Predicting Unprotected Sex and Unplanned Pregnancy among Urban African-American Adolescent Girls Using the Theory of Gender and Power

Janet E. Rosenbaum , Jonathan Zenilman, Eve Rose, Gina Wingood, and Ralph DiClemente

ABSTRACT *Reproductive coercion has been hypothesized as a cause of unprotected sex and unplanned pregnancies, but research has focused on a narrow set of potential sources of reproductive coercion. We identified and evaluated eight potential sources of reproductive coercion from the Theory of Gender and Power including economic inequality between adolescent girls and their boyfriends, cohabitation, and age differences. The sample comprised sexually active African-American female adolescents, ages 15–21. At baseline (n = 715), 6 months (n = 607), and 12 months (n = 605), participants completed a 40-min interview and were tested for semen Y-chromosome with polymerase chain reaction from a self-administered vaginal swab. We predicted unprotected sex and pregnancy using multivariate regression controlling for demographics, economic factors, relationship attributes, and intervention status using a Poisson working model. Factors associated with unprotected sex included cohabitation (incidence risk ratio (IRR) 1.48, 95 % confidence interval (1.22, 1.81)), physical abuse (IRR 1.55 (1.21, 2.00)), emotional abuse (IRR 1.31 (1.06, 1.63)), and having a boyfriend as a primary source of spending money (IRR 1.18 (1.00, 1.39)). Factors associated with unplanned pregnancy 6 months later included being at least 4 years younger than the boyfriend (IRR 1.68 (1.14, 2.49)) and cohabitation (2.19 (1.35, 3.56)). Among minors, cohabitation predicted even larger risks of unprotected sex (IRR 1.93 (1.23, 3.03)) and unplanned pregnancy (3.84 (1.47, 10.0)). Adolescent cohabitation is a marker for unprotected sex and unplanned pregnancy, especially among minors. Cohabitation may have stemmed from greater commitment, but the shortage of affordable housing in urban areas could induce women to stay in relationships for housing. Pregnancy prevention interventions should attempt to delay cohabitation until adulthood and help cohabiting adolescents to find affordable housing.*

KEYWORDS *Adolescents, Safe sex, Condoms, Intimate partner violence, Unplanned pregnancy*

Abbreviations: NSFG – National Survey of Family Growth; Yc-PCR – Test for Y-chromosome using polymerase chain reaction; IQR – Interquartile range; IRR – incidence rate ratio; CI – confidence interval

Rosenbaum is with the Department of Epidemiology, School of Public Health, SUNY Downstate Medical Center, Brooklyn, NY, USA; Zenilman is with the Department of Infectious Diseases, Johns Hopkins Medical Institutions, Baltimore, MD, USA; Rose, Wingood, and DiClemente are with the Behavioral Sciences and Health Education, Rollins School of Public Health, Emory University, Atlanta, GA, USA.

Correspondence: Janet E. Rosenbaum, Department of Epidemiology, School of Public Health, SUNY Downstate Medical Center, Brooklyn, NY, USA. (E-mail: janet@post.harvard.edu)

INTRODUCTION

The American College of Obstetricians and Gynecologists has cited reproductive coercion by romantic partners as a potential cause of unplanned pregnancies.¹ Reproductive coercion comprises attempts to control women's and girls' reproductive decisions, including birth control sabotage, forced abortions, and pregnancy coercion.² The cumulative incidence of sexual coercion among sexually active adolescents and female patients at sexually transmitted disease clinics has been estimated to be over 40 %.³ Women and adolescents may experience reproductive coercion as part of a violent or abusive relationship,^{2,4-7} but reproductive coercion may also occur even without other relationship abuse.¹ Reproductive coercion may interfere with adolescent women's ability to have safe sex and thus potentially undermine otherwise effective HIV prevention interventions.⁸ Understanding factors that contribute to reproductive coercion may assist in developing more effective safe sex interventions. The Theory of Gender and Power suggests that several sources of relationship inequalities could induce reproductive coercion,⁹ but only some variables have been studied empirically.

Past research has found that power inequalities, economic inequalities, and age differences predict unprotected sex and unplanned pregnancy. Relationship power differentials have been identified as a factor in HIV spread in sub-Saharan Africa,^{10,11} and several interventions have succeeded in increasing stigma for intergenerational and power-disparate sexual relationships.¹² Few studies have identified comparable sources of reproductive coercion in the United States among adolescents.¹¹ Adolescents under 18 with older partners are more likely to become pregnant^{13,14} and to acquire a sexually transmitted infection¹⁵ than adolescents with similar age boyfriends. Romantic partners' economic power appears to moderate the decision to have safe sex: high-income men who are motivated to have safe sex are more likely to have safe sex than low-income men.¹⁶ Female adolescents whose primary source of spending money was their boyfriend were more likely not to use condoms than those with other spending money sources.⁸

Cohabitation is a potential source of relationship inequality, especially for poor youth in urban areas with a shortage of affordable housing. Cohabitation among adolescents is rare in the general population, with estimated prevalences 1.8 % among teenage minors ages 15–17 (2007–2009 Current Population Survey),¹⁷ and 5.6 and 4.8 % among ages 15–20 (2002 and 2006–10 National Survey of Family Growth (NSFG)).^{18,19} Youth from poor families are more likely to leave their parents' home before age 18 than youth from nonpoor families²⁰ and thus more likely to cohabit. Adolescents who leave a family living situation early have worse subsequent educational and family outcomes.²¹ Latino adolescent mothers who cohabit are less likely to receive public assistance and have lower educational attainment than those who live with their mothers, possibly because their mothers help them obtain resources.²² Among lower income and disadvantaged minority adults, cohabiting women decide whether the men are allowed to stay depending upon their contributions to the household,²³⁻²⁵ but low-income adolescent girls may not have such power in a cohabiting relationship.

In this study, we use Connell's Theory of Gender and Power²⁶ to identify structures factors that may predict unprotected sex and unplanned pregnancy because of the theory's emphasis on the interaction of affective factors (cathexis) with the sexual division of labor and power.⁹ We identified eight potential sources of reproductive coercion related to the structures of the sexual division of labor (boyfriend has a job, boyfriend has a car, boyfriend makes more money, and

boyfriend is the primary source of spending money), sexual division of power (physical abuse, emotional abuse), and cathexis (cohabitation, having an older boyfriend). This study tests the hypothesis that these measures predict unprotected sex and unplanned pregnancy using data originally collected for an HIV intervention designed to address inequality between participants and their male partners using the Theory of Gender and Power. This study evaluates whether structural inequality between partners may have reduced the intervention's effectiveness despite the intervention's design.

METHODS

Theory of Gender and Power

In his Theory of Gender and Power, Connell defined three structures as fundamental to relationships between men and women—sexual division of labor, sexual division of power, and cathexis (emotional attachment within relationships, social norms)—and noted that these three structures apply at the societal and institutional levels.²⁶ Wingood and DiClemente identify HIV risks within each structure.⁹ The sexual division of labor includes economic exposures such as poverty and socioeconomic exposures such as minority status or youth; the sexual division of power includes physical exposures such as a history of sexual or physical abuse and behavioral risk factors such as substance abuse history; cathexis (“social norms and affective attachments”) includes social exposures such as having an older partner and personal risk factors such as a history of psychological distress.⁹

Sample and Procedures

We evaluated these hypotheses using data from the study of Horizons, an HIV prevention intervention for African-American females in urban Atlanta. From March 2002 to August 2004, the study enrolled low socioeconomic status African-American female adolescents ages 15–21 (mean age 17.8 (sd 1.7)) at three clinics: a publicly funded STI clinic, a teen clinic based in a large public hospital, and a family planning clinic. Unmarried African-American females were eligible to participate if they were sexually active in the past 60 days and neither pregnant nor attempting pregnancy: 847 participants were eligible, of whom 84 % agreed to participate.

Respondents were surveyed at baseline ($n = 715$), 6 months (wave 2, $n = 607$), and 12 months (wave 3, $n = 605$).²⁷ At each wave, participants completed a 40-min interview administered via audio computer-assisted self-interviewing and tested for a biomarker for semen exposure to assess consistency of condom use. After the interview, trained monitors instructed participants how to collect vaginal fluid using a life-like model of a vagina. The Y-chromosome biomarker was evaluated with a polymerase chain reaction (Yc-PCR). Participants performed a 10–15-s vaginal sweep using the Becton Dickinson “swube applicator,” and the swabs were frozen and shipped to the Johns Hopkins Division of Infectious Disease Laboratory, where they were tested for Y-chromosome DNA using the Yc-PCR test. All samples were processed by a female technician to avoid technician Yc contamination. The Yc-PCR assay is sensitive to five copies of Yc for up to 14 days after coitus. The estimated specificity is 92 % (95 % CI (80, 98)); i.e., 92 % of women in the calibration trial who had protected sex tested negative for Yc-PCR, and the 8 % of women each had digital or oral genital contact by their male partner, so the false positives could be explained by epithelial cells.^{28–30}

Participants were paid \$50 upon completion of each survey. Emory University's Institutional Review Board approved the study protocol prior to implementation.

At baseline, 598 (83.6 %) respondents reported having a boyfriend, as did 466 respondents (76.8 %) at 6 months and 438 respondents (72.4 %) at 12 months. Median relationship length at baseline was 10 months, with interquartile range (IQR) 5 to 21 months, and similar at subsequent waves (median 11 months (IQR 5 to 25) at 6 months; median 12 months (IQR 6 to 27) at 12 months). At baseline, 5 of the 715 participants had children whom they lived with.

MEASURES

Outcomes: Pregnancy and Pregnancy Prevention

Pregnancy was coded as 1 for respondents who tested positive on a urine test or who reported being pregnant in the past 6 months, and otherwise 0.

The survey included several measures for unprotected sex. We chose a measure of unprotected sex that most strongly predicted subsequent pregnancy according to a measure of effect size. Unprotected sex was coded as 1 for respondents who met one of the following criteria: positive test on a biomarker for semen exposure in the last 2 weeks^{29,30}, self-report of no condom use in the past 14 days, or self-report of no current oral contraception use. This measure was chosen because it was the strongest predictor of pregnancy in the subsequent wave 6 months later: Cohen's effect size of $d=0.17$ for wave 2 pregnancy and $d=0.10$ for wave 3 pregnancy (Appendix Table 6).

Oral contraception use was defined as 1 for those answering "yes" to "Are you on the pill?" and otherwise 0. Other noncondom methods of contraception including foam, withdrawal, and injectable or patch hormonal contraception were rare.

Primary Predictors from the Theory of Gender and Power

We evaluate four factors related to the sexual division of labor, boyfriend is a primary source of spending money, boyfriend has a job, boyfriend makes more money, and boyfriend has a car; two factors related to the sexual division of power, boyfriend is physically or emotionally abusive; and two factors related to cohabitation, cohabitation with boyfriend and boyfriend is at least 4 years older. Youth is an independent socioeconomic exposure and may also modify the effect of cohabitation because cohabitation is rare for minors¹⁷ and represents a potential for worse outcomes,²¹ so we evaluate cohabitation for all participants and also separately for minors.

Emotional abuse was coded as 1 for those answering yes to the question, "In the past 60 days, have you been emotionally abused by your boyfriend?" and otherwise 0. Physical abuse was coded as 1 for those answering yes to the question, "In the past 60 days, have you been physically abused (hit, punched, kicked, slapped, etc.) by your boyfriend?" The abuse measures were included because intimate partner violence may include interference with women's reproductive choices.^{2,4} Analyses that included emotional and physical abuse were limited to respondents over 18 due to mandatory reporting requirements ($n=385$ (53.8 % of sample), 368 (60.6 % of sample), 419 (69.3 % of sample) at waves 1, 2, and 3.)

Cohabitation was coded as 1 for those who answered the question “Who do you live with (choose one)?” with “boyfriend.” Cohabitation was coded as 0 for those who reported living alone, with one or both parents, another relative, other, or nonresponse.

Measures of resources within the relationship were included because they represent economic division of power in the Theory of Gender and Power. Sociological theories of power within the family also hypothesize that relationship partners receive decision-making precedence proportional to the resources that they bring to their relationships.³¹ Relying on a boyfriend for spending money was coded as 1 for those who answered the question, “Where do you get most of your spending money? (choose one)” with boyfriend and 0 for those who reported getting most spending money from parents, a job, public assistance, other relatives, or other sources. Respondents were coded as having an older boyfriend if the boyfriend was at least 4 years older, the top quartile of difference in ages. Respondents’ boyfriends’ attributes were coded according to the respondents’ report: “Does your boyfriend have a car?”, “Does your boyfriend work?”, and “Who makes the most money in your relationship”?

Control Variable Measures

The participants were homogeneous on race, city of residence, and intention not to become pregnant due to the study’s selection criteria. Intention to become pregnant was an exclusion criterion for participation in the study, so it was not necessary to control for pregnancy intentions. The participants differed in other respects, so we identified control variables using a social cognitive model for unprotected sex to reduce potential confounding between relationship inequality and unprotected sex.

More committed and exclusive relationships are more likely to have unprotected sex and pregnancy.⁵ Relationship commitment was measured by three quantities: a composite variable rating the future of the respondent’s relationship with boyfriend (Cronbach’s $\alpha = 0.64$), the number of months in the relationship (linear and quadratic), and partner concurrency. Nearly all respondents who perceived that their boyfriend had a concurrent partner had a concurrent partner themselves, so boyfriend partner concurrency was not used as a control variable. The composite variable for relationship commitment included four items scored on a Likert-type scale with no neutral option: “I see myself marrying my current boyfriend,” “I’ll stay with my current boyfriend until someone better comes along,” “It would be nice if my relationship succeeded, but I won’t do much more than I’m doing to help it succeed,” and “It doesn’t matter if my relationship succeeds. I refuse to do anymore than I’m doing now to keep the relationship.”

Respondents randomized to the intervention may be less likely to have unprotected sex than respondents in the control group, so we controlled for intervention status.

Demographic and socioeconomic factors predict unprotected sex and pregnancy.³² This analysis included the respondent’s employment status, the clinic that the respondent was recruited from as a proxy for socioeconomic status, high school enrollment, and high school graduation. We also controlled for age and age difference with boyfriend.

Data Analysis

We used Stata SE version 11.2 for data analysis. Pairwise associations between measures of potential boyfriend coercion with significance were calculated as

Pearson correlations. Bivariate associations between potential coercion measures and unsafe sex/pregnancy used *t* tests. Effect size was measured using Hedges's *g*, computed using the *cohend* package for Stata.^{33,34} Effect size measures the difference between two groups and does not depend on sample size, so it is a more appropriate way to judge differences than *p* values. Effect sizes larger than 0.2 can be considered statistically significant: 0.2–0.5 is small, 0.5–0.8 is medium, and 0.8 and above is large.

We estimated relative risks of both unprotected sex and pregnancy at the subsequent wave using a Poisson working model. Estimators from logistic regression are inconsistent when the outcomes are not rare; Poisson regression yields consistent and unbiased estimators.^{35,36} The relative risks were averaged across all three waves using the geometric mean.³⁷

For predicting unprotected sex, the control variables were demographics (age, location that respondent was recruited from as a proxy for neighborhood: a family planning clinic, a county health department, or a teen clinic), economic factors (high school enrollment, high school graduation, and employment status), relationship attributes (number of months with boyfriend (linear and quadratic), age difference with boyfriend, a composite variable rating the future of the respondent's relationship with boyfriend, respondent partner concurrency), and whether the respondent was randomized to the intervention.

Fewer control variables were used in regressions predicting pregnancy because the use of too many variables risked over-fitting because there were only 59 and 56 pregnancies, respectively, at waves 2 and 3. For predicting pregnancy, the regressions used the eight potential coercive measures one at a time, in addition to two biological predictors of pregnancy: the comprehensive unprotected sex measure and number of times the respondent reported having sex in the past 60 days.

To obtain a summary measure of the association between each factor and each outcome, we reshaped the data. We repeated the analysis as random effects regression clustered by individuals. We consider as significant any analyses that are significant in both panel data and individual waves.

To evaluate whether coercive relationships could explain loss to follow-up, we evaluated the association between an indicator for loss-to-follow-up and each coercive relationship measure using a chi-squared test at the 0.05 level.

RESULTS

All respondents had the intention not to become pregnant at baseline. At 6 months, 59 respondents reported pregnancy, representing 8.3 % of the original sample. At 12 months, an additional 46 respondents reported pregnancy, so 56 respondents (7.8 %) were pregnant at 12 months.

About 8.0 % of respondents lived with their boyfriends (Table 1). Among ages 15–17, 4.3 % cohabited, above the national average for those ages (2.0 % NSFG 2002, 0.8 % NSFG 2006–2010).^{18,19} A quarter of respondents (24 %) said that their boyfriend was their primary source of spending money, which was moderately or weakly associated with all seven measures of potential coercion. About a fifth of respondents (20.3 %) had an older boyfriend, which was associated with nonabuse measures of potential coercion. About half of respondents had a boyfriend with a job, car, and who earned more money than the respondent; these variables were all mutually associated to a moderate to strong degree.

TABLE 1 Pairwise correlations between measures of potential boyfriend coercion

		Boyfriend gives spending money	Living with boyfriend	Emotional abuse	Physical abuse	Age difference >4 years	Boyfriend has car	Boyfriend has job
Boyfriend spending money	24.2 %	1.0						
Live with boyfriend	8.0 %	0.17****	1.0					
Emotional abuse	23.6 %	0.15**	0.13**	1.0				
Physical abuse	13.8 %	0.12*	0.05	0.43****	1.0			
Age difference	20.3 %	0.19****	0.10**	0.06	0.05	1.0		
>4 years								
Boyfriend has car	41.5 %	0.13***	0.08*	0.06	-0.08	0.20****	1.0	
Boyfriend has job	56.5 %	0.20****	0.14****	0.05	-0.10*	0.27****	0.44****	1.0
Boyfriend makes more money	47.3 %	0.22****	0.09*	0.08	-0.06	0.27****	0.37****	0.83****

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; **** $p \leq 0.0001$

Cohabitation was associated with six of seven measures of potential coercion, all but physical abuse. Among respondents ages 15–19, 6.8 % cohabited, above the national average for those ages of 1.8–5.6 %.^{17–19}

Cohabiting adolescents were almost 35 percentage points more likely to have unprotected sex than adolescents in other living arrangements, which had small to medium effect size (Table 2). Cohabiting minors were on average 41 percentage points more likely to have unprotected sex, which is classified as a small but significant effect size. Adolescents with older boyfriends were less likely to have unprotected sex in two of three waves in bivariate analysis, but there was no difference in multivariate analysis. Having a job, car, and making more money than the respondent predicted unprotected sex in all three waves with small effect size in bivariate but not multivariate analysis.

Cohabiting adolescents were on average 16 percentage points more likely to be pregnant 6 months later, which had small effect size (Table 3). Cohabiting minors were on average 23 percentage points more likely to be pregnant 6 months later, which had small to medium effect size. Having a boyfriend as the primary source of spending money predicted unprotected sex in bivariate analysis in all three waves and predicted greater chances of subsequent pregnancy in one of two waves (small effect size). Adolescents with older boyfriends at baseline were more likely to be pregnant 6 months later in bivariate analysis (small effect size) and 68 % more likely in multivariate analysis, but the effect was only significant in one of the two waves.

Cohabiting adolescents were on average 48 % more likely to have unprotected sex, adjusting for demographics, economic factors, relationship attributes including three measures of relationship commitment, and intervention status (Table 4). Cohabiting minors were on average 93 % more likely to have unprotected sex, adjusting for demographics, economic factors, relationship attributes, and intervention status. Adolescents with respectively physically and emotionally abusive boyfriends were 55 and 31 % more likely to have unprotected sex than adolescents with nonphysically and emotionally abusive boyfriends. Adolescents whose boyfriends were their primary source of spending money were on average 18 % more likely to have unprotected sex, controlling for economic and relationship factors, but the effect was only significant in the first wave and marginally significant after that.

Adjusting for frequency of sex and contraception, cohabiting adolescents and cohabiting minors were respectively 2.2 and 3.8 times as likely to be pregnant 6 months later than adolescents in other living arrangements (Table 5). Adolescents with an older boyfriend were 68 % more likely to be pregnant 6 months later than adolescents with boyfriends less than 4 years older. Having a boyfriend with a job and who makes more money than the respondent at baseline predicted 65–66 % greater chances of subsequent pregnancy at 6 months ($p < 0.1$) but not 12 months and not overall in the panel data.

Relationship factors associated with greater chances of loss-to-follow-up included cohabitation at both baseline ($p = 0.01$) and 6 months ($p = 0.05$), and at 6 months having a boyfriend as a primary source of spending money ($p = 0.02$), having a boyfriend with a car ($p = 0.001$), job ($p = 0.0001$), and who earns more money ($p = 0.003$). Physically and emotionally abused adolescents were not more likely to be lost to follow-up than nonabused adolescents.

DISCUSSION

All respondents had the intention not to become pregnant at baseline, and yet over 20 % of respondents who cohabited with their boyfriends became pregnant within

TABLE 3 Associations between subsequent pregnancy and each measure of potential coercion

Pregnant one wave later (%)										
Predictor	Wave 2 (n = 607)				Wave 3 (n = 560)				Avg. diff.	
	No	Yes	p	g	No	Yes	p	g		
Live with boyfriend (ages 15–17)	5.9	25.0	*	0.3	5.9	33.3	**	0.5	23.3	
Live with boyfriend	8.0	21.4	**	0.2	7.3	25.0	****	0.4	15.6	
Boyfriend with job	5.7	11.3	*	0.2	6.7	11.0	+	0.2	5.0	
Boyfriend primary source of spending money	7.4	13.7	*	0.2	8.3	11.7		0.1	4.9	
Boyfriend who makes more money	6.2	11.9	*	0.2	7.8	10.9		0.1	4.4	
Boyfriend who physically abuses	10.7	13.6		0.1	10.6	16.0		0.0	4.2	
Age difference >4 years	7.4	11.6	+	0.2	8.8	9.5		0.0	2.5	
Boyfriend with car	8.0	10.2		0.1	8.2	10.6		0.1	2.3	
Boyfriend who emotionally abuses	10.4	13.3		0.1	11.0	10.6		0.0	1.3	

Pregnancy is assessed one wave after each measure of potential coercion. The average raw difference summarizes the difference for each factor and is defined as the average difference in the unprotected sex percentages across the three waves between those with and without the factor. The results are sorted in order of the average raw difference. Hedges' $g \leq 0.2$ is negligible, 0.2–0.5 small effect size, 0.5–0.8 medium effect size, ≥ 0.8 large. Emotional and physical abuse is limited to respondents over 18 due to mandatory reporting requirements: $n = 315$, 337 at waves 2 and 3

+ $p \leq 0.1$; * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; **** $p \leq 0.0001$

TABLE 4 Prediction of unprotected sex from each measure of potential coercion, controlling for demographics, economic factors, relationship attributes, intervention status, and (in the panel data) wave

Outcome: unprotected sex									
Predictor	Wave 1 (n = 715)			Wave 2 (n = 607)			Wave 3 (n = 605)		
	IRR (95 % CI)	p		IRR (95 % CI)	p		IRR (95 % CI)	p	
Live with boyfriend (minors)	1.76 (1.26, 2.46)	***		1.98 (1.20, 3.27)	**		2.09 (0.93, 4.69)	+	
Boyfriend who physically abuses	1.32 (1.04, 1.68)	*		1.84 (1.37, 2.47)	****		1.74 (1.28, 2.35)	****	
Live with boyfriend	1.41 (1.18, 1.68)	****		1.44 (1.15, 1.81)	**		1.80 (1.42, 2.28)	****	
Boyfriend who emotionally abuses	1.26 (1.03, 1.55)	*		1.42 (1.05, 1.93)	*		1.35 (0.97, 1.87)	+	
Boyfriend primary source of spending money	1.18 (1.00, 1.40)	*		1.21 (0.97, 1.51)	+		1.12 (0.86, 1.46)		
Age difference >4 years	1.00 (0.81, 1.24)			1.04 (0.83, 1.30)			1.16 (0.91, 1.46)		
Boyfriend with job	1.20 (0.99, 1.44)	+		0.92 (0.73, 1.17)			0.89 (0.68, 1.16)		
Boyfriend with car	1.09 (0.93, 1.30)			0.97 (0.78, 1.20)			0.86 (0.67, 1.09)		
Boyfriend who makes more money	1.17 (0.98, 1.38)	+		0.88 (0.71, 1.10)			0.82 (0.65, 1.05)		

The table is sorted in order of the incidence risk ratios from the panel data. Regressions for emotional and physical abuse were limited to respondents over 18 due to mandatory reporting requirements: n = 385, 366, and 419 at waves 1, 2, and 3, and n = 1170 within 512 observations in the panel data. Regressions for cohabitation among minors were limited to respondents under 18 at the time of the survey, n = 327, 229, and 159 at the three waves, and n = 714 within 328 observations in the panel data

+ p ≤ 0.1; *p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001; ****p ≤ 0.0001

TABLE 5 Prediction of pregnancy 6 months after report of each measure of potential coercion, controlling for frequency of sex and birth control 6 months earlier

Predictor	Outcome: pregnant				Panel data (n = 1036)			
	Wave 2 (n = 607)		Wave 3 (n = 560)		Wave 3 (n = 560)		Panel data (n = 1036)	
	IRR	(95 % CI)	p		IRR	(95 % CI)	IRR	(95 % CI)
Live with boyfriend (minors)	3.22	(0.92, 11.3)	+		3.66	(1.17, 11.5)	3.84	(1.47, 10.0)
Live with boyfriend	1.50	(0.74, 3.03)		*	2.24	(1.18, 4.27)	2.19	(1.35, 3.56)
Age difference >4 years	2.19	(1.33, 3.59)	**		1.02	(0.56, 1.85)	1.68	(1.14, 2.49)
Boyfriend who physically abuses	0.89	(0.40, 1.98)			0.97	(0.38, 2.48)	1.48	(0.77, 2.84)
Boyfriend with job	1.66	(0.94, 2.93)	+		1.37	(0.79, 2.38)	1.34	(0.83, 2.16)
Boyfriend primary source of spending money	1.39	(0.81, 2.40)			1.22	(0.68, 2.17)	1.33	(0.87, 2.05)
Boyfriend who makes more money	1.65	(0.99, 2.77)	+		1.23	(0.73, 2.06)	1.20	(0.79, 1.82)
Boyfriend with car	1.07	(0.65, 1.77)			1.21	(0.72, 2.01)	0.92	(0.60, 1.40)
Boyfriend who emotionally abuses	0.98	(0.51, 1.90)			0.75	(0.33, 1.72)	0.87	(0.49, 1.54)

The table is sorted in order of the geometric mean of the incidence risk ratios. Regressions for emotional and physical abuse are limited to respondents over 18 due to mandatory reporting requirements: n = 315, 337, and 611 at waves 2 and 3, and n = 751 observations among 447 individuals in panel data. Regressions for cohabitation among minors were limited to respondents under 18 at the time of the survey, n = 289 and 211 in the waves and n = 555 observations among 328 individuals in the panel data

+p ≤ 0.1; *p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001; ****p ≤ 0.0001

6–12 months of baseline, significantly higher than the percentage of noncohabiters who became pregnant. The relationship was particularly strong for minors (ages 15–17) who lived with their boyfriends, as would be predicted by the Theory of Gender and Power because minors have greater vulnerability to coercion than adults. This finding is not explained by cohabiting leading to more frequent sex or more unprotected sex, which was controlled for in the regressions. Adolescent cohabitation may arise from greater relationship commitment, but cohabiting adolescents who lack affordable housing alternatives, including having a strained relationship with their families, may feel coerced to maintain poor relationships. Even cohabiting partners who contribute equally to maintain their homes may lack other affordable housing options. These analyses controlled for three measures of relationship closeness, reducing the possibility that the association can be explained by unprotected sex being more common within committed relationships. This study suggests that regardless of the original motivation behind cohabitation, such as relationship closeness, cohabiting adolescents have less ability to leave romantic relationships than adolescents in other living arrangements and may be vulnerable to reproductive coercion.

As rental costs in urban areas have increased, adolescents like those in this study may be more likely to stay with coercive partners. In the decade since the data was collected, the cost burden of rent has grown for low-income renters, especially for African-Americans.³⁸ In Atlanta, 85 % of households earning less than \$15,000 per year spend more than 30 % of their income on rent, as do 55 % of households earning between \$30,000 and \$45,000, and the percentages are similar in other large metropolitan areas.³⁹ Low-income women are also more likely to be evicted.³⁸ Low-income households are expected to continue to pay a disproportionately high portion of their income on rent through 2025.⁴⁰ For maximal effectiveness, safe sex interventions must address participants' housing arrangements and the possibility that some participants enter or remain in coercive relationships to meet their housing needs.

HIV prevention efforts have begun to address structural factors such as housing.⁴¹ Interventions exist to reduce the chances of pregnancy coercion among women experiencing intimate partner violence.⁴² Similar interventions could be developed to help adolescents to delay cohabitation until adulthood and reduce economic dependence on their partners. Such efforts may be challenged by the absence of an adequate social safety net and supply of affordable housing.

This research concurs with past research that adolescents with older boyfriends are more likely to have unplanned pregnancy,^{13,14} which is also predicted by the Theory of Gender and Power. This research also concurs with past research that adolescents in physically or emotionally abusive relationships are more likely to have unprotected sex,^{5,7} which is also predicted by theory. Adolescents in abusive relationships were not more likely to become pregnant, which could be due to abused adolescents terminating their pregnancies or insufficient statistical power due to the combination of the small number of pregnancies among respondents over the age of 18 at the time of the survey (38 pregnancies at both 6 and 12 months). This lack of association between abuse and pregnancy is not attributable to loss-to-follow-up because abused adolescents did not differ in their likelihood of participating in the next survey wave.

Concurring with previous research using this data,⁸ participants whose boyfriends are a primary source of spending money were more likely to have unprotected sex than participants with other sources of spending money. They were not more likely to become pregnant, which could be partially attributable to slightly greater attrition from the sample, pregnancy terminations, or reduced power.

Strengths and Limitations

Cohabitation may signify many measured and unmeasured factors, including stronger romantic attachment, a lack of other housing options, or ambivalence about pregnancy intentions. If cohabitation suggests that respondents had limited housing options, interventions could reduce pregnancies by assisting participants with their housing needs. Regardless of the reasons for the cohabitation, cohabitation appears to be a marker for unprotected sex and pregnancy risk, especially among minors.

The survey instrument did not include detailed information about household composition because respondents were only allowed to make one selection. Cohabitation may be underreported because a respondent who lives with both their relative and their boyfriend may have reported only their relative. The study could neither differentiate between respondents who live with a boyfriend in addition to family members and respondents who live with only a boyfriend nor differentiate between respondents whose boyfriend moved in with her family and respondents who moved in with their boyfriends. Measurement error in cohabitation would be expected to bias the results toward the null of no association, so the associations between cohabitation and the outcomes of pregnancy and unprotected sex may be larger than stated. Cohabiting adolescents were also more likely to be lost to follow-up, which may bias the association with pregnancy toward the null if pregnant participants were less likely to participate in the subsequent wave of the study.

This study is unique for using a biomarker for semen exposure to augment self-reported contraceptive use and thus identifies more unprotected sex than would be found by self-report alone.

Respondents were chosen for saying that they did not want to become pregnant, but pregnancy intentions may be more complicated than a binary response to a screening question, as documented in a similar population.⁴³ Some respondents may have wanted to get pregnant but may have misreported their pregnancy intentions to participate in the study. However, this study was time-intensive—requiring medical tests, willingness to participate in a 9 h HIV prevention intervention, and follow-ups at 6 and 12 months that had low loss-to-follow-up—and it seems unlikely that respondents who affirmatively wanted pregnancy would participate in such an intensive intervention to promote condom use.

CONCLUSION

Adolescents in at-risk populations may cohabit at greater rates than similar-aged adolescents in the general population. Cohabiting adolescents within these populations are at greater risk for unprotected sex and unplanned pregnancy, especially minors. Interventions to reduced unplanned pregnancy and HIV that address the complex needs of adolescents, including financial and housing needs, are likely to be more successful at increasing condom use and other safe sex practices.

ACKNOWLEDGMENTS

This research was funded by T-32 AI050056 from the Sexually Transmitted Diseases Division of the Centers for Disease Control and Prevention (Dr. Zenilman), the Eunice Kennedy Shriver National Center for Child Health and Human Development grant R24-HD041041 (Maryland Population Research Center), and the School of Public Health at SUNY Downstate Medical Center. The data collection was funded by R01 MH061210 from the Center for Mental Health Research on AIDS, National Institute of Mental Health, Bethesda, MD (Drs. DiClemente and Wingood).

APPENDIX

TABLE 6 Measures of unprotected sex: time period (14 days, 60 days, or last sex), definition, and bivariate analysis between each unprotected sex measure and pregnancy at the subsequent wave

Measure with definition	Time period	Pregnant wave (%)		Pregnant wave 3 (%)		p
		No	Yes	No	Yes	
Biomarker positive and no pregnancy prevention	14 days	4.5	14.2	7.0	12.8	*
No condom use, not currently taking oral contraception, or tested positive for Yc-PCR biomarker for unprotected sex						
No condom or oral contraception use	14 days	7.6	12.7	7.9	12.9	+
No condom use and not taking oral contraception						
Biomarker positive and no oral contraception	14 days	5.7	16.2	8.3	13.0	
Positive Yc-PCR biomarker and not taking oral contraception						
Biomarker unprotected sex	14 days	5.8	15.5	8.4	12.1	
Positive Yc-PCR biomarker						
No condom or oral contraception use	60 days	7.4	15.0	8.5	12.0	
No condom use and not taking oral contraception						
No condom use	60 days	7.5	14.2	8.5	11.6	
Reported having used condoms in 0 episodes of vaginal sex						
No pregnancy protection	Last sex	7.6	10.3	6.2	12.8	**
Reported using no method of pregnancy prevention at last sex and not taking oral contraception						
No condom use	14 days	7.7	11.9	8.0	12.3	+
Reported having used condoms in 0 episodes of vaginal sex						

Measures are sorted in decreasing order of significance for predicting pregnancy at both waves. The Y-chromosome PCR (Yc-PCR) biomarker for unprotected sex is sensitive to the presence of semen Y-chromosome for up to 14 days even during menses^{29,30,44}
+p ≤ 0.1; *p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001; ****p ≤ 0.0001

REFERENCES

1. Committee on Health Care for Underserved Women. ACOG Committee opinion no. 554: reproductive and sexual coercion. *Obstet Gynecol.* 2013; 121(2 Pt 1): 411–5.
2. Pallitto C, Campbell JC, O'Campo P. Is intimate partner violence associated with unintended pregnancy? A review of the literature. *Trauma Violence Abuse.* 2005; 6(3): 217–35.
3. Biglan A, Noell J, Ochs L, Smolkowski K, Metzler C. Does sexual coercion play a role in the high-risk sexual behavior of adolescent and young adult women? *J Behav Med.* 1995; 18(6): 549–68.
4. Miller E, Decker MR, McCauley HL, Tancredi DJ, Levenson RR, Waldman J, Schoenwald P, Silverman JG. Pregnancy coercion, intimate partner violence and unintended pregnancy. *Contraception.* 2010; 81(4): 316–22.
5. Paterno MT, Jordan ET. A review of factors associated with unprotected sex among adult women in the United States. *J Obstet Gynecol Neonatal Nurs.* 2012; 41(2): 258–74.
6. Silverman JG, McCauley HL, Decker MR, Miller E, Reed E, Raj A. Coercive forms of sexual risk and associated violence perpetrated by male partners of female adolescents. *Perspect Sex Reprod Health.* 2011; 43(1): 60–5.
7. Hathaway JE, Willis G, Zimmer B, Silverman JG. Impact of partner abuse on women's reproductive lives. *J Am Med Womens Assoc.* 2005; 60(1): 42–5.
8. Rosenbaum JE, Zenilman J, Rose E, Wingood GM, DiClemente RJ. Cash, cars, and condoms: economic factors in disadvantaged adolescent women's condom use. *J Adolesc Health.* 2012; 51(3): 233–41.
9. Wingood GM, DiClemente RJ. Application of the theory of gender and power to examine HIV-related exposures, risk factors, and effective interventions for women. *Health Educ Behav.* 2000; 27(5): 539–65.
10. Luke N. Confronting the 'sugar daddy' stereotype: age and economic asymmetries and risky sexual behavior in urban Kenya. *Int Fam Plan Perspect.* 2005; 31(1): 6–14.
11. Kuate-Defo B. Young people's relationships with sugar daddies and sugar mummies: what do we know and what do we need to know? *Afr J Reprod Health.* 2004; 8(2): 13–37.
12. Fiscian VS, Obeng EK, Goldstein K, Shea JA, Turner BJ. Adapting a multifaceted U.S. HIV prevention education program for girls in Ghana. *AIDS Educ Prev.* 2009; 21(1): 67–79.
13. Darroch JE, Landry DJ, Oslak S. Age differences between sexual partners in the United States. *Fam Plan Perspect.* 1999; 31(4): 160–7.
14. Manlove J, Terry-Humen E, Ikramullah E. Young teenagers and older sexual partners: correlates and consequences for males and females. *Perspect Sex Reprod Health.* 2006; 38(4): 197–207.
15. Ryan S, Franzetta K, Manlove JS, Schelar E. Older sexual partners during adolescence: links to reproductive health outcomes in young adulthood. *Perspect Sex Reprod Health.* 2008; 40(1): 17–26.
16. Billy JOG, Grady WR, Sill ME. Sexual risk-taking among adult dating couples in the United States. *Perspect Sex Reprod Health.* 2009; 41(2): 74–83.
17. Kennedy S, Fitch CA. Measuring cohabitation and family structure in the United States: assessing the impact of new data from the Current Population Survey. *Demography.* 2012; 49(4): 1479–98.
18. Copen CE, Daniels K, Vespa J, Mosher WD. *First marriages in the United States: data from the 2006–2010 National Survey of Family Growth.* Hyattsville, MD: Technical Report 49, National Center for Health Statistics, CDC, March 2012.
19. Goodwin PY, Mosher WD, Chandra A. *Marriage and cohabitation in the United States: a statistical portrait based on cycle 6 (2002) of the National Survey of Family Growth.* Hyattsville, MD: Technical Report 28, National Center for Health Statistics, CDC, February 2010.

20. Berzin SC, De Marco AC. Understanding the impact of poverty on critical events in emerging adulthood. *Youth Soc.* 2010; 42(2): 278–300.
21. Goldscheider FK, Goldscheider C. *The changing transition to adulthood leaving and returning home*. Thousand Oaks, Calif.: Sage Publications; 1999.
22. Nadeem E, Whaley SE, Anthony S. Characterizing low-income Latina adolescent mothers: living arrangements, psychological adjustment, and use of services. *J Adolesc Health.* 2006; 38(1): 68–71.
23. Goffman A. On the run: wanted men in a Philadelphia ghetto. *Am Sociol Rev.* 2009; 74(3): 339–57.
24. Edin K. What do low-income single mothers say about marriage? *Soc Probl.* 2000; 47(1): 112–33.
25. Cross-Barnet C, Cherlin A, Burton L. Bound by children: intermittent cohabitation and living together apart. *Fam Relat.* 2011; 60(5): 633–47.
26. Connell R. *Gender and power: society, the person, and sexual politics*. Palo Alto, CA: Stanford University Press, 1987.
27. Rose E, Diclemente RJ, Wingood GM, Sales JM, Latham TP, Crosby RA, Zenilman J, Melendez J, Hardin J. The validity of teens' and young adults' self-reported condom use. *Arch Pediatr Adolesc Med.* 2009; 163(1): 61–4.
28. Zenilman JM, Yuenger J, Galai N, Turner CF, Rogers SM. Polymerase chain reaction detection of Y chromosome sequences in vaginal fluid: preliminary studies of a potential biomarker for sexual behavior. *Sex Transm Dis.* 2005; 32(2): 90–4.
29. Ghanem KG, Melendez JH, McNeil-Solis C, Giles JA, Yuenger J, Smith TD, Zenilman JM. Condom use and vaginal Y-chromosome detection: the specificity of a potential biomarker. *Sex Transm Dis.* 2007; 34(8): 620–3.
30. Melendez JH, Giles JA, Yuenger JD, Smith TD, Ghanem KG, Reich K, Zenilman JM. Detection and quantification of Y-chromosomal sequences by real-time PCR using the LightCycler system. *Sex Transm Dis.* 2007; 34(8): 617–9.
31. Scanlon J. *Sexual bargaining: power politics in the American marriage*. Chicago, IL: University of Chicago Press; 1982.
32. Sipsma HL, Ickovics JR, Lewis JB, Ethier KA, Kershaw TS. Adolescent pregnancy desire and pregnancy incidence. *Womens Health Issues.* 2011; 21(2): 110–6.
33. Hedges LV. Distribution theory for glass's estimator of effect size and related estimators. *J Educ Stat.* 1981; 6(2): 107–28.
34. Tannenbaum D. *COHEND: Stata module to compute Cohen's d*. Technical report. Chestnut Hill, MA: Boston College Department of Economics, February 2011.
35. Cummings P. The relative merits of risk ratios and odds ratios. *Arch Pediatr Adolesc Med.* 2009; 163(5): 438–45.
36. McNutt LA, Wu C, Xue X, Hafner JP. Estimating the relative risk in cohort studies and clinical trials of common outcomes. *Am J Epidemiol.* 2003; 157(10): 940–3.
37. Rothman KJ, Greenland S, Lash TL. *Modern epidemiology*. Philadelphia, PA: Lippincott Williams and Wilkins, 3rd edition, 2008.
38. Desmond M. Institute for Research on Poverty, University of Wisconsin. *Unaffordable America: poverty, housing, and eviction, number Fast Focus No. 22–2015*, Madison, WI, March 2015.
39. *America's rental housing: expanding options for diverse and growing demand*. Technical report, Joint Center for Housing Studies of Harvard University, Cambridge, MA, December 9 2015.
40. Charette A, Herbert C, Jakabovics A, Marya ET, McCue DT. *Projecting trends in severely cost-burdened renters: 2015–2025*, Harvard University's Joint Center for Housing Studies and Enterprise Community Partners Inc., September 21 2015.
41. Willard N, Chutuaape K, Stewart-Campbell R, Boyer CB, Ellen J. Targeting structural change for HIV prevention: a process and tool for community application prevention: a process and tool for community application. *Health Promot Pract.* 2015; 16(6): 837–48.

42. Miller E, Decker MR, McCauley HL, Tancredi DJ, Levenson RR, Waldman J, Schoenwald P, Silverman JG. A family planning clinic partner violence intervention to reduce risk associated with reproductive coercion. *Contraception*. 2011; 83(3): 274–80.
43. Schwartz A, Peacock N, McRae K, Seymour R, Gilliam M. Defining new categories of pregnancy intention in African-American women. *Womens Health Issues*. 2010; 20(6): 371–9.
44. Brotman RM, Melendez JH, Smith TD, Galai N, Zenilman JM. Effect of menses on clearance of Y-chromosome in vaginal fluid: implications for a biomarker of recent sexual activity. *Sex Transm Dis*. 2010; 37(1): 1–4.