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Research Report

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ABSTRACT

This paper uses longitudinal data from a weekly mixed-mode (online or phone) survey spanning 2.5 years, or 130 weeks. We use these data to examine the types of relationships that produce pregnancies among 1000 18-21 year old women. We draw from the literature predicting that serious relationships, as well as unstable relationships, lead to pregnancy. We examine dynamic, time-varying measures of seriousness and instability. Our results are preliminary at this time, but our analyses suggest that both seriousness and instability are important. Time-intensive and exclusive relationships are particularly likely to produce pregnancies. Further, this effect does not appear to be due to the types of young women who enter these relationships – current involvement in a time-intensive or exclusive relationship increases pregnancy risk *net of* prior experiences with these types of relationships. These types of relationships appear to mainly increase pregnancy risk via increased sexual activity, and less so via contraceptive behavior. Finally, changes and instability in living arrangements are associated with increased risk of pregnancy, as well. We plan to continue investigating these effects through refined measurement and modeling.

Although the United States experienced declines in unintended childbearing in the 1970s and early 1980s, levels have recently risen, and the most recent national estimates indicate that approximately 35% of live births from 1997-2002 were unintended at the time of conception (Chandra et al. 2005). Unintended childbearing is associated with a wide range of negative health statuses for children and mothers (Brown and Eisenberg 1995), including delayed prenatal care, depression, poor birth outcomes, divorce, developmental delay, and even child abuse. In fact, the combination of these negative health statuses and rising levels of unintended childbearing led the U.S. Department of Health and Human Services (in its National Health Promotion and Disease Prevention Objectives) to target a substantial reduction in unintended childbearing in its objectives for both 2000 (formulated in 1990) and 2010 (formulated in 2000). According to data available from the most recent national estimates of unintended childbearing, the goal for 2000 was not met, and the goal for 2010 will not be met either. Research that has addressed the social consequences of unintended childbearing suggests that they may be severe, may permeate multiple aspects of social life, and may persist for the very long term (Axinn et al. 1998; Barber et al. 1999; Baydar 1995; Brown and Eisenberg 1995).

The issue of relating context and strategic behavior, or macro-micro linkage (Alexander 1988), has been a central concern in social demography since the early 1980s (Smith 1989). Since that time, a growing body of empirical work has demonstrated important influences of context on individual preferences and behaviors, particularly those related to fertility (Barber 2001; Billy et al. 1994; Brewster 1994a, 1994b; Crane 1991; Grady et al. 1993; Jencks & Mayer 1990; Lloyd & South 1996; South & Crowder 1999, 2000; Sucoff & Upchurch 1998). This research has demonstrated that community context affects women's sexual and contraceptive behavior and the resulting risk of pregnancy (Grady et al. 1993). Building on this research, we focus on context at a more local level, where individuals act and react to day-to-day activities: young women's romantic relationships.

Our contribution in this paper is threefold. First, we examine multiple relationship domains, both individually and in tandem. Specifically, we focus on time spent together, whether the couple agreed to be exclusive, whether they live together, and whether they have other sexual partners. Second, we examine these characteristics at multiple levels – the individual's current relationship, the history of that relationship, and the individual's overall relationship history with all partners. Third, we use our dynamic weekly measures of women's experiences to examine

instability in their relationships. To our knowledge, no other data exist that allow for such a detailed examination of young women's weekly experiences with relationships.

THEORETICAL FRAMEWORK

The formation, dissolution, and character of heterosexual romantic relationships are key determinants of unintended childbearing that are understudied (Brown et al. 1999). Most existing research on relationships as a context for unintended, premarital, or early pregnancy has focused on the intensity of relationships. Demographers have focused on relationship characteristics like age at first intercourse (sexual debut), dating/"going steady" at a young age, and cohabiting behavior, finding that intense relationships are linked to unintended childbearing. Edin and Kefalas (2005) found that once a relationship has reached "the next level" (i.e., sexually exclusive and identity as a "couple") contraception may stop, with the woman figuring "If I get pregnant, I get pregnant." (p. 38). Intensity is clearly an important determinant of pregnancy.

Others have focused on instability in relationships suggesting that the ambiguities during transitions – juggling multiple partners, breaking up and getting back together, conflict, etc. – produce less predictable sexual behavior, less effective contraceptive use, and higher unintended pregnancy rates (Miller 1973). Elijah Anderson (1999) describes a "game" in which young men have multiple sexual partners, fight against identity as a couple, and engage in a great deal of conflict with their partners. It is precisely this type of instability and these transition points that may increase the risk of an unintended birth (Miller 1973; Schoen et al. 1999).

We will not attempt to adjudicate between these types of hypotheses; rather, we expect these processes to work in tandem, explaining the overall relatively high risk of an unintended birth, particularly among less educated, lower income, young women.

We propose a multidimensional and dynamic approach to measuring relationships. The Add Health study has revolutionized measurement of relationship dynamics by providing multidimensional measurement among those categorized by other studies as "single" (Bearman et al. 2004; Bruckner and Bearman 2003; Udry and Bearman 1998). Measurement of multiple dimensions of relationships, including number of partners, time spent together, couple identity, living arrangements, engagement plans, sex and other physical intimacy, are all needed to measure the relationship context. Further, the multidimensional nature of relationships makes categorical relationship status difficult to define. For example, Carver and her colleagues (2003)

point out that it is difficult for many adolescents to give a date – even a year – to the start of their relationships, largely because relationship-building is a dynamic process that often begins with friendship. There may be no defining "event" to mark categorical changes in status. However, because ambiguities during these relationship transitions are a particularly important context for unintended pregnancy, frequent measures of relationships are necessary to monitor relationship dynamics. Thus, we do not categorize relationships as "serious" or "casual", or in any other way. Rather, we use measures of multiple dimensions of the seriousness of relationships – time spent together, whether the couple has agreed to be exclusive, whether they live together, and whether they have other sexual partners. We examine these dimensions separately and together.

We draw on the proximate determinants of fertility framework to investigate two mechanisms to explain the influence of relationships on pregnancy rates – contraception and sexual intercourse. Bongaarts identifies four proximate determinants, through which all less proximate factors must affect fertility: exposure to sexual intercourse, contraceptive use and effectiveness, abortion, and postpartum infecundability (Bongaarts 1982). We focus here on sex and contraceptive use. Postpartum infecundability is not a factor because we are examining first pregnancy, and abortion is not a factor because we are examining pregnancies rather than births. Research on unintended childbearing in the United States has focused closely on the first three, finding that early sex, low rates of contraceptive use, and avoidance of abortion are key determinants of who has unintended births. We expect exposure to sex and variance in contraceptive use to be major important proximate determinants of unintended pregnancy in this setting and age group. We hypothesize that an important reason serious relationships are likely to increase unintended pregnancy rates is because they provide more regular access to sexual intercourse. Further, we hypothesize, consistent with Kusunoki and Upchurch (in press), that serious relationships will increase more effective contraceptive use rates, and thereby decrease unintended pregnancy rates.

MEASUREMENT AND CONCEPTUALIZATION OF UNINTENDED PREGNANCY

One of the major obstacles to scientific research on unintended pregnancy is the measurement of unintended pregnancy. Most study designs, such as that used in the National Survey of Family Growth (NSFG), feature a single cross-sectional interview with lifetime retrospective reporting. Methodological research on surveys suggests that recall errors will be

substantial and significant (Groves et al. 2001; Schwarz and Sudman 1994; Sudman et al. 1996). Of greatest concern is that individuals alter their feelings to become more consistent with behavior (Festinger 1957; Williams et al. 1999), which may produce substantial underestimates of the true level of unintended childbearing. A closely related concern is that retrospective reporting severely limits the extent to which these studies can measure temporal dynamics in intentions/attitudes, and their association with relationship characteristics or contraceptive use.

Longitudinal studies, which interview the same young women multiple times, address some potential shortcomings of the cross-sectional measures. The National Longitudinal Study of Adolescent Health (Add Health), the National Longitudinal Survey of Youth (NLSY), and the National Survey of Families and Households (NSFH) are all important alternatives to the cross-sectional measures of unintended pregnancy. Multiple interviews with the same young women at multiple times allow measurement of intentions, contraception, happiness about pregnancy, and relationship characteristics at one time point, followed by subsequent measurement of pregnancy. This design greatly reduces the risk of retrospective reporting error. Unfortunately, even in these designs, lengthy gaps between interviews greatly increase the chance of changes in the immediate context of pregnancy and retrospective reporting errors about that context. Without very frequent re-interviews, it is impossible to fully capture the temporal dynamics in intentions, contraception, attitudes toward pregnancy, and relationship characteristics.

To address the critical limitations in existing measures of unintended pregnancy, we are conducting a study which intensively measures these key processes. Specifically, we are collecting weekly, journal-based attitudinal and behavioral measures of pregnancy, relationships, and contraceptive use. These measures reduce the retrospective reporting period to one week, and capture the dynamics in attitudinal and behavioral aspects of relationships and contraceptive use during the early adult years, when both the instability and the risk of unintended pregnancy are at their peak.

DATA AND METHODS

Sample

Our sample consists of young women, ages 18-19, residing in a Michigan county. Their names and contact information have been obtained from public records. To be eligible in the

recruitment phase of the study, the young women were no younger than 18 and no older than 19 at the time of the sample.

Study Design

An initial 60-minute face-to-face survey interview was conducted to assess important aspects of their family background; demographic information; key attitudes, values, and beliefs; current and past friendship and romantic relationships; education; and career trajectories. Once the in-person baseline interview was completed, all respondents were invited to participate in the weekly journal-based study. The journal is a weekly mixed mode (Internet and phone) survey. Each week respondents can choose to complete the survey either by logging into the study's secure website, or by calling a toll free number and completing the survey with a live interviewer. The survey period for each respondent is approximately 2.5 years, and during that time each respondent can potentially complete up to 183 surveys (if they complete a new survey every 5 days). Respondents are paid $1 per weekly survey with $5 bonuses for on-time completion of five weekly surveys in a row. Automated email and text messages are sent to respondents weekly to remind them to complete the surveys. If a respondent becomes late on her next survey, study staff first attempt to contact her by phone, and later by email and letter in attempt to regain her participation. Respondents who become 60 or more days late are offered an increased incentive for completing the next survey. Small gifts (e.g., pen, chapstick, compact, pencil) are also given to respondents to award continued participation.

We have completed the baseline data collection in all four replicate samples and have 1003 baseline interviews and 36,042 weekly surveys (between one and one hundred three per woman per woman, depending on the baseline interview date). Our experience indicates that our incentive scheme, coupled with the cooperative nature of this age group and their interest in the subject matter has resulted in extremely high cooperation rates. We have an 83% response rate and a 94% cooperation rate for the baseline interviews and over 99% of respondents who completed a baseline interview enrolled in the weekly survey portion of the study (N=992). Furthermore, weekly survey participation rates have thus far been high. To date, almost 60% of respondents have completed a survey in the past 30 days.

Variable Description and Measurement

Pregnancy. We operationalize a pregnancy as the report of a positive pregnancy test. A respondent is coded 1 at the first survey where she reports a new pregnancy after the baseline interview and 0 otherwise. For example, a respondent whose first report of a pregnancy occurred at the tenth survey would be coded 0 for all surveys prior to the tenth and 1 for the tenth survey. All later surveys are censored from the analysis. A respondent who has not yet reported a pregnancy would be coded 0 at all surveys and censored at the last survey she completed to date.

Relationship Measures

During each weekly survey, which we refer to as a journal, respondents are asked questions about the relationship they are in at that time. If they are in more than one relationship, they are asked to choose the one that is the most serious or the one they have been with most recently. All information reported at that journal is based on the time between the current journal and the last journal. For instance, at the sixth journal, respondents would be talking about events that occurred between the fifth and the sixth journals. We create several journal-varying measures about respondents' relationship experiences, with a particular focus in the current paper on the seriousness and instability of respondents' relationships.

Seriousness. Relationship seriousness is operationalized as time spent together, exclusivity, cohabitation, and concurrency. Respondents are asked whether they and their partner spent a lot of time together since the last journal. Respondents who answered affirmatively to this question are coded as having spent a lot time with their partner and 0 otherwise. Respondents who are not married or engaged to their partner or who are not cohabiting with their partner are asked whether they and their partner have agreed to only have a special romantic relationship with each other and no one else. Respondents who answered affirmatively to this question are coded as being in an exclusive relationship at that journal and 0 otherwise. Respondents who are married, engaged, or cohabiting are recoded to 1 (i.e., considered exclusive). Respondents are considered to be cohabiting with a partner if they are not married or engaged and reported living with a partner (1/0). Concurrency is based on two questions, the first asks whether the respondent had sex with anyone other than the partner and the second asks whether the respondent thinks her partner had sex with anyone other than her. A relationship is considered to have been concurrent if the respondent answered yes to either of these two questions (1/0).

We create two types of measures for each of the four seriousness variables. The first is based on the relationship reported two journals prior to the most recently completed journal (j_{n-2}); we will refer to this as "current". The second type of measure is based on information reported in the "current" journal and all prior journals (j_{n-2+}); we will refer to this as "cumulative." For example, the "current" measure for time spent together would indicate whether or not the respondent spent a lot of time with the partner she talked about two journals prior to the most recent journal whereas the "cumulative" measure for time spent together would indicate the proportion of all journals prior to and including the "current" journal in which the respondent spent time with a partner. We chose two journals prior to the most recent journal to use measures collected closer to the time the pregnancy actually occurred, rather than the time the respondent reported the pregnancy.

Instability. Relationship instability is operationalized as the proportion of changes in the each of the seriousness measures. For example, the "change" measure for time spent together would indicate the proportion of journals prior to the "current" in which the respondent experienced a change in time spent with a partner.

Mediating Measures. We also include sex and perfect birth control as mediating measures in our analysis. For sex, respondents are coded 1 if they had been sexually active with their partner in the "current" journal and 0 otherwise. For perfect birth control, respondents are coded 1 if they had been sexually active with their partner in the "current" journal and had used some method of birth control every time they had sex (not having had sex is also considered to be a form of perfect birth control) and 0 if they had sex but did not use birth control every time.

Baseline Controls. Several sociodemographic characteristics measured at the baseline interview are included as controls in the current analysis. Age is coded in years and ranges from 18 to 20 years; the reference category is 18 years old. Race is included as a dichotomous indicator for African American versus non-African American. School enrollment is created using information about the type of school the respondent is enrolled in and highest grade completed and includes the following categories: 1) dropped out of high school, 2) graduated from high school, 3) enrolled in high school, 4) enrolled in two year college/vocational/technical/other, and 5) enrolled in four year college. Four year college is the reference category.

A respondent is coded as receiving public assistance if she identified receiving at least one of the following: 1) WIC, 2) FIP, 3) cash welfare, or 4) food stamps. Importance of religion is included as a continuous measure ranging from not important (1) to more important than anything else (4). A dichotomous measure indicating whether the respondent is currently living with a romantic partner is also included (1/0). Mother's age at first birth is included as a dichotomous measure indicating that the respondent's mother had her first child when she was younger than 20. Family structure is based on information about who the respondent lived with while growing up and includes the following three categories: 1) both biological parents or biological parent and step-parent, 2) single biological parent only, and 3) other situations. Two-parent family (biological or biological and step) is the reference category. Mother's education is coded as a dichotomous indicator for less than high school or otherwise. Low parental income is operationalized as $14,999 or less; a dummy for don't know or refused is also included.

Sexual, contraceptive, and pregnancy experiences. Sexual, contraceptive, and pregnancy experiences as of the baseline interview are also included as controls. Indicators for early sexual debut (less than or equal to 14) and average sexual debut (15 or 16 years old) are included as dummy variables in the regression models. Lifetime number of sexual partners is continuous. Respondents who have ever had sex without using birth control are coded 1 and 0 otherwise. Prior pregnancy experience is included as a three category variable: 1) no prior pregnancies, 2) one prior pregnancy, and 3) two or more prior pregnancies. The category for no prior pregnancies is the reference.

Analytic Strategy

We use discrete-time hazard models to estimate the risk of becoming pregnant during the study period thus far as a function of the seriousness and instability of respondents' relationships. Because each respondent's journals can be considered discrete time units, we estimate a logistic regression model predicting whether a pregnancy did or did not occur in each journal. Control variables are fixed as of the baseline interview whereas relationship measures are allowed to vary across journal. We adopt a hierarchical modeling strategy, beginning with each relationship seriousness measure net of control variables and then adding sex, perfect birth control, and both sex and birth control to subsequent models. We first present the results from models that include each of the current measures of seriousness, then each of the cumulative measures of seriousness,

and then both the current and cumulative measures of seriousness. Finally, we present the results of models that include the instability measures (i.e., changes in seriousness), again using the same hierarchical modeling strategy described above. Results from these models are presented in the form of log-odds. All analyses are conducted using Stata/SE 11.0. Results are presented for the relationship seriousness and instability measures. (The results from models that include the mediating measures and baseline controls are provided in Appendix Table 1; the results did not differ substantially upon including each relationship measure.)

RESULTS

Table 2 presents logistic regression estimates of the effects of relationship characteristics on the hazard of pregnancy. Panel A focuses on time spent together. Models 1 through 4 focus on *current* measures of the relationship – during the approximate week that the pregnancy occurred. Model 1 shows that, overall, young women who spent a lot of time with their partner during the prior week had higher pregnancy rates than those who did not spend a lot of time with their partner. Models 2 and 3 demonstrate that sexual behavior and contraceptive use explain between 22 and 30% of the magnitude of this effect. In other words, spending a lot of time together leads to more sex, which increases the risk of pregnancy. In addition, spending a lot of time together is associated with less perfect use of contraception, which increases pregnancy risk. Taken together, sexual and contraceptive behavior explain approximately 23% of the magnitude.

Models 5 through 8 focus on *cumulative* measures of time spent together. Recall that these models focus on the young woman's entire relationship history, not only on her current relationship.[1] These measures indicate the characteristics of relationships that the young women have experienced overall. Consistent with our hypothesis, young women who have spent more of their time in time-intensive relationships have a higher pregnancy risk than young women who have spent less of their time in such time-intensive relationships. Note, however, that the majority of this effect is explained by sexual and contraceptive behavior – young women who spend a lot of time in time-intensive relationships have more frequent sexual intercourse and have lower contraceptive rates. Sex and contraception explain 64% of this effect.

[1] A next step for the current manuscript is to examine young women's history within the current relationship – i.e., the current relationship history.

Models 9 through 12 include both the current and cumulative measures of relationship characteristics. Note that the current measures completely explain the cumulative measures – when included in the same model, the effect of the proportion of weeks spent in a time-intensive relationship becomes essentially zero. This indicates that the reason young women with a history of time-intensive relationships have higher pregnancy rates is because they later tend to enter more time-intensive relationships, which in turn have increased pregnancy risk.

Panel B focuses on exclusivity – the extent to which the young woman and her partner have agreed to have a special romantic relationship with each other and no one else. The story here is similar to that of time spent together. Exclusive relationships are associated with a higher pregnancy risk during the week in which the exclusivity occurred. This is explained, in part, by sexual behavior – exclusive relationships have higher sexual frequency, which in turn elevates pregnancy risk. Exclusive relationships, however, do not differ in terms of contraceptive behavior, and thus contraception does not explain the association between exclusive relationships and elevated pregnancy risk. The young woman's history of exclusive relationships is also associated with increased pregnancy risk, but this is largely explained by sexual behavior and contraception. And, finally, being exclusive with the current partner is associated with increased pregnancy risk net of the young woman's prior history of exclusive relationships, but that prior history is not associated with increased pregnancy risk net of the current relationship.

Panel C focuses on cohabitation – whether the young woman lives with her partner. Note that this characteristic of the relationship is not associated with pregnancy risk in these models. However, the bivariate relationship between cohabitation and pregnancy *is* statistically significant, with cohabitors experiencing higher pregnancy rates than non-cohabitors (not shown in tables). Once we include the baseline sociodemographic characteristics and prior sexual, contraceptive, and pregnancy experiences, this effect is no longer statistically significant, indicating that the reason cohabitors in this sample have higher pregnancy risk is because they tend not to be enrolled in school, to come from a one-parent family, to have earlier sexual debut, and to have experienced prior pregnancies before age 18.

Panel D focuses on concurrency. Independently, neither concurrency with the current partner nor in the young woman's history predicts her risk of pregnancy. However, when both measures are included in the same model, history of concurrent partners is associated with

increased risk of pregnancy.[2] Very little of this effect is explained by sexual behavior, but a large part of it is explained by contraceptive behavior. Women who experienced concurrency (either her own or her partner's sex with another partner) have higher pregnancy risk in part because they are less effective users of contraception.

Table 3 investigates change and instability in relationships. Note that these results are quite preliminary, and represent our first attempt at coding these types of measures. We plan to further test and refine these measures. However, these preliminary models indicate that instability and change, particularly in living arrangements, are strong predictors of pregnancy. Recall that neither living with a partner in a particular week, nor a history of living with a partner is strongly related to the risk of pregnancy (net of socioeconomic and other background controls). However, changes in living arrangements – operationalized here as the proportion of weeks observed where there is change from the prior week – do predict pregnancy. This effect is mainly via changes in sexual behavior, and is explained somewhat by contraceptive use, as well. In other words, young women who move in with and away from their partners more frequently are more sexually active, and are also less effective contraceptive users, relative to young women who *either* remain living with or apart from their partner continuously. Changes in concurrency are also related to an increased risk of pregnancy. This effect, however, is largely explained by contraceptive use and less so by sexual activity.

DISCUSSION

In sum, we find that measures of the seriousness of young women's relationships are strong predictors of their risk of pregnancy. Time-intensive and exclusive relationships are particularly likely to produce pregnancies. Further, this effect does not appear to be due to the types of young women who enter these relationships – current involvement in a time-intensive or exclusive relationship increases pregnancy risk *net of* prior experiences with these types of relationships. These types of relationships appear to mainly increase pregnancy risk via increased sexual activity, and less so via contraceptive behavior. Finally, changes and instability in living arrangements are associated with increased risk of pregnancy, as well. We plan to continue investigating these effects through refined measurement and modeling.

[2] We are investigating the reason for the increase in magnitude of this effect once current concurrency is accounted for.

REFERENCES

Anderson, E. (1999). Code of the street: Decency, violence, and the moral life of the inner city. New York: Norton.

Alexander, J.C. (1988). *Action and Its Environment: Toward a New Synthesis*. New York: Columbia University Press.

Axinn, W.G., Barber, J.S., and Thornton, A. (1998). "The Long-Term Impact of Parents' Childbearing Decisions on Children's Self-Esteem." *Demography,* 35(4): 435-443.

Barber, J.S. (2001). "Ideational Influences on the Transition to Parenthood: Attitudes Toward Childbearing and Competing Alternatives." *Social Psychology Quarterly,* 64(2): 101-127.

Barber, J.S., Axinn, W.G., and Thornton, A. (1999). "Unwanted Childbearing, Health and Mother-Child Relationships." *Journal of Health and Social Behavior,* 40(3): 231-257.

Baydar, N. (1995). "Consequences for Children of their Birth Planning Status." *Family Planning Perspectives,* 27: 228-234+245.

Bearman, P.S., Moody, J., and Stovel, K. (2004). "Chains of Affection: The Structure of Adolescent Romantic and Sexual Networks." *American Journal of Sociology,* 110(1): 44-91.

Billy, J.O.G., Brewster, K.L., and Grady, W.R. (1994). "Contextual Effects on the Sexual Behavior of Adolescent Women." *Journal of Marriage and the Family,* 56(2): 387-404.

Brewster, K.L. (1994a). "Neighborhood Context and the Transition to Sexual Activity Among Young Black Women." *Demography,* 31(4): 603-614.

Brewster, K.L. (1994b). "Race Differences in Sexual Activity Among Adolescent Women: The Role of Neighborhood Characteristics." *American Sociological Review,* 59: 408-424.

Brown, S.S., and Eisenberg, L. (1995). "Demography of Unintended Pregnancy." In *The Best Intentions: Unintended Pregnancy and the Well-Being of Children and Families.* Washington, DC: National Academy Press, pp. 21-49.

Brown, B.B., Feiring, C., and Furman, W. (1999). "Missing the Love Boat: Why Researchers Have Shied Away form Adolescent Romance." In W. Furman, B.B. Brown, and C. Feiring (eds.), *The Development of Romantic Relationships in Adolescence*. New York: Cambridge University Press, pp. 1-16.

Bruckner, H., and Bearman, P. (2003). "Dating Behavior and Sexual Activity Among Young Adolescents." In B. Albert, S. Brown, and C.M. Flanigan (eds.), *14 and Younger: The Sexual Behavior of Young Adolescents*. Washington, DC: Campaign to Prevent Teen Pregnancy, pp. 31-56.

Carver, K., Joyner, K., and Udry, J.R. (2003). "National Estimates of Adolescent Romantic Relationships." In P. Florsheim (ed.), *Adolescent Romantic Relations and Sexual Behavior: Theory, Research, and Practical Implications*. Mahwah, NJ: Lawrence Erlbaum, pp. 23-56.

Chandra, A., Martinez, G.M., Mosher, W.D., Abma, J.C., and Jones, J. (2005). "Fertility, Family Planning, and Reproductive Health of U.S. Women: Data from the 2002 National Survey of Family Growth." National Center for Health Statistics, *Vital Health Stat,* 23(25).

Crane, J. (1991). "The Epidemic Theory of Ghettos and Neighborhood Effects on Dropping Out and Teenage Childbearing." *American Journal of Sociology,* 96: 1226-1259.

Edin, K., and Kefalas, M. (2005). *Promises I Can Keep*. Berkeley, CA: University of California Press.

Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Evanston, IL: Row-Peterson.

Grady, W. R., Klepinger, D. H., and Billy, J.O.G. (1993). "The Influence of Community Characteristics on the Practice of Effective Contraception." *Family Planning Perspectives,* 25(1): 4-11.

Groves, R.M., Biemer, P.P., Lyberg, L.E., Massey, J.T., Nicholls, W.L., and Waksberg, J. (eds.). (2001). *Telephone Survey Methodology*. New York: John Wiley.

Halpern, C.T., Udry, J.R. and Suchindran, C. (1994). "Effects of Repeated Questionnaire Administration in Longitudinal Studies of Adolescent Males' Sexual Behavior." *Archives of Sexual Behavior*, 23(1): 41-57.

Jaccard, J., McDonald, R., Wan, C.K., Guilamo-Ramos, V., Dittus, P.J., and Quinlan, S. (2004). "Recalling Sexual Partners: The Accuracy of Self-Reports." *Journal of Health Psychology*, 9(6): 699-712.

Jencks, C., and Mayer, S. (1990). "The Social Consequences of Growing Up in a Poor Neighborhood." In L. Lynn, Jr. and M. McGeary (eds.), *Inner-City Poverty in the United States*. Washington, D.C.: National Academy of Sciences Press.

Lloyd, K.M., and South, S.J. (1996). "Contextual Influences on Young Men's Transition to Marriage." *Social Forces*, 74: 1097-1119.

Miller, W.B. (1973). "Psychological Vulnerability to Unwanted Pregnancy." *Family Planning Perspectives* 5(4): 199-201.

Schoen, R., Astone, N.M., Kim, Y.J., Nathanson, C.A., and Fields, J.M. (1999). "Do Fertility Intentions Affect Fertility Behavior?" *Journal of Marriage and the Family*, 61(3): 790-799.

Schwarz, N., and Sudman, S. (eds.). (1994). *Autobiographical Memory and the Validity of Retrospective Reports*. New York: Springer Verlag.

Searles, J.S., Perrine, M.W., Mundt, J.C., and Helzer, J.E. (1995). "Self-Report of Drinking Using Touch-Tone Telephone: Extending the Limits of Reliable Daily Contact." *Journal of Studies on Alcohol*, 56(4): 375-382.

Smith, H. (1989). "Integrating Theory and Research on the Institutional Determinants of Fertility." *Demography*, 26: 171-184.

South, S.J., and Crowder, K.D. (1999). "Neighborhood Effects on Family Formation: Concentrated Poverty and Beyond." *American Sociological Review*, 64(1): 113-132.

South, S.J., and Crowder, K.D. (2000). "The Declining Significance of Neighborhoods? Marital Transitions in Community Context." *Social Forces*, 78(3): 1067-1099.

Sucoff, C.A., and Upchurch, D.M. (1998). "Neighborhood Context and the Risk of Childbearing Among Metropolitan-Area Black Adolescents." *American Sociological Review*, 63(4): 571-585.

Sudman, S., Bradburn, N.M., and Schwarz, N. (1996). *Thinking about Answers: The Application of Cognitive Processes to Survey Methodology*. San Francisco, CA: Jossey-Bass.

Udry, J.R., and Bearman, P.S. (1998). "New Methods for New Research on Adolescent Sexual Behavior." In R. Jessor (ed.), *New Perspectives on Adolescent Risk Behavior*. Cambridge: Cambridge University Press, pp. 241-269.

U.S. Department of Health and Human Services. (1990) *Healthy People 2000*. Healthy People 2000: National Health Promotion and Disease Prevention Objectives. Washington, DC: U.S. Government Printing Office, September 1990.

U.S. Department of Health and Human Services. *Healthy People 2010*. (2000) 2nd ed. With Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office, November 2000.

Williams, L., Abma, J., and Piccinino, L.J. (1999). "The Correspondence Between Intention to Avoid Childbearing and Subsequent Fertility: A Prospective Analysis." *Family Planning Perspectives*, 31(5): 220-227.

Table 1. Descriptive Statistics of Measures Used in the Analyses

	Mean	Std. Dev.	Minimum	Maximum
Pregnancy (N=844 individuals)	0.12		0	1
Relationship Measures (N=29,936 observations) †				
Current				
Spent a lot of time with a partner during past week	0.42		0	1
Relationship exclusive during past week	0.52		0	1
Lived with a partner during past week	0.12		0	1
Self or partner had multiple sex partners during past week	0.03		0	1
Cumulative				
Proportion of weeks spent a lot of time with a partner	0.42	0.37	0.00	1.00
Proportion of weeks relationship was exclusive	0.53	0.42	0.00	1.00
Proportion of weeks lived with a partner	0.11	0.27	0.00	1.00
Proportion of weeks self/partner had multiple partners	0.03	0.10	0.00	1.00
Change				
Proportion of changes in time spent	0.16	0.18	0.00	1.00
Proportion of changes in exclusivity	0.07	0.12	0.00	1.00
Proportion of changes in cohabitation	0.02	0.07	0.00	1.00
Proportion of changes in concurrency	0.04	0.11	0.00	1.00
Mediating Measures (N=29,936 observations)				
Had sex during past week	0.32		0.00	1.00
Perfect birth control during past week	0.51		0.00	1.00
Baseline Control Measures (N=844 individuals)				
Sociodemographic Characteristics				
Age				
18 years old	0.42		0	1
19 years old	0.50		0	1
20 years old	0.08		0	1
African American	0.33		0	1
School enrollment and type				
Dropped out of high school	0.08		0	1
Not enrolled (graduated from high school)	0.21		0	1
High school	0.14		0	1
2 year college/vocational/technical/other	0.29		0	1
4 year college	0.29		0	1
Receiving public assistance	0.23		0	1
Religious importance	2.69	0.92	1	4
Living with romantic partner	0.14		0	1
Biological mother less than 20 years old at first birth	0.35		0	1
Family structure				
Biological parents/biological and step parent	0.54		0	1
One biological parent only	0.38		0	1
Other	0.08		0	1
Mother's education less than high school graduate	0.08			
Parent's income				

$14,999 or less	0.14		0	1
$15,000 or greater	0.67		0	1
Don’t know/Refused	0.19		0	1
Sexual, Contraceptive, and Pregnancy Experiences				
Age at first sex				
14 years or less	0.15		0	1
15-16 years	0.35		0	1
17 years or greater/never had sex	0.50		0	1
Lifetime number of sexual partners	3.25	4.90	0	57
Ever had sex without birth control	0.45		0	1
Prior pregnancies				
0 prior pregnancies	0.79		0	1
1 prior pregnancy	0.14		0	1
2 or more prior pregnancies	0.07		0	1

† N for change measures is N=821 individuals and 29,092 observations.

Table 2. Logistic Regression Estimates (Coefficients) of Effects of Relationship Measures (Current and Cumulative) on Hazard of Pregnancy, net of Controls (N=844 individuals, 29,936 observations)

	Current Relationship Characteristics				Cumulative Relationship Characteristics				Current and Cumulative Relationship Characteristics			
	Overall	Net of Sex	Net of Cont.	Net of Sex and Cont.	Overall	Net of Sex	Net of Cont.	Net of Sex and Cont.	Overall	Net of Sex	Net of Cont.	Net of Sex and Cont.
	1	2	3	4	5	6	7	8	9	10	11	12
PANEL A. Time Spent Together												
Spent a lot of time with a partner during week	.92 **	.64 *	.72 *	.71 *					.94 **	.70 *	.76 *	.75 *
	(.33)	(.34)	(.33)	(.34)					(.37)	(.37)	(.37)	(.37)
Proportion of weeks spent a lot of time with a partner					.83 **	.24	.35	.30	-.05	-.15	-.11	-.12
					(.34)	(.40)	(.40)	(.40)	(.44)	(.44)	(.45)	(.45)
PANEL B. Exclusivity												
Relationship exclusive during week	1.19 *	1.06 *	1.18 *	1.14 *					1.19 *	1.08 *	1.12 *	1.09 *
	(.52)	(.52)	(.52)	(.52)					(.57)	(.57)	(.57)	(.57)
Proportion of weeks relationship exclusive					.85 **	.44	.63	.59	.02	-.05	.13	.11
					(.34)	(.41)	(.42)	(.42)	(.47)	(.47)	(.48)	(.48)
PANEL C. Cohabiting												
Lived with a partner during week	.44	.31	.25	.24					.25	.09	.23	.19
	(.28)	(.27)	(.28)	(.28)					(.44)	(.44)	(.44)	(.44)
Proportion of weeks lived with a partner					.84 *	.55	.33	.33	.39	.45	.08	.11
					(.41)	(.40)	(.40)	(.40)	(.64)	(.63)	(.63)	(.63)
PANEL D. Concurrency												
Self/partner had multiple partners during week	-.22	-.24	-.51	-.36					-.87	-.83	-.88	-.74
	(.47)	(.48)	(.48)	(.48)					(.61)	(.61)	(.61)	(.61)
Proportion of weeks self/partner had multiple partners					.78	.56	.07	.17	1.36 *	1.23 *	.78	.76
					(.55)	(.56)	(.58)	(.58)	(.71)	(.72)	(.74)	(.74)

Coefficients are effects on log-odds. Standard errors in parentheses.
All models control for baseline sociodemographic characteristics and prior sexual, contraceptive, and pregnancy experiences.
* p < 0.05; ** p < 0.01; *** p < 0.001 (one-tailed tests)

Table 3. Logistic Regression Estimates (Coefficients) of Effects of Relationship Measures (Change) on Hazard of Pregnancy, net of Controls (N=821 individuals, 29,092 observations)

	Overall Effect	Effect Net of Sex	Effect Net of Cont.	Effect Net of Sex & Cont.
Proportion of weeks w/ change in time spent together	-0.48	-0.49	-0.68	-0.66
	(0.54)	(0.54)	(0.56)	(0.55)
Proportion of weeks w/ changes in exclusivity	-0.22	-0.09	-0.26	-0.23
	(0.66)	(0.66)	(0.70)	(0.69)
Proportion of weeks w/ changes in cohabitation status	1.45 *	1.16	1.33 *	1.32 *
	(0.68)	(0.71)	(0.75)	(0.75)
Proportion of weeks w/ changes in concurrency	1.07 *	0.96 *	0.71	0.77
	(0.57)	(0.58)	(0.61)	(0.61)

Coefficients are effects on log-odds. Standard errors in parentheses.

All models control for baselinesociodemographic characteristics and prior sexual, contraceptive, and pregnancy experiences.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (one-tailed tests)

Appendix Table A1. Logistic Regression Estimates (Coefficients) of Effects of Baseline Control and Mediating Measures on Hazard of Pregnancy (N=844 individuals, 29,936 observations)

	Overall Effect	Effect Net of Sex	Effect Net of Perfect BC	Effect Net of Sex & Perfect BC
Mediating Measures				
Sex		1.15 ***		1.87 ***
		(0.23)		(0.25)
Perfect birth control			-1.00 ***	-1.68 ***
			(0.23)	(0.29)
Sociodemographic Characteristics				
Age				
18 years old	ref	ref	ref	ref
19 years old	0.09	0.15	0.07	0.13
	(0.23)	(0.23)	(0.23)	(0.23)
20 years old	-1.04 *	-0.92	-0.88	-0.70
	(0.61)	(0.61)	(0.61)	(0.61)
African American	0.17	0.30	0.11	0.22
	(0.28)	(0.28)	(0.28)	(0.28)
School enrollment and type				
Dropped out of high school	-0.15	-0.09	-0.27	-0.29
	(0.47)	(0.47)	(0.47)	(0.48)
Not enrolled (graduated from high school)	0.67 *	0.65 *	0.49	0.35
	(0.34)	(0.33)	(0.34)	(0.35)
Enrolled in high school	0.49	0.49	0.42	0.33
	(0.39)	(0.39)	(0.39)	(0.39)
Enrolled in 2 year college/vocational/technical/other	-0.25	-0.25	-0.31	-0.37
	(0.35)	(0.35)	(0.35)	(0.35)
Enrolled in 4 year college	ref	ref	ref	ref
Receiving public assistance	0.14	0.15	0.12	0.24
	(0.26)	(0.27)	(0.26)	(0.26)
Religious importance	-0.06	-0.04	-0.03	0.00
	(0.13)	(0.13)	(0.13)	(0.13)
Living with romantic partner	0.62 **	0.41	0.74 **	0.32
	(0.25)	(0.26)	(0.26)	(0.26)
Biological mother less than 20 years old at first birth	0.49 *	0.49 *	0.53 **	0.48 *
	(0.22)	(0.22)	(0.23)	(0.22)
Family structure				
Biological parents/biological and step-parent	ref	ref	ref	ref
One biological parent only	0.53 *	0.55 *	0.52 *	0.56 *
	(0.25)	(0.24)	(0.25)	(0.24)
Other	0.27	0.23	0.32	0.38
	(0.37)	(0.38)	(0.37)	(0.37)
Mother's education less than high school graduate	-0.13	-0.05	-0.13	-0.01
	(0.36)	(0.36)	(0.36)	(0.36)
Parent's income				
$14,999 or less	0.29	0.23	0.28	0.19
	(0.29)	(0.29)	(0.29)	(0.29)

$15,000 or greater				
Don't know/refused	-0.02	0.09	-0.10	0.05
	(0.28)	(0.28)	(0.28)	(0.28)
Sexual, Contraceptive, and Pregnancy Experiences				
Age at first sex				
14 years or less	0.84 *	0.71 *	0.85 *	0.70 *
	(0.37)	(0.36)	(0.37)	(0.36)
15-16 years	1.05 ***	0.97 ***	1.11 ***	1.00 ***
	(0.31)	(0.30)	(0.31)	(0.30)
17 years or greater/never had sex	ref	ref	ref	ref
Lifetime number of sexual partners	0.02	0.02	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.02)
Ever had sex without birth control	0.39	0.28	0.41	0.18
	(0.28)	(0.27)	(0.28)	(0.27)
Prior pregnancies				
0 prior pregnancies	ref	ref	ref	ref
1 prior pregnancies	0.79 **	0.79 **	0.80 **	0.71 **
	(0.29)	(0.28)	(0.29)	(0.28)
2 or more prior pregnancies	1.12 ***	1.20 ***	1.04 ***	1.12 ***
	(0.34)	(0.34)	(0.34)	(0.34)
Baseline Hazard Controls				
# weeks in journal	-0.02	-0.01	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)
(# weeks in journal)^2	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Intercept	-7.31 ***	-8.03 ***	-6.83 ***	-7.77 ***
	(0.55)	(0.59)	(0.56)	(0.60)
X^2	167.42 ***	194.47 ***	188.49 ***	234.00 ***
Log-likelihood	-586.29	-572.76	-575.75	-553.00

Coefficients are effects on log-odds. Standard errors in parentheses.

* p < 0.05; ** p < 0.01; *** p < 0.001 (one-tailed tests)

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