Waiting to Have Sex: The Timing of First Sexual Intercourse within Young People's Relationships

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ABSTRACT

This study examines the timing of first sexual intercourse within adolescent partnerships, which has important consequences for health and development outcomes. Using life history calendar data from a sample of Kenyan youth, we examine the effects of relationship characteristics on the timing of first sexual intercourse within partnerships. We also distinguish between transitions to first sex with and without consistent condom use because of their implications for reproductive health. We examine not only the transition to first sexual intercourse within first relationships but repeated transitions across youth's multiple partnerships. Preliminary analysis finds that young people decrease the delay to sexual intercourse after they have accumulated experience within previous relationships, leading to event dependence across multiple partnerships. We also find that risk factors operate in opposing directions by gender; stronger commitment to relationships accelerates the timing of first sex for young women while it delays it for young men.

INTRODUCTION

Researchers have a long-standing interest in understanding what factors are related to adolescent sexual activity (Menning, Holtzman, and Kapinus 2007). The timing of first sexual intercourse has attracted attention because of its association with adolescents' transition to adulthood (Hogan and Astone 1986), including trajectories of marriage and childbearing in particular (Miller and Heaton 1991). Much of the previous research employs a life course approach to examine the context of the transition to first sexual intercourse, including the influence of family background (e.g., Crockett et al. 1996; McNeely et al. 2002; Upchurch et al. 1999 and 2001), schooling experience (e.g., Bearman and Bruckner 2001), and neighborhood context (e.g., Browning, Leventhal, and Brooks-Gunn 2004 and 2005; Brewster, Billy, and Grady 1993; Upchurch et al. 1999 and 2001). This body of literature largely ignores the relationship context, however, although the relationship is where sexual behavior is negotiated and enacted (Cleveland 2003, Luke et al. 2009a; Giordano 2003; Harrison, Cleland, and Frohlich 2008; Manlove, Ryan, and Franzetta 2007). We focus on two aspects of the relationship context. First, a bargaining power perspective views sexual activity, like other decisions negotiated between couples, as dependent not only on the characteristics of two individuals in the match but also on power differentials between them. This perspective focuses on differential access to social and economic resources between partners, where the partner with greater access has greater power to determine sexual intercourse. Second, the nature of the relationship in terms of levels of commitment and emotional attachment form the context of expectations surrounding sexual activity, including the onset of sexual intercourse.

In addition to context, a life course approach also takes the timing of events into account in the transition to first sex (Manlove et al. 2007). While much of the previous research examines the timing of sexual debut within an individual's lifetime, a focus on the relationship-level highlights how the transition to sexual intercourse occurs repeatedly across individuals' multiple partnerships. An emerging body of research finds that the *timing of first sexual intercourse within partnerships* is related to important reproductive health behaviors and outcomes. Shorter duration between the start of a relationship and unprotected first sexual intercourse can accelerate the transmission of STDs across sequential sexual partnerships (Kraut-Becher and Aral 2003) and has been associated with sexual abuse and teenage pregnancy (Roosa et al. 1997). On the other hand, delaying first sexual intercourse within relationships may provide the opportunity for adolescents to be mentally and emotionally prepared for and make informed choices about sexual intercourse (Ryan et al. 2007; Smith and Udry 1985; Upadhyay, Hindin, and Gultiano 2006), and has been linked to increased consistency of contraceptive use (Manlove, Ryan, and Franzetta 2003). With respect to timing, a life course approach also recognizes that early life experiences affect later behavior and outcomes (Elder et al. 2003, Elder 1994). Experience of sexual activity in early relationships may affect the timing of sexual intercourse in later relationships, which not only has substantive importance for health outcomes, but such "event dependence" has implications for modeling the timing to first sex within multiple sequential and concurrent partnerships.

Finally, much of the previous literature on the timing of first sexual intercourse either within partnerships or within individuals' lifetimes is concerned with adolescents in developed countries, especially in the United States. It is unclear whether the associations found in this

body of work are applicable to developing countries, where the nature and sequence of life course transitions vary greatly. Adolescent sexual activity is of particular concern in settings such as sub-Sahara Africa, where this young population is severely affected by poor sexual and reproductive health outcomes, including HIV/AIDS and other STDs as well as early pregnancy and abortion. Furthermore, given that access to resources and motivations for relationships differ for young males and females, differences in the timing and determinants of sexual intercourse within partnerships by gender is also an important area of study.

This paper seeks to contribute to the research on adolescent sexual behavior by examining the potential influence of the relationship context and previous sexual relationship experience on the timing of sexual initiation within partnerships for adolescent males and females. We analyze data collected with the Relationship History Calendar (RHC) from a random sample of young men and women aged 18-24 in urban Kisumu, Kenya. The RHC records detailed retrospective information on the relationship histories of youth, including time-varying partner and partnership characteristics, for relationships up to 10 years before the survey. We chose to conduct our research in Kisumu, the headquarters of Nyanza Province in Western Kenya, as it is the epicenter of a mature HIV/AIDS epidemic in the region. HIV prevalence in the Province was estimated at 15.3% in 2007, more than double the national rate (Kenya AIDS Indicator Survey 2008), and young people are among the most severely affected (Glynn et al. 2001). In addition, other sexually transmitted infections (STIs), particularly herpes (HSV-2) and Chlamydia, are common among adolescents and young adults in Kisumu (Buvé et al. 2001; Weiss et al. 2001).

The analysis has three main parts. First, we describe general patterns of the timing of first intercourse within partnerships for young males and females by the sequence of their relationship episodes and relationship types. Second, we explore the associations between individual, partner, and relationship-level variables and the timing to first sexual intercourse within and across multiple partnerships using extended Cox regression. Third, we distinguish between within-partnership transitions to first sexual intercourse with and without consistent condom use because of their different implications for prevention of STDs and teenage pregnancy. This extended abstract describes the data and methods for each of these analyses, and preliminary results of the first descriptive analysis are included.

CONCEPTUAL FRAMEWORK

Our conceptual framework builds on the idea that the progression to sexual intercourse within partnerships is not solely determined by one individual but stems from the interaction of both partners' characteristics, expectations, and bargaining power between them.

Commitment within Partnerships

Level of commitment to a relationship or degree of closeness between two partners has been associated with adolescent sexual debut in previous research. A higher the level of commitment to a relationship may raise adolescents' expectation for rapid progression through the sequence of emotional development, which may in turn shorten the time period before first sexual

intercourse (Upadhyay, Hindin, and Gultiano 2006). Using Add Health data, Bearman and Brückner (2001) found that current involvement in a romantic relationship and emotional commitment were both related to an increased likelihood of initiating sexual intercourse in an adolescent' s lifetime. Using the same data source but limiting the sample to adolescents aged 14-15 years, McNeely and colleagues (2002) found a significant association between recent (in the last 18 months) romantic relationships and initiating sexual intercourse for males, but not for females. With respect to sub-Saharan Africa, Gueye, Castle, and Konaté (2001) reported that female adolescents in rural Mali tended to have sex earlier than they would have liked because of a marital duty or the promise of marriage, while in urban areas, those who expressed that they were in love with their partners had sex earlier. These findings lead us to hypothesize that a higher level of commitment within a partnership—characterized by serious types of relationships, feelings of love, and marital aspirations—will be associated with earlier timing of intercourse within the partnership.

The dyadic nature of a relationship implies that not only an adolescent's but also his or her partner's commitment matters regarding their progression to sexual intercourse. For example, partner's infidelity may increase an adolescent's perception of elevated risk of STDs infection (Norris and Ford 1999) and change his or her commitment to the relationship, thus leading to changes in sexual behaviors with the partner accordingly (Brady et al. 2009). We hypothesize that partner's infidelity will be associated with postponed progression to sexual intercourse.

Bargaining Power within Partnerships

The two people involved in a relationship do not exert equal influence on the occurrence of sexual intercourse. Following the sociological and economics literature on bargaining power (Malhotra and Mather 1997; Agarwal, 1997; McElroy, 1990; Kabeer, 1997; Luke et al. 2009b), the individual with access to greater resources will have more power to make important decisions, including when to initiate sex. The underlying assumption in most studies of adolescent sexual behavior, including sub-Saharan Africa, is that males prefer to have sexual intercourse earlier, while females desire not to have sex or delay its initiation, given the greater consequences for them stemming from unintended pregnancy (Luke 2006). Thus, if males possess greater resources and power relative to their female partners, this will result in initiating sex earlier, and females with access to greater resources will delay the timing of first intercourse within partnerships.

In studies of adolescent sexual behavior, bargaining power has largely been measured by age differences between partners, where older partners are seen to exert more power within partnerships (Abma, Driscoll, and Moore 1998, Luke 2003, Kaestle et al. 2002). Using the Add Health data, Kaestle and colleagues (2002) found that adolescent females with an older partner faced a higher risk of having sexual intercourse with that partner, compared to females with same-age partners; however, the magnitude of this association declined as the young females grew older. In rural Uganda, Kelley et al. (2003) found increased risk of HIV infection among young females ages 15-24 with a primary partners 10 or more years older compared to those with partners up to 4 years older. In rural Zimbabwe, both males and females aged 17-24 were at increased risk of HIV infection the older the male partner in comparison to the female (Gregson

et al. 2002). Thus, we hypothesize that older partners will be associated with earlier initiation of sexual intercourse within the relationship for male and female adolescents.

In the context of sub-Saharan Africa, the exchange of money and gifts within relationships (often referred to as "transactional sex") has been identified as another source of relationship asymmetry and power differentials (Luke 2003, Luke et al. 2009b). Transactional sex is prevalent in both urban and rural settings, and large amounts of money and gifts (what we refer to as "transfers") are given by males to their female partners; to a lesser extent, females also give transfers to males (Dunkle et al. 2007; Luke 2003, 2006; Moore, Biddlecom, & Zulu, 2007). Numerous qualitative studies have described the complexity of transactional sex in Africa, where the motivations and meanings vary for individuals involved. For some, engaging in transactional sex may be a calculated strategy to gain "income" to pay school fees or secure the survival of their families. Others, particularly young women, desire money or gifts of simple luxuries, such as lotion, clothes, or jewelry, from male partners to help them look modern and boost status among their peers (Kaufman & Stavrou, 2002; Leclerc-Madlala, 2008; Luke 2003). Whatever the motivation, transactional sex is assumed to disempower the receiver, and studies have found associations between receiving transfers and HIV infection in South Africa (Dunkle et al. 2004) and increased sexual activity and decreased condom use in Kenya (Luke 2006, Luke et al. 2009b). We test the hypotheses that receiving money and gifts and in larger amounts leads to more rapid progression to sexual intercourse within the partnership for both young males and females. In addition, being motivated to be in the relationship because of money and gifts would also accelerate the progression to first intercourse (Gueye, Castle, and Konaté 2001, Luke et al. 2009b). Finally, we also measure bargaining power by the partner's economic status, with wealthier partners having greater power to initiate sexual intercourse.

Other Partner and Partnership Factors

Other partnership characteristics may have an impact on the timing of first sexual intercourse. Geographic distance between the two partners increases travel costs and may result in less time together (Harrison, Cleland, and Frohlich 2008) and hence delay the occurrence of first sexual intercourse. The desire to have sex as well as physical attraction reduce the waiting time for first intercourse within adolescent relationships (Cleveland 2003, Cohen and Shotland 1996). Therefore, we hypothesize that engaging in a relationship due to physical attraction and the desire for sex will decrease the time to first intercourse, while geographic separation of partners will reduce it.

Individual Factors

Several categories of individual characteristics are included in the analyses. With respect to socioeconomic status, school enrollment has been identified as protective for adolescents against sexual risk (Lloyd and Hewett 2003; Hallman and Grant 2004). In addition, employment status can increase young people's financial independence, another protective factor against sexual risk (Hallman and Grant 2004), and may increase their bargaining power within relationships even if they receive money or gifts from partners, resulting in possibly delayed first intercourse (Luke et

al. 2009b). Adolescents' migration experience may encourage them to expand their sexual and romantic networks (Harrison et al. 2008), leading to potentially early sexual intercourse. Finally, adolescents' sexual history can affect behavior in later partnerships. Having multiple partners is associated with an increased likelihood of sexual debut (Bearman and Brückner 2001), and this may also be the case for the timing of intercourse within relationships. Adolescents who are sexually experienced view sexual activity more positively (Menning, Holtzman, and Kapinus 2007) and hence may initial sex earlier.

Gender Difference in Risk Factors

Young men and women are likely to differ in their expectations and bargaining power with respect to relationships (Cohen and Shotland 1996; Rosengard et al. 2004). For example, men and women may differ in their attitudes and desire toward premarital sex (McCabe 1987; McCabe and Collins 1984, Gueye, Castle, and Konaté 2001) and the types of relationships they enter into, and hence levels of commitment within them (Roche and Ramsbey 1993). In the context of sub-Sahara Africa, women are more likely than men to receive money and gifts in their relationships, which affects their bargaining power to a greater extent than among young men (Luke 2003 and 2006). Each of these factors may affect young males' and females' preferences for initiating or delaying sexual intercourse within a partnership. We will consequently examine the influence of individual and relationship-level factors on the timing of first sex within partnerships by gender.

DATA AND METHODS

The Relationship History Calendar Data

We utilize a unique data set to examine the timing of sexual intercourse across adolescents' multiple relationships. The overall study aimed to assess the quality of data collected with the Relationship History Calendar (RHC), a new method to gather detailed, retrospective information on young people's relationships. We used an experimental design in which a random sample of 1275 youth ages 18-24 residing in Kisumu town were randomly assigned the RHC or a standard survey instrument. A detailed description of the study's methods is presented elsewhere (Luke et al. 2009a). The overall response rate for the study was 94.9 percent, with no significant differences by sex of the respondent and instrument type.

The RHC is a life history calendar designed to collect contextualized and time-varying information on important life course domains that are particularly significant for the transition to adulthood (see Axinn & Pearce, 2006; Freedman, Thornton, Camburn, Alwin, & Young-DeMarco, 1988; Luke et al., 2009a for fuller details regarding life history calendar methods). In a time line format, the RHC records details of respondents' schooling, employment, residence, and relationships histories by month for 10 years previous to the survey. The calendar collects information on not only sexual relationships but those that are non-sexual. Non-sexual relationships are ignored in most surveys in sub-Saharan Africa, although these relationships may be particularly prevalent among young people (Bankole et al. 2007). Furthermore,

including these relationships is essential to obtain unbiased estimates of the transition to first sex within relationships.

On the RHC, partner characteristics are elicited for each relationship, including partner's age, year in school, economic status, and residence for each month of each relationship. In addition, relationship dimensions are also recorded by month, including type, reasons for entering and continuing in the relationship, marital aspirations, and exchanges of money and gifts between partners. Finally, the calendar elicits information on coital frequency and consistency of condom use for each month of each relationship.

Because of the long reference period and the sensitive topic of sexual behavior, we were particularly concerned with the quality of data produced with the RHC. Previous studies have found that life history calendars increase respondent recall and data reliability by aiding respondents to accurately report the occurrence and timing of past events (Belli, Shay, & Stafford 2001; Freedman et al. 1988). Events that are more easily remembered (like weddings, residential moves, and schooling transitions) provide important reference points for the timing of less salient events (Freedman et al., 1988). In addition, the structure and interview procedure of life history calendars draw on qualitative techniques. Calendar interviews are flexible and conversational in nature, with the order of questions left up to trained interviewers (Axinn & Pearce, 2006; Belli et al., 2001). This procedure increases rapport and respondent enjoyment (Freedman et al., 1988), which are particularly beneficial to ensuring truthful reporting of sensitive sexual behavior. In our assessment of the quality of data collected with the RHC compared to the standard survey instrument, we found that the RHC produced improved reporting on multiple measures of sexual behavior compared to the standard survey instrument (Luke et al., 2009a).

The full sample included 1275 respondents; this analysis uses data from the 608 male and female RHC respondents, of which we exclude 18 adolescents (3 percent) who had not established a sexual or non-sexual relationship in the last 10 years.

Dependent Variable

A relationship episode is defined as an uninterrupted sequence of months in which a respondent had a specific partner. A new relationship episode began each time a partner change occurred, even if the partner had been identified in an earlier episode (Fortenberry et al. 2002). The dependent variable in this study is the "failure time," measured in months, from the start of a relationship to the month of first sexual intercourse with that partner within that relationship episode.

An episode was censored if sexual intercourse did not occur throughout the course of a relationship. No additional failure time was contributed by a relationship episode after the occurrence of first sexual intercourse with that partner. That is, we only analyze the failure time to first sexual intercourse within a partnership. All episodes were censored at the time of survey (i.e. June-July 2007) if they were still ongoing.

For timing to first intercourse with or without condom use, the definition of censoring varies according to different analytic strategies (see the analytic section). Nonetheless, we consider the failure time to sexual intercourse without consistent condom use to occur in the first month of sexual intercourse where a respondent reported that he or she *did not always* use condoms during sex with that partner. Similarly, we designate first sexual intercourse with consistent condom use as *always* using a condom during the first month of sexual intercourse with that partner.

Young men and women with one partner contributed one episode unless that partnership was broken and resumed, in which case, two episodes were contributed. Only 11 adolescents in our sample experienced such a scenario. During the time frame of the 10 years before the survey, a respondent could have had multiple relationships and hence contributed multiple episodes. We stratify multiple relationship episodes per individual according to the temporal order of their initiations. We limit our analysis to the first 4 episodes for each respondent, because only very few young men and women (N=60) in the sample had more than 4 episodes, and even fewer experienced sexual intercourse within those episodes.

Independent Variables

We examine the effects of individual, partner, and relationship characteristics on the timing of first sexual intercourse across partnerships. Several independent variables do not change their values over relationship months and hence are time-constant. Gender, birth place (urban or rural) and previous familiarity with the partner (knew partner well or not before the relationships began) are dichotomous variables.

Other variables changed values across months in the calendar and hence are time-varying by month. At the individual level, dichotomous variables include school enrollment, employment status, ever having migrated (rural to urban or vice versa) in the previous to current month. Age in years is measured as a continuous variable, and we include a squared term to test for nonlinearity. The cumulative number of partners to date was also coded as a continuous variable, and whether the respondent maintained a concurrent partner was coded dichotomously.

Commitment to a relationship are measured by the type of relationship (spouse or fiancé/fiancée, serious, dating, and casual or other unspecified partners), whether the partner had other marital partner(s) or non-marital partner(s), and marital aspirations (if the respondent wanted to marry the partner, yes or no). For every relationship-month, respondents' main and secondary reasons for being in the relationship were recorded. We include a dichotomous variable for whether the respondent reported "love" as a reason or not.

Bargaining power within a relationship is measured by whether the respondent received money or gifts from the partner as well as the net amount of money or gifts received (amount received minus amount given). The age difference between partners was constructed as the male partner's age minus the female partner's age and then coded as a dichotomous variable (5 years or more vs. less than 5 years) to capture nonlinearity. Partner's socioeconomic background was measured by education level (secondary school or above, and none or primary school), and economic status (wealthy versus average or poor).

We also include a dichotomous variable for whether the respondent reported "physical attraction" or "sex" as main or secondary reasons for the relationship. Geographic distance was measured by whether a partner lived in the same city or village as the respondent.

Analytic Methods

We use survival analysis, as it is appropriate for analyzing time to event in the presence of censored data. We use Kaplan-Meier (KM) estimates of survivor functions for the descriptive analysis and log-rank tests for bivariate associations. We use extended Cox regression to conduct multivariate analysis. All analyses are conducted for the three outcomes of interest (i.e. the timing of first sexual intercourse regardless of condom use or not; the timing of first intercourse with condom use; and the timing without condom use).

In the first part of the analysis, we use KM estimates to describe the general patterns of time to first intercourse by drawing survival curves and estimating median survival time. We also use KM estimates to detect potential event dependence introduced by multiple relationship episodes. Multiple relationship episodes and occurrences of first sexual intercourse within these episodes may introduce the interdependence between recurrent events that an individual experienced. Sexual or romantic experience obtained from previous relationships is likely to affect the progression to intercourse in later relationships. Ignoring this correlation can yield underestimated variances for regression coefficients and lead to inflated statistical significance and hence misleading conclusions about the effects of factors on event risk (Aalen 1992). We examine the significance of the presence of event dependence by log rank tests.

In the second part of the analysis, we explore the associations between individual, partner, and relationship-level variables and the timing to first sexual intercourse within partnerships. We adopt a conditional gap time model to accommodate the correlation between recurrent first sexual intercourse events that an individual experienced in multiple relationship episodes (Box-Steffensmeier and Jones 2004). In this model, we assume that there is a natural sequence of recurrent events and that an individual was not at risk for a later event until he or she had experienced all prior events. This implies that a respondent only became at risk of having first sexual intercourse within the *k*th relationship episode after he or she had been exposed to the risk within the *k*th-1 episode. We can estimate a conditional gap time model by extending the conventional Cox model to clustering on individuals and stratifying by event order (Box-Steffensmeier and Jones 2004).

A limitation of a conditional gap time model can be raised due to the presence of concurrent sexual partnerships in the sample. For instance, a respondent could start the first relationship and initiate a second one while still maintaining the first. In certain cases, first sexual intercourse may occur in the second relationship before it occurs in the first relationship, resulting in inconsistent definitions of risk pools and event sequences, regardless of whether we control for the presence of a concurrent partner or not. Therefore, we estimate a frailty model for recurrent events to examine the robustness of the results from the conditional gap time model. The idea of a frailty model is that some young men and women are intrinsically (due to, for example,

personality or genetics) more prone to have first sexual intercourse or to have it more quickly than others. The correlation between individuals' recurrent events can be accommodated by including a random effects term, of which the distribution is positive such as Gaussian and Gamma distributions, in the hazard (Box-Steffensmeier and Jones 2004).

In the third part of the analysis, we further distinguish the types of events as first sexual intercourse with and without consistent condom use. This is known as competing risks survival analysis, and we adopt an analytical approach that estimates separate models for the two different event types (Kleinbaum and Klein 2005). Specifically, in the analysis of failure time to first sexual intercourse without condom use, we treat intercourse with condom use as censored, in addition to the relationship episodes that ended without having had sex. Similarly, in the analysis of failure time to first sexual intercourse with condom use, we treat intercourse without condom use as censored. This competing risks approach allows us to obtain more refined estimates of how a potential factor affects a particular event occurrence, rather than an average effect regardless condom use.

An underlying assumption of this competing risks approach is that once one of the two events was experienced, the individual youth exited the risk set and was no longer at risk of experiencing the other event. However, in this study, an individual could remain at risk of experiencing, say, first sexual intercourse without condom use after he or she had experienced first sexual intercourse with condom use. As a result, the estimate of the association between a covariate and risk of failure may be different from this perspective than what is obtained from the latent survivor time approach. We use a stratified Cox model by event types (Box-Steffensmeier and Jones 2004) to check the robustness of the results obtained from the latent survivor time model. Instead of treating one type of event as censored for analyzing the other, a stratified Cox model assumes that an individual remains at risk of experiencing one type of event after the occurrence of the other type of event. To estimate a stratified Cox model by event types, we assume that the covariate effects are common to each event type, but the baseline hazard is allowed to vary by different types of intercourse (Box-Steffensmeier and Jones 2004). This model also has an advantage of being parsimonious because only a single set of parameters is estimated for each of the event types.

PRELIMINARY RESULTS

Sample Characteristics

In Table 1, we describe the young men and women in the sample at the baseline (i.e. the first month of their first relationship) in last 10 years. The total sample size is 590 with slightly more young men (313) than women (277). Two thirds of the sample was born in urban areas. The average age was about 15 years old. Almost three quarters were enrolled in school, and less than 10 percent were employed. About 4 percent moved in the previous month. Only 1 percent maintained a concurrent romantic partner at the baseline; however, these percentages increase as respondents grew older. The average number of partners to date was, not surprisingly, 1. With respect to commitment within the first month of first relationships, about 4 percent were categorized as spouse or fiancé/fiancée, 14 percent serious, 55 percent dating, and the rest as casual or other unspecified types. 15 percent of the respondents initiated the relationship

because of love, and nearly one quarter expressed a desire to marry their first partner in the first month of the relationship. Only about 1 percent of partners had other martial partner(s) at the time, but approximately 12 percent had other non-marital partner(s). Over half of the sample knew their partners well or very well before they started these relationships.

With respect to measures of bargaining power, about 20 percent of young men and women had a 5-year or greater age difference with their partners. Over one half received money or gifts from their partners, with the net mean amount received Kenyan shillings 6 (US$0.09) across all respondents in the sample, with young women receiving positive amounts on average and young men giving more than they receive on average. Four percent of respondents initiated the relationship because of money or gifts. Nearly one fifth of the young men and women had wealthy partners, and almost half of the partners' education level was secondary school or above.

The majority of the young men and women lived in the same city or village as their partners. About one-third entered the relationship due to physical attraction or the desire for sex.

Exploratory Results

In the first part of our analysis, we explore the overall patterns of the timing to sexual intercourse within relationships. Figure 1A-C present, for up to the first four relationship episodes, the Kaplan-Meier estimates of survivor functions of the overall timing to first sexual intercourse, and that with and without consistent condom use. These graphs depict the proportion of young men and women who survived (i.e. not yet had sexual intercourse) to a specific month after the initiation of a relationship.

With respect to the timing of first intercourse and that with consistent condom use (Figure 1A-B), the survival curves for first relationship episode drop less rapidly towards 0 (all individuals had sexual intercourse with their partners) compared to those for higher-order episodes. Log-rank tests indicate significant difference among the first four episodes in their survival functions (see Table 2). This suggests that after having sexual intercourse with first partners, adolescents wait less time to have intercourse with their next partners, perhaps because they have become more sexually experienced. This creates an event dependence of high-order episodes on low-order ones due to the "damage effects" raised by previous events (Box-Steffensmeier, Boef, and Joyce 2007). Technically, this event dependence results in potential differences in the underlying hazards between different episodes. Therefore, we should extend the conventional Cox model to adjust for this. However, this pattern does not hold for the timing to first sexual intercourse without consistent condom use (Figure 1C).

Table 2 presents median failure times for the three events of interest, stratified by gender and episode orders. Log rank tests were used to examine the significant difference in survival time among low- and higher-order relationship episodes. Half of the sample experienced first sexual intercourse by 4 months after starting the first relationship episode. As they moved to the second and third episodes, the median failure time dropped rapidly by half and so again in the fourth episode. This simply confirms the event dependence shown in the graphs of survival functions.

This pattern holds for both young men and women, as within each gender group, the median survival time dropped substantially in higher-order episodes compared to lower-order ones.

With respect to first intercourse with consistent condom use, half of the sample experienced the event by 12 months; in other words, for those relationships that would eventually include consistent condom use during their first month of sex, the median waiting time to having sex was 12 months. This delay is much longer than for first intercourse regardless of condom use, most likely because we treated first intercourse without condom use as censoring. Again, event dependence exists for both men and women, as the median survival time declined notably as the episode order increased within each gender group. However, event dependence did not exist for first intercourse without consistent condom use. Treating intercourse with condom use as censoring, the median failure time was 6 months for first intercourse without condom use in the first episode, and then dropped relatively slowly as both young men and women moved to higher-order episodes.

It is also worth noting that there seems to be a gender difference in the timing of first sex with consistent condom use. Men appear to be more prone to experience the event than women, because the median survival time is shorter for men than for women in each episode up to the third one. Nevertheless, log rank tests did not provide evidence for significant gender differences (results not shown).

We further explore the bivariate association between types of relationships and timing of first intercourse within partnerships (regardless of condom use). Figures 2A-B show the KM estimates of these survival functions for young men and women respectively. Gender difference in the effect of relationship type on timing of first intercourse can be seen by comparing the two figures. For young women, the survival curve drops more rapidly for more serious relationships (spouse or fiancée and serious partners), but relatively more slowly for those with dating, casual and other types of partnerships. This indicates that young women were likely to experience first sexual intercourse earlier when they engaged in more serious relationships. For young men, the survival curves drop most rapidly for relationships with casual and other types of partners, but relatively more slowly for more serious relationships. This implies that young men tend to wait less time to engage in first sexual intercourse with casual and other types of partners. Taken together, these results suggest that stronger commitment or attachment to a relationship tends to speed up the timing to first sexual intercourse for young women but postpone it for young men.

PRELIMINARY DISCUSSION

One of the main findings from our exploratory analyses is the presence of interdependence between recurrent events, including the timing of first sexual intercourse regardless of condom use and with consistent condom use, but not without condom use. For the first two outcomes, the survival curves declined relatively slowly for early relationship episodes, especially the first one, but more sharply for later episodes. Accordingly, the estimates of median survival time were larger (longer durations) for early episodes than for later ones, and this holds for both young men and women. These results suggest that young people were less likely to delay first sexual intercourse as they moved from earlier relationships to later ones. This may be due to

increased romantic and sexual experience that is accumulated within earlier relationships, resulting in, for example, increased positive attitudes toward engaging in sexual intercourse with future partners (Menning, Holtzman, and Kapinus 2007). The correlation of timing to first sexual intercourse within multiple episodes also violates the assumption of event independence, and thus requires particular statistical techniques to adjust for it.

The findings regarding timing to first sexual intercourse without condom use are also interesting. We find that timing is shorter compared to first sex with consistent condom use and that it does not vary by relationship episodes. This indicates that for those partnerships where condoms will not be used consistently, adolescents do not delay sexual intercourse as long as in those partnerships where safe sex will be practiced. Perhaps because this timing is rather short to begin with, the median survival time does not decrease significantly in later relationship episodes.

Another important finding is that relationship risk factors may affect the timing of first intercourse in different ways for young men and women. Results from KM estimates of survival functions suggest that the level of commitment within a relationship—as measured by relationship type—has contradictory impact on the timing of first intercourse for young men and women. Young women tend to wait less time to have sex with more serious partners, whereas young men tend to do so with more casual partners. This suggests that we need to consider gender differences in how risk factors operate and to test gender interactions in the multivariate analysis.

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Table 1. Descriptive Statistics of Independent Variables at the Baseline

	Total	Female	Male
Sample size (n)	590	277	313
Individual Characteristics			
Mean Age (years) [a]	15.1	15.2	15.0
Enrollment in school (%; ref = no) [a]	73.7	68.2	78.6
Employment status (%; ref = no) [a]	9.5	6.1	12.5
Born in urban (%; ref = no)	66.8	57.0	75.4
Changed urban/rural residence from last month (%; ref = no) [a]	3.6	2.9	4.2
Maintained a concurrent partner (%; ref = no) [a]	1.0	0.4	1.6
Mean cumulative number of romantic partners to date (n) [a]	1.0	1.0	1.0
Commitment to Relationship			
Type of partnership [a]			
Spouse/fiancé (%)	4.4	5.4	3.5
Serious (%)	14.2	11.2	16.9
Dating (%)	54.9	64.3	46.7
Casual/other (%)	26.4	19.1	32.9
In love as the main reason to start relationship (%)	15.4	19.9	11.5
Marital aspiration (%; ref = no) [a]	23.9	25.6	22.4
Partner had other marital partner (%; ref = no) [a]	1.2	1.8	0.6
Partner had other non-marital partner (%; ref = no) [a]	12.4	10.5	14.1
Knew partner well before (%; ref = no)	58.0	56.7	59.1
Bargaining Power within Relationship			
Age difference >= 5years (%; ref < 5 years)	21.4	42.6	2.6
Received money/gifts from partner (%; ref = no) [a]	52.0	64.3	41.2
Mean net amount of money/gifts received (KSh) [a]	239.6	573.0	-55.5
For money as the main reason to start relationship (%)	4.2	7.6	1.3
Partner was wealthy (%; ref = no) [a]	19.0	15.9	21.7
Partner had secondary+ schooling (%; ref = none/primary) [a]	46.8	67.2	28.8
Other Partner and Relationship Factors			
Lived in different city/village (%; ref = no) [a]	11.9	15.5	8.6
Physically attracted or for sex as the main reason to start relationship (%)	30.9	17.7	42.5

Note: [a] time-varying variables; ref = reference.

Figure 1A. Kaplan-Meier estimates of survivor functions of the timing to first sexual intercourse, stratified by relationship episode.

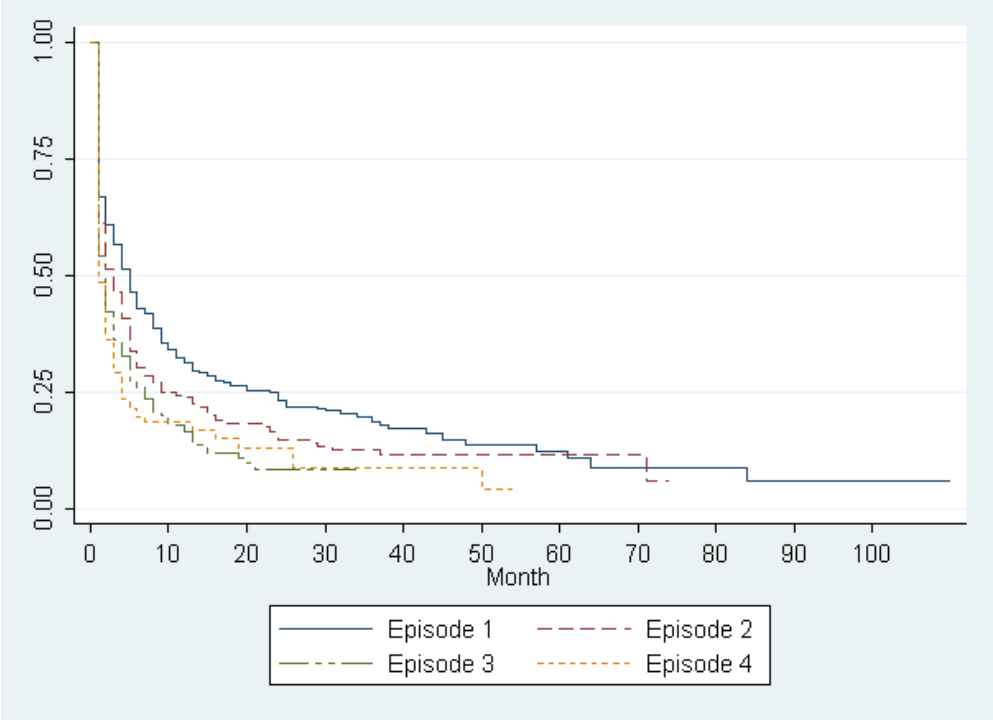

Figure 1B. Kaplan-Meier estimates of survivor functions of the timing to first sexual intercourse with condom use, stratified by relationship episode and treating intercourse without condom use as censoring.

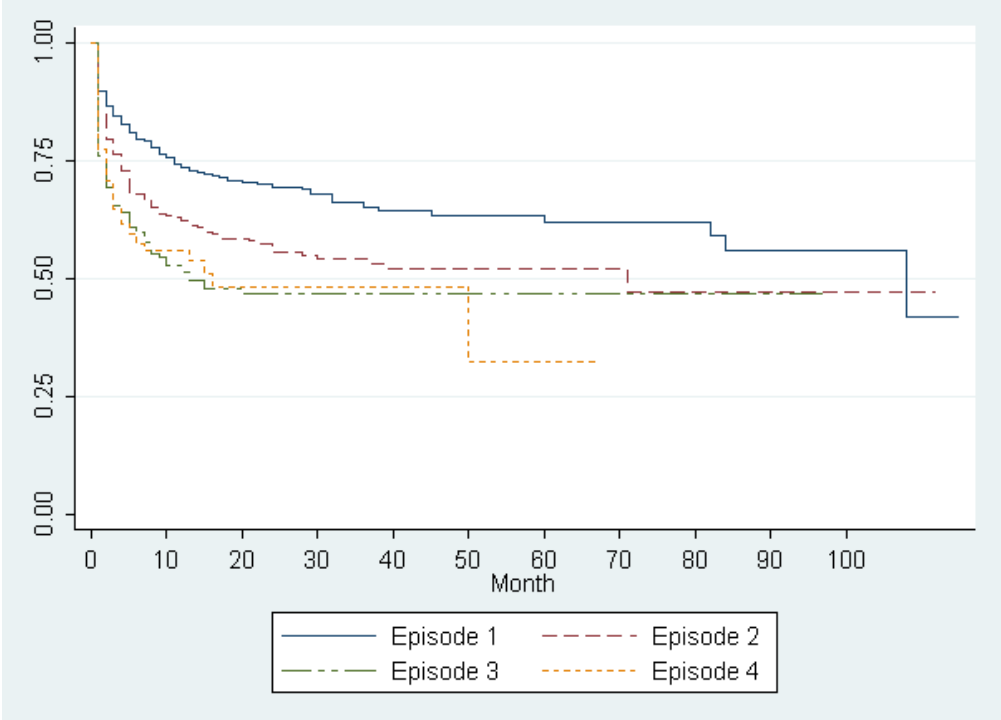

Figure 1C. Kaplan-Meier estimates of survivor functions of the timing to first sexual intercourse without condom use, stratified by relationship episode and treating intercourse with condom use as censoring.

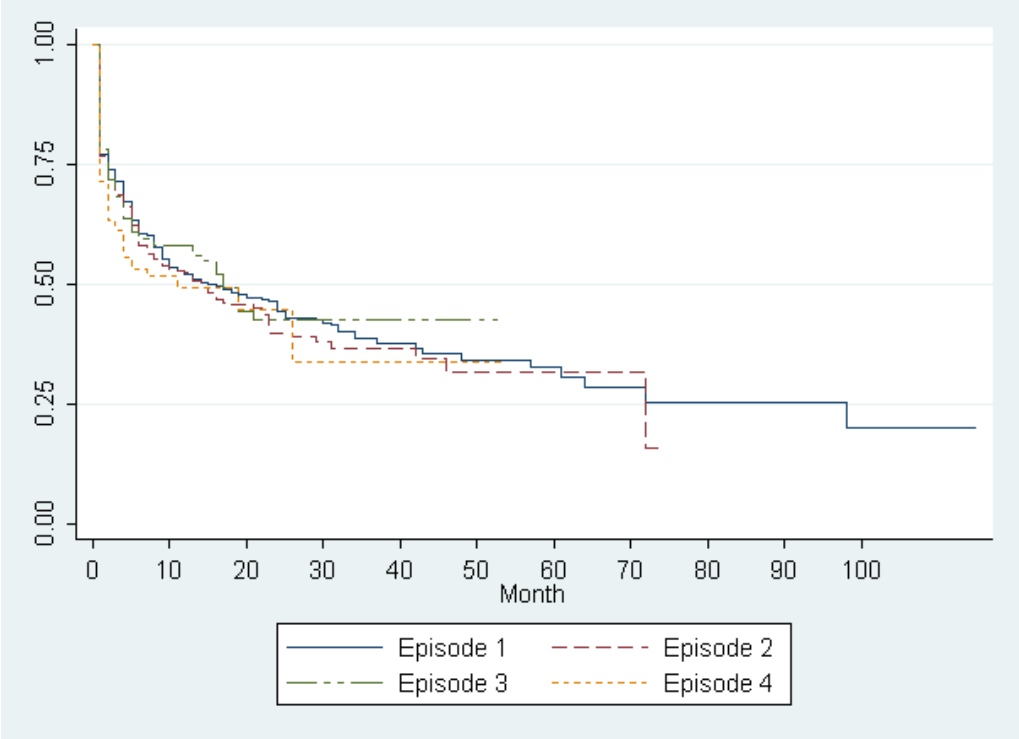

Table 2. Median Survival Time (Months) by Relationship Episode

	Time to First Sex			Time to First Sex with Condom			Time to First Sex without Condom		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
Episode 1	4	4	4	12	13	11	6	6	7
Episode 2	2	2	3	7	9	6	5	5	5
Episode 3	2	2	1	5	6	3	4	4	3
Episode 4	1	1	2	5	3.5	5	3	2	4
Log-rank test of equality by episode	45.4***	25.2***	21.3***	49.0***	14.7**	32.8***	2.1	4.7	0.9

Note:***p<0.001;**p<0.01

Figure 2A. Time to first sexual intercourse within relationships among young women, stratified by types of relationship.

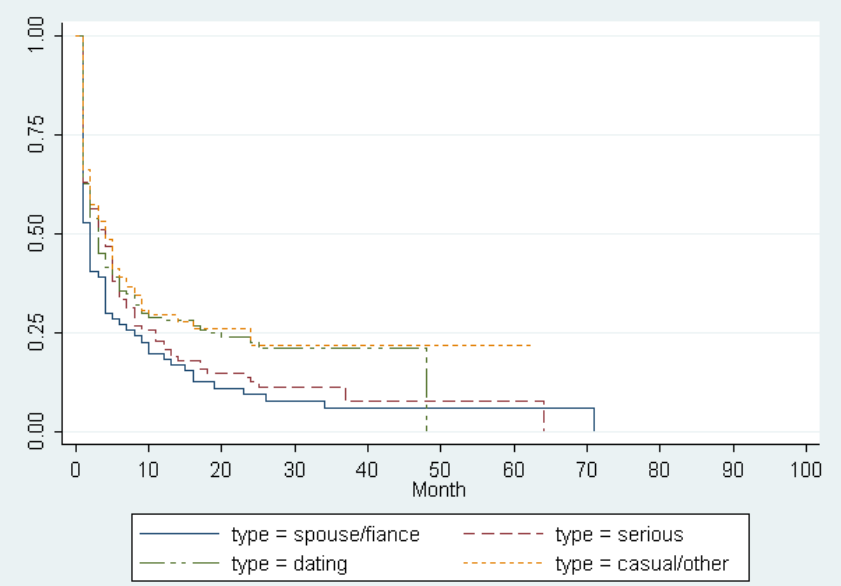

Figure 2B. Time to first sexual intercourse within relationships among young men, stratified by types of relationship.