Developmental Changes in Condom Use among Urban Adolescent Females: Influence of Partner Context

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Abstract

Purpose—National surveys have found the percentage of female adolescents who report condom use at last sex differs by age group. Using longitudinal data, the authors examined whether there are longitudinal changes in condom use and whether these longitudinal changes are due in part to developmental changes in the types of sexual relationships in which young women are involved.

Method—A clinic sample of 298 African American females aged 14 to 19 years at enrollment were interviewed every 6 months for 36 months. At each interview, participants were asked to name all their recent sex partners, to classify each partner as main or casual and to report whether or not a condom was used at last sex with each of these partners. Hierarchical generalized linear modeling was used to analyze repeated measures within individuals.

Results—On average, there was no statistically significant change in condom use over time. The odds of having a single main partner increased by 4% for each six months spent in the study (OR: 1.04, 95%CI: 1.02, 1.05). Stratifying females by longitudinal relationship patterns resulted in three distinct condom use trajectories.

Conclusions—Data suggest that longitudinal changes in condom use are a function of developmental changes in relationships, whereby young women trend toward monogamous relationships. As condoms are abandoned within these monogamous relationships, lowering infection rates in sex partners through broader STI screening or through community-level interventions aimed at sex networks may prove to be a more effective approach to reduce STI risk in young women.

INTRODUCTION

The likelihood that a young woman in the US, especially a young woman of color, will become infected with HIV or another STI increases as she transitions from adolescence to

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young adulthood(1;2). This trajectory of increasing risk for STI among young women may be attributable to longitudinal changes in condom use. Consistent use of condoms has long been the cornerstone of STI prevention. Studies have shown that as young women transition to young adulthood, their condom use declines(3-5).

We hypothesize that longitudinal decreases in condom use are due in part to developmental changes in the types of sexual relationships in which young women are involved. Multiple cross-sectional and short-term longitudinal studies have shown that adolescent and young women are less likely to report consistent condom use or condom use in the context of a main sexual partnership, than they are in the context of a new or casual partnership(5-8). Furthermore, young adult women are more likely to have a single long-term main sexual partner than adolescent women. While informative, these cross-sectional studies cannot address our hypothesis about development.

There are only a few longitudinal studies that have tracked young women across this critical developmental transition period and provide information that could support or refute our hypothesis that developmental trends towards monogamy may explain decreases in condom use over time. Fergus and colleagues found in a sample of predominately African American high school students in Flint, Michigan who were followed for eight years that condom use and number of sex partners declined over time while coital frequency increased(4). However, this study did not directly test whether changes in relationships explained changes in condom use; rather they focused on correlates of changes in overall risk that was a composite of number of sex partners and condom use. We would argue that condom use and number of sex partners represent two very distinct behaviors and should not be combined into a single index if these aspects of risk are to be examined. Another study by Sayegh and colleagues recruited a sample of 14-17 year old predominately African American female clinic attendees who were followed for two and half years (5). They found that over this time condom use declined while coital frequency increased. However this study also did not directly test the association between development changes in relationship types or relationship quality and condom use.

Our hypothesis is that condom use decreases as adolescents and young adults transition toward having main partnerships. The term main partnership is thought to represent relationship qualities, which distinguish it from other partner types (9;10). These relationships are marked by feelings of intimacy, trust and commitment (11;12). However, the concern is that while adolescents and young adults transition to committed relationships, they may perceive themselves to be in a mutually monogamous relationship when that may not be the case. A study of adolescent dyads found that 37% of female study participants incorrectly perceived that their main partner was monogamous (13). Having a sex partner who has additional sex partners has been shown to increase an individual's STI risk by as much as 5 times despite the individual's monogamy (14). Further, a recent study using social network data found that the majority of adolescent couples were not reciprocally acknowledged and among those that were acknowledged, 30% were discordant with respect to partner type (15). Yamazaki and colleagues found that when there was disagreement on partner type, females were more likely to label their partner as main than males. This previous work has shown that adolescents and young adults often misperceive being in a mutually monogamous relationship, which may in turn put them at increased risk for STDs. Thus, as adolescents and young adults transition to long term partnerships, cessation of condom use in this context may prove risky.

The objective of this study was to determine whether developmental changes in sexual relationship types that might occur as young women transition from adolescence to young adulthood are associated with longitudinal changes in condom use. We conducted this study

among a predominately low income African American sample of female clinic attendees who were followed for three years as part of this observational study.

MATERIALS AND METHODS

Study Population

A prospective cohort of adolescent females was recruited from two urban health clinics, a hospital-based adolescent medicine clinic and a public STD clinic, in Baltimore, MD. Both clinics serve similar populations, primarily African American youth, aged 12-21 yrs. Between July 2000 and September 2002, 298 adolescent females were enrolled in the Perceived Risk for Sexually Transmitted Diseases (PRSTD) study. Eligibility criteria included age between 14 and 19, vaginal or anal intercourse with an opposite sex partner in the preceding 6 months, English-speaking, and residence in the Baltimore metropolitan area. Seventy-four percent of eligible females agreed to participate. All participants provided written informed consent; parental consent was not required as Maryland law allows for adolescents to consent for confidential health services. The Johns Hopkins University Institutional Review Board approved the study protocol.

Participants were interviewed at baseline and at six-month intervals for 3 years (a total of 7 interviews) to study an adequate developmental time span. Trained research assistants conducted the baseline and semi-annual interviews face-to-face. Participants received $25 as compensation for completing the baseline, 6-, and 12-month interviews; $35 for 18-month; $45 for 24-month; $55 for 30-month, and $65 for 36-month interview.

Measures

The study was designed to look at within-subject changes over time; therefore, measures were collected repeatedly within adolescent females. For this analysis, our primary variables of interest were type of sex partner and partner-specific condom use, which was assessed at each semi-annual visit.

Partner type—At each visit, adolescent females were asked to list, using first name only, all of their sexual partners in the three months preceding the interview. Participants were then asked to classify each sexual partner as a main or a casual partner. We defined a main sex partner as "someone you have sex with and you consider to be the person you are serious about." We defined a casual partner as "someone you've had sex with only once, or a few times or you have sex with on an on-going, casual basis. The important thing is that this person is not a main partner to you." In order to evaluate patterns of sex partnerships over time, females were dichotomized as having either a single main partner or not at each visit. The other category could consist of any other relationship configuration, such as a single casual partner or concurrent partners (main and a casual, multiple casuals, etc.). Adolescent females reporting a single main partner in the previous three months were compared to those reporting multiple and/or casual partners.

Condom Use—For the most recent sex partner at each semi-annual visit, participants were asked whether or not a condom was used the last time they had sex with that partner. Condom use trajectories were modeled separately from partnership pattern trajectories.

Statistical Analyses

To test our hypotheses, we first examined the average within-subject changes in condom use over time, i.e., condom use growth curve. We then assessed variance components to evaluate whether there was significant variation in either initial condom use or rate of change in condom use between females. Second, we looked at within-subject changes in

relationship patterns over time, i.e., relationship pattern growth curve. Third, we examined the condom use growth curves once more after stratifying females based on changes in relationship patterns between baseline and 36 months. Participant's chronological age and age at sexual debut were included as covariates in the adjusted models so as to control for developmental changes occurring at different ages (people at different ages may have different curves) as well as mother's education in order to avoid confounding by socioeconomic status.

As both outcomes were dichotomous, a binomial sampling model with a logit link was used within a hierarchical generalized linear modeling (HGLM) framework to examine longitudinal trends in both condom use and sex partnerships as well as the association between the two measures using prospective data within individuals.(16) HGLM examines within subject changes over time while accounting for the correlation of repeated measures within individuals. HGLM also estimates random effects, whereby the amount of individual variation from the population average initial status and population average rate of change is quantified. Of note, while this was a within-subject analysis, it was a between relationship analysis, thus condom use within a relationship was not explicitly examined. All analyses were conducted using HLM software, version 6.08.(17)

RESULTS

Participant Characteristics

Seventy-one percent (211/298) of the cohort was retained over three years. The majority of the attrition occurred between the baseline and six-month interview. Among the participants who completed the six-month interview, the retention rate at 36 months was 85%. There were no differences in age or risk behavior at baseline between those completing the study and those lost to follow-up.

The 298 females enrolled at baseline completed a median of 6 follow-up interviews with 77% of the cohort completing at least 4 interviews. Adolescents reported a mean (standard deviation (SD)) of 3.3 (1.9) sex partners over the three-year follow-up period, 77% of which were classified as main partners. Participant characteristics are shown in Table 1. Participants were 17.1 yrs old on average at enrollment. The sample was 97% African American race. The mean age at sexual debut was 14.2 yrs. Sixty-seven percent of participants reported that their mother had less than or equal to a high school education. The median number of lifetime sexual partners was 5 and 52% of the sample reported ever having an STD at baseline. Sixty-three percent of the cohort reported having a single main partner at baseline, with 80% reporting condom use at first sex and 41% reporting condom use at last sex across all partner types.

Condom Use Trajectories

Using HGLM, the average log-odds of condom use at last sex with most recent partner at baseline was -0.264 (standard error (SE) = 0.115), corresponding to a probability of 0.43 or 43% of young women using a condom at last sex with their most sex recent partner at baseline. The unconditional growth model found no statistically significant change in reports of condom use at last sex within females across visits at the $P = 0.05$ level of significance (Table 2), indicating no change in rates of condom use within individuals over time. Analysis of variance components; however, found significant variation in initial status, r_{0i} ($P < 0.001$) and slope, r_{1i} ($P = 0.001$) between females (Table 2), indicating that young women varied in rates of condom use both at baseline and over time. Neither initial status nor rate of condom use differed when females' age at baseline, age at sexual debut or mother's education was entered into the model (data not shown). However, these condom use trends

are average trajectories among all participants. Given the significant variation in condom trajectories between young women indicated by the variance components analysis, we proceeded to test our hypothesis that trends toward monogamy may explain declines in reports of condom use.

Trajectories of Relationship Patterns

At baseline, 62% of participants reported having a single main sex partner in the previous 3 months, 2% reported having 2 main sex partners and no casual sex partners, 12% reported having one or more casual sex partners and no main sex partner, and 24% reported having a main as well as one or more casual sex partners. Thus, at baseline, the relationship patterns of 38% of the cohort consisted of multiple and/or casual sex partners. At 36 months, 80% of participants reported having a single main sex partner in the previous 3 months, less than one percent reported having 2 main sex partners and no casual sex partners, 12% reported having one or more casual sex partners and no main sex partner, and 8% reported having a main as well as one or more casual sex partners. At the end of the follow-up period, the relationship patterns of 20% of the cohort consisted of multiple and/or casual sex partners.

Using HGLM, we then examined within-subject changes in relationship patterns over time. The average log-odds of having a single main partner at baseline was 0.859 (SE = 0.146), corresponding to a probability of 0.70 or 70% of young women having a single main sex partner at baseline. The unconditional growth model found a statistically significant increase in the odds of having a single main partner across visits (Table 3), indicating that young women trend toward having a single main partner over time. On average, the odds of an adolescent female having a single main partner increased by 4% (OR = 1.04) for each six months spent in the study, with a 95% CI of 2 – 5%. Analysis of variance components found significant variation between females in both initial status of relationship patterns, r_{0i} ($P <$ 0.001) and slopes, r_{1i} ($P = < 0.001$) (Table 3), indicating that young women vary in their partnership patterns both at baseline and over time. Neither initial status nor slope differed when females' age at baseline, age at sexual debut, or mother's education was entered into the model (data not shown).

Stratified condom use trajectories

Next, we stratified adolescent females by their changes in relationship patterns between baseline and 36 months and subsequently examined changes in condom use over time within these strata. Using data on the 259 participants who remained in the study for all 36 months, females were stratified into three categories of longitudinal relationship patterns. Table 4 shows the number of females in the cohort who went from casual and/or multiple partners at baseline to a single main partner at 36 months (N = 81), the number who did not change their relationship patterns between baseline and 36 months (N = 150), and the number who went from a single main partner at baseline to multiple and/or casual partners at 36 months (N = 28).

Using HGLM found that among females who went from having casual and/or multiple partners to a single main partner, individual condom use did decline, with the odds of condom use at last sex decreasing by 3% (OR = 0.97) for each six months spent in the study with a 95% confidence interval (CI) of 2 – 5%. In contrast, among females who trended from having a single main partner at baseline to casual and/or multiple partners at 36 months, a statistically significant increase in individual condom use was found with the odds of condom use at last sex increasing by 5% (OR = 1.05) for each six months spent in the study with 95% CI of 2 – 9%. There was no change in condom use over time within females who had no change in relationship patterns between baseline and 36 months, the majority of whom had a single main partner at both time points (N = 127 (85%)). When we examined

whether the three slopes differed significantly from each other by testing the time-strata interaction we found that the slopes were significantly different from one another ($p < 0.01$). A single model was run which included each of the three strata as dummy variables; however, as the interaction term was statistically significant and indicated different trajectories, Table 4 presents the stratified models for ease of interpretation. An examination of variance components found there was no difference in rates of condom use among females in the strata of young women who did not change relationship patterns over time nor among the young women who went from a single main partner to casual and/or multiple partners. However, there remained significant variation in rates of condom use over time among young women who trended toward a single main partner.

DISCUSSION

We found three distinct longitudinal patterns of condom use corresponding to three different developmental patterns of relationship changes that support our hypothesis. Adolescent and young adult women who moved from multiple sexual partnerships to monogamous main partnerships showed decreased condom use. Those who moved from monogamous main partnerships to multiple sexual partnerships increased condom use. Probably most important for our hypothesis, those who did not change partnership patterns did not change condom use over time.

Our observed longitudinal changes in condom use and sexual partnership are consistent with the previous longitudinal studies that have followed women from adolescence to young adulthood(4;5). As stated previously, there are no studies, which have examined the association between the two developmental trajectories within which we could ground our findings. As such, others will need to replicate these findings before we are ready to state the robustness of these findings.

The study is not without some limitations. Asking about condom use at last sex may not reflect the adolescent's condom use over a longer time period; however, asking about event-specific behavior limits recall error and biases(18). Furthermore, condom use at last sex has been found to be a valid proxy for condom use behaviors spanning longer time periods(19). A second limitation is that this was a clinic sample, who tend to be at higher risk for sexually transmitted infections (STI) – while this would not limit our inferences or internal validity there may be issues of external validity in that this is not a school-based sample comparable to many national cross-sectional studies, such as the Youth Risk Behavior Surveillance System (YRBSS). It may be that subjects recruited from schools have different relationship trends from subjects recruited from STD clinics. Based on our findings, it is likely that the school based sample more uniformly follows the trend toward monogamy, which would explain the decline in condom use seen among the YRBSS data. However, data from the current cohort demonstrated a mix of trends, a subset who trended toward monogamy as well as a subset who trended towards multiple and/or casual partners.

A final limitation of this study is that while stratification eliminated the residual variation in condom slopes between females who did not change partner type as well as between females who trended away from monogamy, variation in condom use slopes remained among females who trended toward a single main partner. Heterogeneity in partner characteristics and relationship qualities may account for the remaining variation in this stratum. While we did evaluate partner type, we did not adjust for partner age, partner concurrency, intimacy and relationship duration which have been shown to influence condom use.(20-24) This study took important first steps; however, future work should examine the factors that could account for these relationship patterns beyond development.

Our findings suggest that STI prevention efforts face a significant challenge. For young women, it is developmentally appropriate to move towards stable, monogamous relationships(25). Yet it may be during these relationships that risk increases, if condoms are abandoned but the perception of mutual monogamy is mistaken. While prevention messages could focus on altering these perceptions of mutual monogamy, this may prove to be quite challenging. Main partnerships are themselves viewed as entailing monogamy, and trying to convince women otherwise may be tantamount to challenging their fundamental perceptions of relationships and how they work(26). An alternate strategy of reducing risks by lowering infection rates in sex partners may prove to be a more effective approach. These might include efforts to reduce infection through broader STI screening or through community-level interventions that focus on reshaping the sex networks that put young women at greatest risk for STI.

Acknowledgments

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Table 1

Baseline Characteristics of 298 Female Participants in PRSTD, Baltimore, Maryland, 2000 – 2002

	Value
Number of visits completed[†]	6 [1 – 7]
Age, mean (sd), years	17.1 (1.5)
African American race	97
Age at sexual debut, mean, y (sd)	14.2 (1.6)
Maternal education ≤ high school, %	67
Lifetime number of sexual partners[^]	5 [3 – 7]
STD history, %	52
Single main partner, %	63
Condom use at first sex, %	80
Condom use at last sex, %	41

[†] median, [range]

[^] median [IQR]

Table 2

HGLM (unconditional growth model) for condom use, PRSTD, Baltimore, Maryland, 2000 – 2002

	Coefficient	Standard Error	Odds Ratio	95% Confidence Interval
Fixed effect				
Mean initial status, β_{00}	−0.264	0.115		
Mean growth rate, β_{10}	−0.009	0.005	0.99	0.98, 1.0
	Variance Component	X^2	*P*- value[†]	
Random effect				
Initial status, r_{0i}	1.660	450.1	< 0.001	
Slope, r_{1i}	0.002	354.8	0.001	

[†]*P*-values are two-sided

Table 3

HGLM (unconditional growth model) for relationship patterns, PRSTD, Baltimore, Maryland, 2000 – 2002

	Coefficient	Standard Error	Odds Ratio	95% Confidence Interval
Fixed effect				
Mean initial status, β_{00}	0.859	0.146		
Mean growth rate, β_{10}	0.034	0.007	1.04	1.02, 1.05
	Variance Component	X^2	*P*-value[†]	
Random effect				
Initial status, r_{0i}	1.255	377.8	< 0.001	
Slope, r_{1i}	0.006	441.8	< 0.001	

[†]*P*-values are two-sided

Table 4

HGLM (unconditional growth models) for condom use stratified by relationship changes from baseline to 36 months (N = 259), PRSTD, Baltimore, Maryland, 2000 – 2002

	Coefficient	Standard Error	Odds Ratio	95% Confidence Interval
Casual and/or Multiple Partners to Single Main Partner, N = 81 (31%)				
Fixed effect				
Mean initial status, β_{00}	0.419	0.221		
Mean growth rate, β_{10}	−0.035	0.009	0.97	0.95, 0.98
No change in relationship pattern, N = 150 (58%)				
Fixed effect				
Mean initial status, β_{00}	−0.480	0.145		
Mean growth rate, β_{10}	−0.005	0.006	0.99	0.98, 1.01
Single Main Partner to Casual and/or Multiple Partners, N = 28 (11%)				
Fixed effect				
Mean initial status, β_{00}	−0.968	0.421		
Mean growth rate, β_{10}	0.050	0.016	1.05	1.02, 1.09