific to the state of Michigan, where these data were collected, public schools must educate students on the risks of HIV and other STIs, and while sex education is optional, schools are recommended to follow an "abstinence-only" curriculum if the school chooses to provide sex education (Michigan Board of Education 2007).

Women began by completing a comprehensive 50-minute in-person baseline survey. At the end of this survey they were invited to complete weekly journals, online or via telephone, for the following 2.5 years. Ninety-nine percent of women completed at least one journal; 78% completed journals for >=1.5 years; and 63% completed journals for the full 2.5 years (Barber et al. 2016a).[1] During the journals, women were asked about their pregnancy status, relationship status and dynamics, sexual activity, and contraceptive use. Every twelve weeks, journals also re-asked women about their moral beliefs and desires for sex. A randomized experiment conducted alongside the RDSL provided little indication that repeatedly answering questions about sex, contraception, and beliefs influenced women's reported behavior or outlook (Barber et al. 2016b).

Given our interest in weekly sex and contraceptive use and our interest in moral beliefs about premarital sex, we limit our analytic sample to respondents who completed three or more

[1] However, attrition rates differed by race and baseline education: African American women and women who had not attended college respectively completed 11 and 12 fewer journals, on average, than did white respondents and respondents who had at least some college education.

journals, and more specifically, to weeks when respondents were not married or pregnant. This yields a final sample of 54,754 weeks across 757 women.

Measures

Intercourse. Intercourse is captured in weekly journals as a dichotomous indicator of whether a young woman reported having vaginal intercourse ("when a man puts his penis in a woman's vagina"). Respondents reported having intercourse in 33% of weeks (Table 1).

Hormonal contraception. Hormonal contraceptive methods were captured in weekly journals as a dichotomous measure of whether a young woman uses any hormonal method. Women responding affirmatively were asked follow-up questions about hormonal methods used, including oral contraceptive pills, vaginal rings (i.e. Nuvaring), injectable contraceptives, transdermal patch, implant, and IUD. We define hormonal contraceptive use as (1) when a woman reported using any of these methods and (0) otherwise.

Coital contraception. Coital contraceptive methods were only asked about in weeks when women reported having intercourse. We define coital contraceptive use as (1) when a woman reported using male or female condoms or withdrawal that week and (0) otherwise. Table 1 shows that women report using coital contraception in 22% of weeks.

Moral beliefs about sex. Young women's belief that premarital sex is morally wrong is asked on a five-point continuous agreement scale ranging from 0-4, with zero as "Strongly disagree," one as "Disagree," two as "Neither agree nor disagree," three as "Agree" and four as "Strongly agree" that premarital sex is morally wrong.

Desire for sex. Desire for sex in the next year is measured at each weekly journal on a six-point continuous scale of 0-5, with zero representing "No desire" for sex in the next year and five representing "Extremely desiring" sex.

Control variables. In all models, we control for nine demographic characteristics known to be correlated with women's moral beliefs, sexual activity, and contraceptive use (Landor and

Simons 2014, Longmore et al. 2009, Mollborn et al. 2014). Specifically, these include (1) religiosity, which was assessed once at baseline and ranges from 1 to 4, where higher numbers equate stronger religious importance; (2) relationship context, measured as a weekly indicator of relationship status (none, causal, special /romantic, or engaged); (3) family context, measured every 12 weeks using the question "How much do you think your parents would approve of your having sex?" on a 0-5 scale, with higher numbers indicating increasing agreement; (4) peer context, measured as friend approval of having sex every 12 weeks on a 0-5 scale, where higher numbers indicate stronger agreement; (5) education level, which was updated every twelve weeks and defined as "less than high school," "high school graduate, but not enrolled in post-secondary school," and "enrolled or graduated from post-secondary school"; (6) race, which is captured as a dichotomous measure of whether the respondent was African American or not;[2] (7) maternal education (less than high school, completed high school, or completed college); (8) whether the respondent's mother had a teenage birth; and (9) the number of previous live births a respondent reports.

In the models predicting sex and hormonal contraceptive use, we additionally control for whether a young women reports sex in the current week.

[Table 1]

Analytic Strategy

Our analysis is centered on four questions: *How do moral beliefs and sexual desire co-evolve throughout the transition to adulthood? How do young women's social environments determine her moral beliefs and sexual desire? How do young women's sexual and contraceptive behaviors vary with their moral beliefs and desire for sex? And, does desire for sex condition the effects of moral beliefs on sex and contraceptive use?* To address these questions, we conduct a series of logistic regressions with random effects. In models with random effects, coefficients on time-variant predictors reflect a combination of differences across women and variation within women over time as they transition from one state to another. Coefficients on time-invariant predictors

[2] 97% of respondents identified as either African American or white.

exclusively reflect differences across women of different states.

To begin, we describe moral beliefs and the desire for sex at the study baseline and track the evolution of these beliefs and desires over time. We then assess the relationship between a young woman's social environment and her moral beliefs about premarital sex and desire for sex. From there, we assess the relationship between moral beliefs about premarital sex on a woman's odds of having sex in a given week, including only beliefs and control variables as covariates. In a second model, we assess the extent to which desire for sex mediates the relationship between beliefs and sex by additionally adjusting for desire for sex. Finally, to explore the possibility that desire for sex conditions the effect of moral beliefs on sex, we include interaction terms between moral beliefs and desire in a third model. Given that the results of interaction terms are notoriously difficult to interpret in nonlinear models, we present the results of this third model both in terms of odds ratios and marginal effects (differences in predicted probabilities) (Ai and Norton 2003). We then repeat this series of models estimating hormonal contraceptive use in a given week, net of sexual activity in that same week, and estimating coital contraceptive use in weeks when women reported having sex and did not report hormonal contraceptive use.

Results

Variation in Attitudes and Desires Among Young Adult Women

To determine whether women have varying levels of beliefs that premarital sex is morally wrong, as well as whether young women desire sex, we conducted univariate analyses of these two outcomes (Figure 1). Overall, young women's attitudes toward premarital sex vary, with a mean score of 1.9 on a 0-5 scale, with higher scores suggesting stronger belief that premarital sex is wrong. Women's desire for sex in the next year is highly variable, with a mean score of 2.7 on a 0-5 scale, with higher scores indicating higher desire for sex.

[Figure 1]

Because we have repeated measures of attitudes and desires, we plotted Lowess curves of attitudes and desires over the 2-year period in which most respondents completed weekly journals. These measures were captured quarterly, providing enough temporal spacing to see

whether beliefs and desires change. Figure 2 shows that moral opposition to premarital sex falls slightly in the first two quarters of the study and then is unchanged for the remainder of the study. However, the mean desire for sex increases by 50% over the course of the study, from 2 to 3 out of 5, suggesting that women's cognitive dissonance towards sex and contraceptive use increase over time.

[Figure 2]

Predictors of Moral Beliefs and Desires

To begin, we examine the social environmental predictors of moral beliefs toward premarital sex as well as the desire for sex. We find that all social environmental factors, including religious context, family environment, educational and peer environment, and relationship context strongly predict the desire for sex. Specifically, with each increase in religiosity, the odds of desiring sex decreases by 36% (Table 2 reported in log odds). However, with increasing family and friend support of sex, the odds of desiring sex increase, as does being in a special romantic relationship (Model 1). Regarding moral beliefs, as desire for sex increases, the odds of reporting moral opposition to premarital sex are 37% lower. Further, among the social environment variables, only religious context significantly predicts moral beliefs regarding premarital sex: each increase in religiosity is associated with a 230% increased odds of premarital opposition (Model 2).

[Table 2]

Sexual Intercourse

Next we examine the relationship between moral beliefs, desire for sex, and sexual intercourse. The results of logistic regressions with random effects, presented in Table 3, confirm that moral beliefs about sex are significant predictors of sexual intercourse in any given week. Specifically, for each one-unit increase in the moral beliefs that premarital sex or contraception is wrong, a

woman's odds of sexual intercourse decrease by 10% (Model 3).

After adding desire for sex into the model, in Model 4, the effect of opposition to premarital sex is reduced by almost half, thus suggesting that the effect of moral beliefs about sex operates in part through correspondingly lower desires for sex. Relatedly, in this model, desire for sex is associated with 31% higher odds of sexual intercourse—an effect that is in the opposite direction and approximately five times the magnitude of the effect of moral beliefs about sex. The results of Model 4 thus suggest that although moral beliefs affect sexual behavior by deflating sexual desire, the presence of desire nonetheless competes with the influence of moral beliefs.

Model 5 examines the extent to which desire for sex further conditions the effect of moral beliefs. The results reveal that desire for sex is a strong moderator of young women's attitudes towards premarital sex. That is, the negative effect of opposition to premarital sex becomes significantly smaller in magnitude when women more strongly desire sex. Figure 3 helps illustrate this relationship. As can be seen in this figure, irrespective of their beliefs toward premarital sex, women with an extremely high desire for sex have a 40% likelihood of having sex. For women who report some desire or strong desire for sex, their moral beliefs still informs their likelihood of sex, as their likelihood of sex is marginally lower with stronger opposition to premarital sex. Among women with no desire for sex, opposition to premarital sex is still an important determinant of the probability of sex: women strongly opposed to premarital sex have a one third lower probability of sex than that of women with no opposition (29% versus 21%).

[Table 3]

[Figure 3]

Hormonal Contraceptive Use

Having shown that the relationship between moral beliefs and sexual behavior operates partially through desire for sex and that desire moderates the effects of moral beliefs about sex, we next turn our attention to hormonal contraceptive use (the left-hand panel in Table 4). The results of Model 6 suggest that each one-unit increase in opposition to premarital sex is associated with a

corresponding 9% decrease in the odds of using hormonal contraception.

The results in Model 7 suggest that desire for sex partially mediates the relationship between beliefs regarding premarital sex, and the effect of desire for sex—a 13% increase in the odds of using hormonal contraception for each increase in desire—is in the opposite direction of and larger than the effects of moral beliefs, again highlighting that this desire competes with moral beliefs.

The results of Model 8 additionally highlight the conditioning effect of desire for sex. As in our models estimating sexual intercourse, they suggest that the negative effect of moral opposition to premarital sex is significantly smaller when women possess stronger desire for sex, as illustrated in Figure 3. For instance, among women with the strongest desire for sex, the probability of hormonal contraceptive use increases slightly for women who do not believe premarital sex is wrong compared to women who those who do, up to 35% from 33%. For all other women, the desire for sex plays less of a role in determining the probability of hormonal contraceptive use: women who report some desire have a reduced likelihood of using hormonal contraception the more strongly they oppose premarital sex.

[Table 4]

Coital Contraceptive Use

The results for Model 9 show that unlike the models estimating hormonal contraceptive use, opposing premarital sex is associated with 10% higher odds of coital contraceptive use. However, desire for sex fully mediates the relationship between beliefs and coital contraceptive use, and controlling for attitudes, each increase in desire is associated with a 15% increased odds of using coital contraception (Model 10).

Similar to hormonal contraceptive use, conditioning on desire for sex also shows differential effect of moral beliefs on young women's coital contraceptive use (available upon request). Opposition to premarital sex is less predictive of coital contraceptive use for women with the highest desire for sex. Those women reporting any less desire, however, are less likely to use

coital contraception as their moral opposition to premarital sex increases. For women with no desire for sex, their probability of using contraception is 20% if they do not oppose premarital sex, yet falls to 14% if they strongly oppose, for a 30% reduction in probability.

Discussion

This analysis describes how women's social environment shape the co-evolution of moral beliefs and desires, and how these beliefs and desires operate together – sometimes in conflicting ways – to affect young women's behavior during the transition to adulthood. Drawing on intensive longitudinal data over a 2.5 year period, we isolate how young women's moral beliefs affect her sexual behavior and contraceptive use and how desire for sex relates to this process. Overall, our results are important for understanding how young women navigate decisions fraught with conflicting beliefs and desires during the transition to adulthood, namely engagement in sex and contraceptive use. These results have three distinct theoretical implications.

First, we show that young women's moral beliefs regarding premarital sex and contraceptive use are static throughout this period, yet their desire to have sex increases over time (Hypothesis 1a and 1b). This is consistent with the idea that exposure to normative ideas about sex and contraception in a young woman's social environment, such as at school, among peers, at home, or in religious organizations, are salient in shaping her moral belief systems during early adulthood (Lefkowitz et al. 2010, Longmore 2009). It is also consistent with the idea that exposure to new ideas during the transition to adulthood as well as entry into romantic relationships during a period of rapid pubertal development and corresponding increase in sexual drive can increase her desire for sex amidst these longstanding moral beliefs (Levine 2003, Sennott and Mollborn 2011).

We are then able to demonstrate that the social environment, especially religious organizations, peers, and family characteristics, shape young women's moral beliefs regarding premarital sex and contraceptive use, as well as her desire for sex (Hypothesis 2). We additionally find that moral beliefs and the desire for sex strongly predict a young women's subsequent risk of having sex and using hormonal or coital contraceptives when she has sex (Hypothesis 3). We know from prior research that moral beliefs regarding premarital sex are a salient form of social control that

is transmitted through the social environment, and we find support for this hypothesis with this study as well (Mollborn 2017).

Finally, we show that young women's desire for sex conditions the effect of premarital beliefs and sexual behavior and contraceptive use (Hypothesis 4). For women with some or no desire for sex, increased opposition to premarital sex reduces the likelihood of sex and contraceptive use. However, for young women who experience cognitive dissonance, expressing moral opposition to premarital sex yet a strong desire for sex, we find that desire for sex is more strongly predictive of her engagement with sex and contraceptive use. Navigating sex and contraceptive use could be tricky for these women. For one, they may strongly oppose premarital sex based on ideas about appropriate contexts for sex and perceived norms of their peer networks, family members, and religious values. Should they have sex, our findings show that women do not change their hormonal contraceptive behavior and instead rely more on coital methods or no contraceptive method. According to Kahnemann's framework of cognitive shortcuts, we anticipated that young women would rely on coital contraception as an easy method that requires less planning when experiencing cognitive dissonance, and we find evidence of this pattern (2011). We additionally find that once considering a young woman's desire for sex, her moral beliefs are completely inconsequential in determining whether she will use a coital contraceptive method. As her desire for sex increases, she is less likely to use a coital contraceptive method. This sheds light on an extreme cognitive shortcut for women who do not use hormonal contraceptives: in situations of high desire for sex, women simply use no method of contraceptive.

These findings follow a structural and psychosocial determinants framework, suggesting that individual's social environment as well as their internalized schemas of normative behavior are salient determinants of their beliefs, desires, and behaviors (Udry 1988, Arnett 2000, Johnson-Hanks 2011, Kahnemann 2011). For women who experience cognitive dissonance with strong moral opposition to sex yet strong desire for sex, we find evidence that their desire for sex strongly conditions their sexual behavior and contraceptive use, and that little effect of moral beliefs remain. This is important because young women in this situation need to be prepared for having sex and understand their contraceptive options and how to negotiate contraceptive use

with a partner. Our findings suggest that among women experiencing cognitive dissonance, contraceptive avoidance is occurring for hormonal methods, and coital methods

These results have important implications. They suggest that unmarried young women face cognitive dissonance around sex, leaving them prepared for sex when they do not express desire to have sex or believe that they should not have sex. However, women in this sample had sex in over 30% of weeks in this study, suggesting that they still need protection from pregnancy and sexually transmitted infections (STIs). Policies and programs should focus on the messaging received in young women's social environment that then shape their own thinking about sex. Prior literature has shown that sex education is a central way to prepare adolescents for healthy sexual behavior. Currently, Michigan's law requires that health education include risks of HIV and STIs but does not need to include sex education, and for school districts incorporating sex education, it must be abstinence focused (Michigan Board of Education 2007). However, school systems can empower young women by teaching them to recognize desire as an important predictor of whether they have sex, and to protect themselves from unintended pregnancy or STIs by incorporating curriculum on contraceptive use, even if elsewhere they learn that premarital sex is morally wrong (Fine and McClelland 2006). This way, regardless of their moral beliefs, young women know how to protect themselves when they engage in sex.

We believe these findings are robust and important, but are not without limitations. For one, we are unable to measure how partner dynamics that can contribute to cognitive dissonance between moral beliefs and desire for sex. While we know that these results are not purely driven by being in a romantic relationship, it is possible that partners play a significant role in deciding to have sex or not use contraception when a young woman is conflicted (Manlove, Ryan, and Franzetta 2007). Further, we consider the social environment broadly to understand young women's moral belief systems; however, we are unable to tease out exactly the types of normative messaging women received from their social environment, such as sex education curriculum or religious doctrines from specific religious organizations. We additionally know that moral beliefs are consistent throughout the study, yet desires change over time. We only have assessments of desires every 12 weeks, and would benefit from weekly measures in order to capture shifts in desires that may occur as a result of specific events, such as entry into a new relationship or a

breakup. Finally, as with all research drawing on logistic regression with random effects, we are unable to determine the effects of these beliefs and desires within women versus how these differ between women and across time.

Overall, our findings demonstrate that socially controlled messaging around premarital sex does not protect young women from having premarital sex in this transitional period, and that rather, these messages often create cognitive dissonance around important decisions about having sex and using contraception. Cognitive dissonance puts young women at risk of not using hormonal contraceptive methods. By recognizing the complex set of factors that contribute to sexual behavior and contraception beliefs and behaviors, we can empower young women to better make contentious decisions amidst cognitive dissonance.

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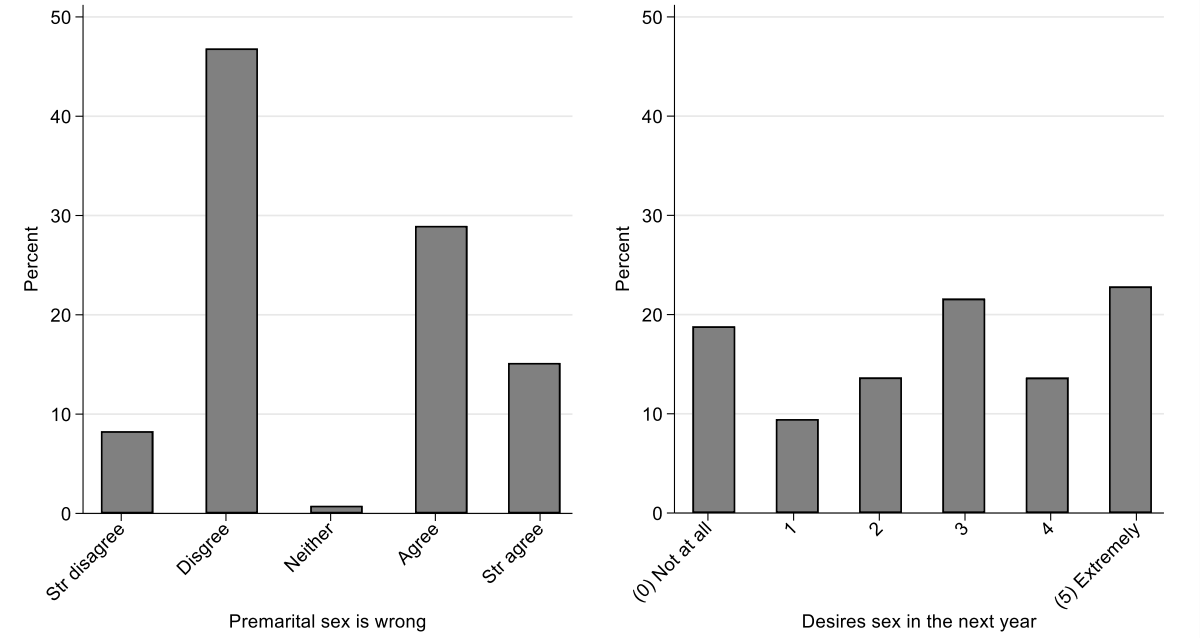
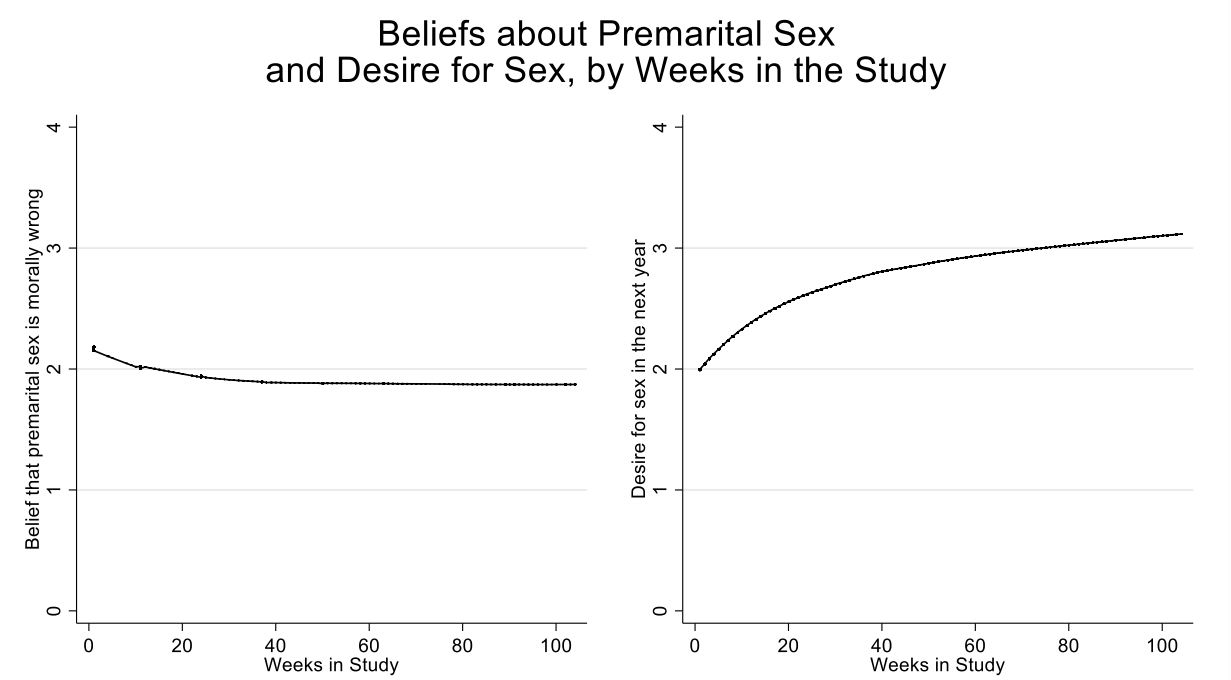
Figure 1. Univariate beliefs towards premarital sex and desire for sex



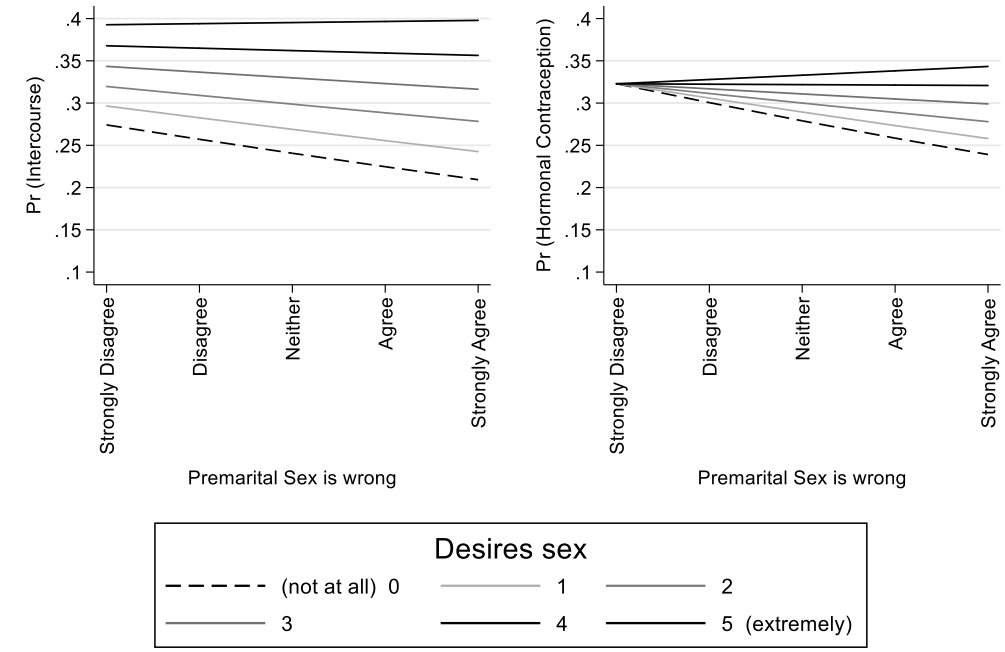
Source: RDSL

Figure 2. Lowess curves of moral beliefs and desire for sex across study participation



Source: RDSL

Figure 3. Predicted Probabilities of Intercourse and Hormonal Contraception, by Moral Beliefs About Sex and Desire for Sex



Source: RDSL

Note: Predicted probabilities are calculated from the results of Models 3, 6, and 9, presented in Tables 2 and 3.

Table 1. Sample description

Characteristic	Mean / Proportion	SD
Sex and Contraceptive Use		
Weeks of sex	0.32	0.47
Type of contraception		
Hormonal	0.33	
Coital	0.22	
Moral Beliefs		
Young people should not have sex before marriage*	1.94	1.30
Desire for sex		
Desire for sex in the next year*	2.73	1.79
Controls		
Race: Black†	0.31	
Religiosity*†	2.68	0.93
Relationship status (measured weekly)		
No relationship or Nonspecial, physical or emotional relationship	0.38	
Special romantic relationship or Engaged	0.62	
Education (measured at baseline)		
Did not graduate HS or Graduated HS, no longer enrolled	0.38	
Enrolled or graduated from post-secondary	0.62	
Mom's level of education		
Less than HS	0.08	
Graduated HS or some post-secondary	0.68	
Graduated post-secondary	0.21	
Mom gave birth <20	0.33	
Number of live births	0.14	0.39

Note: N= 54,754 weeks (among 757 respondents)

† Measure was assessed once at baseline and therefore does not vary within respondents over time.

* Measured as 0-4 in increasing agreement

Table 2. Random Effects Logistic Regression of social environmental predictors of moral beliefs and desires

	Desire for sex			Premarital sex is wrong		
Model	1			2		
Predictors						
Young people should not have sex before marriage†	-0.66	(0.07)	***			
Desire for sex in the next year (0-5 in increasing desire)				-0.40	(0.06)	***
Religious context: Religiosity						
Religiosity (0-4 in increasing religiosity)	-0.44	(0.14)	**	0.84	(0.14)	***
Family Context						
Parental approval of sex (0-5 in increasing agreement)	0.24	(0.05)	***	-0.03	(0.07)	
Education/Peer context						
Friends approval of sex (0-5 in increasing agreement)	0.40	(0.05)	***	-0.06	(0.08)	
Relationship context (ref: No rel/Nonromantic)						
Special romantic relationship	0.46	(0.05)	***	0.03	(0.06)	
Race: Black	-0.36	-0.26		0.15	(0.30)	
Education (ref: <HS or HS grad, not enrolled)						
Enrolled or graduated from post-secondary	0.12	-0.17		0.00	(0.19)	
Mom's level of education	0.58	(0.21)	**	0.06	(0.21)	
Mom gave birth <20	0.46	(0.25)		-0.03	(0.25)	
Number of live births	-0.44	(0.21)		0.10	(0.25)	
lnsig2u	1.62	(0.13)	***	1.17	(0.16)	***
Constant	2.08	(0.64)	**	2.85	(0.64)	***
Observations		4,775			4,650	
Number of respondents		925			924	

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05 (2 tailed p-tests)

† Measured 0-4, in increasing agreement

Table 3. Random Effects Logistic Regression for Weeks of Reported Sex

	Weeks of sex								
Model	1			2			3		
Primary predictor									
Young people should not have sex before marriage†	-0.11	(0.02)	***	-0.06	(0.02)	**	-0.16	(0.04)	***
Mediator									
Desire for sex in the next year (0-5 in increasing desire)				0.27	(0.02)	***	0.20	-0.02	***
Interaction									
Premarital sex morally wrong X Desire for sex							0.03	(0.01)	***
Religious context: Religiosity									
Religiosity (0-4, in increasing religiosity)	-0.36	(0.10)	***	-0.30	(0.09)	**	-0.29	(0.09)	**
Family Context									
Parental approval of sex (0-5 in increasing agreement)	0.11	(0.02)	***	0.09	(0.02)	***	0.09	(0.02)	***
Education/Peer context									
Friends approval of sex (0-5 in increasing agreement)	0.19	(0.02)	***	0.14	(0.02)	***	0.14	(0.02)	***
Relationship context (ref: No rel/Nonromantic)									
Special romantic relationship	1.10	(0.02)	***	1.09	(0.02)	***	1.09	(0.02)	***
Race: Black	-0.07	(0.20)		0.07	(0.19)		0.07	(0.19)	
Education (ref: <HS or HS grad, not enrolled)									
Enrolled or graduated from post-secondary	-0.12	(0.05)	*	-0.19	(0.05)	***	-0.19	(0.05)	***
Mom's level of education	-0.49	(0.16)	**	-0.52	(0.15)	***	-0.52	(0.15)	***
Mom gave birth <20	0.56	(0.18)	**	0.56	(0.17)	**	0.55	(0.17)	**
Number of live births	-0.48	(0.09)	***	-0.51	(0.09)	***	-0.51	(0.09)	***
lnsig2u	1.66	(0.07)		1.53	(0.07)	***	1.53	(0.07)	***
Constant	-1.75	(0.43)	***	-2.49	(0.41)	***	-2.26	(0.42)	***
Observations		53,235			53,171			53,171	
Number of respondents		935			935			935	

*** p<0.001, ** p<0.01, * p<0.05 (2 tailed p-tests)

† Measured 0-4, in increasing agreement

Table 4. Random Effects Logistic Regression for Weeks of Reported Hormonal and Coital Contraceptive Use

	Weeks of hormonal contraception use									Weeks of coital contraception use					
Model	4			5			6			7			8		
Primary predictor															
Young people should not have sex before marriage†	-0.09	(0.02)	***	-0.07	(0.02)	**	-0.26	(0.04)	***	0.10	(0.05)	*	0.07	(0.05)	
Mediator															
Desire for sex in the next year (0-5 in increasing desire)				0.13	(0.02)	***	-0.01	(0.03)					-0.27	(0.04)	***
Interaction															
Premarital sex morally wrong x Desire for sex							0.07	(0.01)	***						
Religious context: Religiosity															
Religiosity (0-4, in increasing religiosity)	-0.51	(0.15)	**	-0.48	(0.15)	**	-0.47	(0.15)	**	-0.20	(0.17)		-0.26	(0.18)	
Family Context															
Parental approval of sex (0-5 in increasing agreement)	0.02	(0.02)		0.01	(0.02)		0.01	(0.02)		-0.26	(0.04)	***	-0.24	(0.04)	***
Education/Peer context															
Friends approval of sex (0-5 in increasing agreement)	0.08	(0.02)	***	0.06	(0.02)	**	0.06	(0.02)	*	-0.07	(0.04)		-0.05	(0.04)	
Relationship context (ref: No rel/Nonromantic)															
Special romantic relationship	0.15	(0.02)	***	0.14	(0.02)	***	0.14	(0.02)	***	-0.06	(0.05)		-0.06	(0.05)	
Race: Black	-0.40	(0.31)		-0.29	(0.30)		-0.31	(0.30)		-0.08	(0.33)		-0.28	(0.35)	
Education (ref: <HS or HS grad, not enrolled)															
Enrolled or graduated from post-secondary	0.31	(0.06)	***	0.28	(0.06)	***	0.27	(0.06)	***	0.27	(0.12)	*	0.30	(0.13)	*
Mom's level of education	0.43	(0.24)		0.40	(0.24)		0.41	(0.24)		0.97	(0.28)	***	1.08	(0.29)	***
Mom gave birth <20	0.16	(0.28)		0.15	(0.28)		0.14	(0.28)		-0.17	(0.30)		-0.20	(0.31)	
Number of live births	0.62	(0.10)	***	0.57	(0.10)	***	0.57	(0.10)	***	0.29	(0.15)		0.42	(0.15)	**
Had sex this week	0.79	(0.04)	***	0.77	(0.04)	***	0.77	(0.04)	***						
lnsig2u	2.77	(0.07)	***	2.75	(0.07)	***	2.75	(0.07)	***	2.15	(0.11)	**	2.23	(0.11)	**
Constant	2.71	(0.67)	***	-2.98	(0.67)	***	-2.54	(0.67)	***	1.83	(0.77)	*	2.73	(0.81)	**
Observations (weeks)		52,794			52,732			52,732			8,615			8,602	
Number of respondents		928			928			928			619			617	

*** p<0.001, ** p<0.01, * p<0.05 (2 tailed p-tests)

† Measured 0-4, in increasing agreement