Dual Method Use Among a Sample Of First-Year College Women

CONTEXT: *Dual method use—using one protective method to reduce the risk of STDs and another to prevent pregnancy—is effective but understudied. No prior studies have employed an event-level approach to examining characteristics associated with dual method use among college women.*

METHODS: *In 12 consecutive monthly surveys conducted in 2009–2010, data on 1,843 vaginal intercourse events were collected from 296 first-year college women. Women reported on their use of condoms and hormonal contraceptives during all events. Multilevel regression analysis was used to assess associations between event-, month- and person-level characteristics and hormonal use and dual method use.*

RESULTS: *Women used hormonal contraceptives during 53% of events and condoms during 63%. Dual method use was reported 28% of the time, and only 14% of participants were consistent users of dual methods. The likelihood of dual method use was elevated when sex partners were friends as opposed to romantic partners or ex-boyfriends (odds ratios, 2.5–2.8), and among women who had received an STD diagnosis prior to college (coefficient, 2.9); it also increased with level of religiosity (0.8). Dual use was less likely when less reliable methods were used (odds ratio, 0.2) and when women reported more months of hormonal use (0.8), were older than 18 (coefficient, –4.7) and had had a greater number of partners before college (–0.3).*

CONCLUSIONS: *A better understanding of the characteristics associated with dual method use may help in the design of potential intervention efforts.*

Perspectives on Sexual and Reproductive Health, 2014, 46(2):73–81, doi: 10.1363/46e1014

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STDs and unplanned pregnancy affect many young people. In the United States, 20 million new STD diagnoses are made each year,[1] and although teenagers and young adults (15–24-year-olds) make up only 25% of the sexually active population, they account for 50% of all gonorrhea infections and 75% of all chlamydia infections.[2] In addition, U.S. women aged 18–19 experience a high rate of unplanned pregnancy (162 per 1,000),[3] which exceeds rates in other industrialized nations.[4] These consequences of unprotected sexual behavior are common despite the availability of highly effective contraceptive and preventive methods.

Dual method use involves the use of a contraceptive to reduce pregnancy risk and another method to reduce the risk of STDs. This combined approach is recommended because condom use is the most effective method for preventing the spread of STDs,[5] whereas hormonal contraception is the most effective method for pregnancy prevention.[6]

Despite the efficacy of dual method use as a protective strategy, uptake of this practice remains low; in one review, rates of dual use ranged from 12% among sexually active women aged 21–25 (2006–2008) to 23% among men and women aged 18–26 and in dating relationships (2002–2005).[7] National data indicate that fewer than one-third of sexually active, unmarried women aged 15–19 use condoms consistently,[8] and rates are even lower when hormonal contraceptives are used[9] and in romantic relationships.[10] Increasing dual method use among 15–19-year-old females is a goal of Healthy People 2020.[11] To improve our understanding about dual method use, for this exploratory study, we examined the prevalence, use patterns and correlates of dual use among female college students.

BACKGROUND

Gaps in the Literature

The literature on dual method use is limited in several ways. First, most studies have focused on younger adolescents;[12] accordingly, we have limited information about the prevalence of or characteristics associated with dual method use among adolescents older than 18 and college students. This is surprising, given that college students are likely to be sexually active and to engage in serial monogamy,[13] and thus have multiple sexual partnerships during the college years.

Second, many studies of the correlates of dual method use have investigated a small number of variables.[14–16] However, sexual behavior is influenced by multiple variables, and is associated with individual, dyadic, familial, peer and other sociocultural characteristics.[17] Research that evaluates a wider range of correlates reflecting a more ecological framework is needed to better understand sexual and contraceptive behavior.[18]

Third, most studies have relied on one-time measures involving a long recall period (e.g., the past 3–6 months), which undermines the reliability of the data,[19] and implicit averaging across events, which results in less precise assessment. Such methods do not capture important variability among events, as use of both condoms and hormonal contraceptives can change over time, and use of either method is often inconsistent. Moreover, features related to the sexual event itself (e.g., partner type or substance use) may be associated with dual method use. Event-level studies address these concerns; however, studies limited to single events are also imperfect, because if that event is not representative, it can distort our understanding. Hence, event-level studies that employ multiple events are needed, as they can provide reliable and precise data that are more representative of a person's sexual experiences.[20]

Potential Correlates of Use

A wide range of sociocultural and behavioral characteristics may be associated with contraceptive use, and these associations have been examined to varying degrees.

•***Relationship type and duration.*** Hormonal contraceptive use becomes more frequent, and condom use less frequent, as relationship duration increases,[21–23] and relationship commitment and duration are negatively associated with dual method use.[24,25] Moreover, frequent intercourse (common with steady partners) is negatively related to condom use[26] and dual method use.[27] In addition, condom use is more common with casual than with committed partners.[28,29] Notably, few studies have considered the likelihood of dual use with specific types of sexual partners (e.g., acquaintances, friends, ex-boyfriends or new romantic partners). However, studies have suggested that the types of sexual activities engaged in and the emotional reactions to sexual encounters differ across types of casual sexual partners,[30,31] and one study found that condom use was more common with ex-boyfriends, ex-girlfriends and acquaintances than with strangers and friends.[30]

•***Substance use.*** Drinking, smoking marijuana and cigarette smoking may be related to dual method use, although results from past research are mixed. Alcohol and marijuana use are thought to interfere with sexual decision making,[32,33] and these behaviors may lead to decreases in condom use[34,35] and dual method use.[14] However, one study of college students found no association between substance use and dual method use.[25] Research has also associated cigarette smoking with higher levels of risky sexual behavior,[36] although smoking in adolescence may be positively associated with consistent condom use in young adulthood.[37]

•***Hormonal contraceptive use.*** Research has suggested that as women gain experience with hormonal methods, they may reduce their condom use (and thus dual method use), possibly because they are more confident that their hormonal contraceptive will protect against pregnancy.[26]

•***Sexual history and risk perceptions.*** One study suggested that women who have partners they perceive as risky may be more likely than others to use dual methods,[25] while another found that dual use was negatively correlated with perceptions of STD risk.[16] Other research has found that women who have had an STD are more likely than others to use condoms,[38] possibly because they place greater importance on protection. Some studies have found that young people who have had a greater number of sexual partners are more likely than those who have had fewer partners to use dual methods,[39,40] but research has also suggested that condom use declines more rapidly within relationships for those who have had more past partners.[23] An additional element that may relate to risk perception is use of less reliable contraceptive methods. The diaphragm, sponge, fertility awareness and withdrawal are less effective than condoms and hormonal contraceptives for both pregnancy and STD prevention;[6,41] however, women using these methods may believe they are adequately protected.[42] Most prior studies of dual method use have either not considered these methods or included them in the definition of dual method use despite their lower effectiveness.[12,14,16]

•***Parent and peer characteristics.*** One study found that positive parental attitudes toward condom use and birth control were associated with increased levels of dual method use.[16] Similarly, discussing safer sex with parents has been correlated with dual use;[12,43] however, studies have not investigated the role of communication with peers. Parental connectedness appears to be protective against sexual risk behavior and pregnancy,[44] so we might expect it to be positively associated with dual method use, although no studies have specifically examined this.

•***Personality.*** Impulsivity and sensation-seeking are both related to risky sexual behavior,[45] and one study found that impulsivity was negatively associated with dual use.[46] In contrast, conscientiousness has been found to be positively associated with condom use,[47] but its association with dual method use has not been explored.

•***Demographic characteristics.*** Past research has suggested that the prevalence of dual use is higher among adolescents than among adults,[7,39] and higher among blacks than among whites or Latinas.[15] Religiosity is commonly regarded as protective against sexual activity in general,[48] but studies have found mixed results regarding its association with condom use,[48,49] and the possible correlation between religiosity and dual method use has not been examined. A final demographic correlate is socioeconomic status; one study showed that teenagers from higher status groups were more likely than others to use condoms,[50] and this variable has been assessed in some dual method studies.[16]

The Current Study

This exploratory study addresses two questions: What is the prevalence of dual method use in a sample of first-year college women? And what characteristics are associated with dual use in this sample? We used event-level data from multiple sexual events, and considered a wide variety of event-, month- and person-level characteristics that may

be associated with dual method use, many of which have rarely or never been considered. Consistent with a behavioral ecological framework,[18] we included proximal variables related to the sex partner and characteristics of the sexual event—often neglected in previous studies—as well as more distal ones, such as family and peer characteristics. We also considered two categories of risk behavior—substance use and past sexual experience—which are important elements in an ecological framework.[18]

METHODS

Participants and Procedures

Women came from a pool of 483 first-year students who were attending a private university in upstate New York and who were participating in a yearlong study of health behaviors and relationships. The larger study, conducted between September 2009 and September 2010, explored a variety of health behaviors (e.g., substance use, diet, exercise, sleep), as well as sexual behavior and psychosocial adjustment.[51–53] The full sample constituted 26% of first-year female students for the fall 2009 semester. The 296 women included in the current study reported at least one episode of vaginal intercourse with a romantic or casual partner during their first year of college.

The university's institutional review board approved all study procedures. Participants were recruited via a mass mailing sent to first-year female students. Campus flyers, word of mouth and the psychology department participant pool bolstered recruitment. Most participants (61%) heard about the study through the mass mailing, 28% signed up through the department pool, and 11% responded to flyers or word of mouth. Interested students attended an orientation session, after which they provided informed consent and completed the initial survey. Subsequently, participants completed monthly online assessments for one year; surveys were completed during the first week of each month, and reports covered the previous month. Participants received $10–20 for each survey, depending on its length.

Measures

•***Event-level variables.*** At each monthly survey, women who said they had had oral or vaginal sex during the past month reported on their most recent encounter involving oral, vaginal or anal sex with both a romantic partner and a casual partner. (A romantic partner was defined as "someone whom you were dating or in a romantic relationship with at the time of the physical intimacy"; a casual partner was "someone whom you were not dating or in a romantic relationship with at the time of the physical intimacy, and there was no mutual expectation of a romantic commitment; some people call these hookups.") Thus, each participant could describe 0–2 encounters per month, or 0–24 total. Only reports of vaginal sex in the preceding month were included in this analysis.

For vaginal intercourse events, participants reported all contraceptive methods they had used. Response options were nothing; male condom; pill, patch or ring; withdrawal ("pulling out"); injectable; female condom; IUD; diaphragm, cervical cap or sponge; fertility awareness (calendar, mucus, basal body temperature); and other. Women were coded as using a condom if they reported male or female condom use. They were coded as using another reliable contraceptive if they had used the pill, patch, ring, injectable or IUD; no women in our sample reported IUD use, so this category is henceforth referred to as "hormonal contraceptive use." Women were coded as using a less reliable method if they had used withdrawal; a diaphragm, cap or sponge; or fertility awareness.[6]

For events with romantic partners, relationship duration was dichotomized into one month or less or longer than a month. The one-month cutoff was chosen because condom use begins to decline within weeks of beginning a new relationship.[10] For events with casual partners, participants were asked to identify their partner; response options were a stranger, an acquaintance, a friend, an ex-boyfriend and other. Answers of "other" were rare (2%) and were coded as missing.

Participants also reported whether they had drunk alcohol or used marijuana before each event.

•***Month-level variables.*** Some variables were assessed on a monthly basis but were not linked directly to the sexual events reported. Because measures were collected over one year, we included the month of data collection in models, ranging from 2 (October 2009) to 13 (September 2010). Participants who were involved in romantic relationships reported their relationship duration in months. Women indicated the number of days in the past month during which they had engaged in binge drinking (consuming four or more drinks on one occasion) or had smoked marijuana. They were also asked whether they had smoked a cigarette during the past month; those who had smoked reported the average number of cigarettes per day. Because of low rates of cigarette smoking, a dummy variable was created indicating whether participants had smoked at least one cigarette a day, on average.

Participants reported the number of times they had had vaginal intercourse with romantic and casual partners during the past month. We created separate counts of monthly intercourse events by type of partner (excluding the event under analysis). Similarly, participants reported the number of romantic and casual partners they had had intercourse with in the past month; these counts also excluded the event under analysis. Finally, we created a variable indicating women's average number of months of hormonal contraceptive use; this included only months after women had enrolled in college.

•***Person-level variables.*** These variables were assessed only once during the year. Several items concerned sexual history. At baseline, participants indicated the number of partners they had had vaginal intercourse with, whether they had ever received an STD diagnosis and whether they had ever been pregnant prior to enrolling. In April 2010, participants answered one item assessing perceived STD risk: "What do you think your chances are of getting an

TABLE 1. Selected event-, month- and person-level characteristics of vaginal intercourse events among first-year college women attending a private university, New York State, 2009–2010

Characteristic	% or mean
Event level	(N=1,843)
Partner type	
Stranger	1
Acquaintance	4
Friend	15
Ex-boyfriend	5
New romantic (≤1 month)	22
Established romantic (>1 month)	53
Used alcohol before intercourse	20
Used marijuana before intercourse	7
Used less reliable contraceptive†	30
Month level	(N=1,843)
Month of data collection (range, 2–13)	7.5 (3.5)
Months of romantic relationship (range, 0–53)	9.1 (12.1)
No. of days engaged in binge drinking (range, 0–14)	2.8 (3.4)
No. of days used marijuana (range, 0–21)	2.4 (5.1)
Smoked cigarettes	14
No. of intercourse events‡	
With romantic partner (range, 0–31)	5.5 (7.0)
With casual partner (range, 0–7)	0.4 (1.2)
No. of intercourse partners (range, 0–2)‡	
Romantic	0.1 (0.3)
Casual	0.1 (0.3)
Months of hormonal contraceptive use (range, 1–12)§	4.2 (2.8)
Person level	(N=296)
Age	
18	96
>18	4
Race	
White	71
Black	13
Asian	8
Other	7
Latina	11
Family socioeconomic status (range, 1–10)	6.3 (1.6)
Religiosity (range, 0–3)	0.9 (0.7)
No. of intercourse partners before college (range, 0–9)	2.4 (2.4)
Perceived STD risk (range, 1–5)	2.0 (0.9)
Ever had STD diagnosis before college	3
Ever pregnant before college	2
Parental connectedness (range, 1–4)	3.4 (0.5)
Parental attitude toward birth control (range, 1–5)	3.5 (1.1)
Parental communication about sex (range, 0–4)	1.7 (0.7)
Peer communication about sex (range, 1–6)	2.5 (1.1)
Impulsivity (range, 1–4)	2.2 (0.6)
Sensation-seeking (range, 1–4)	2.9 (0.6)
Conscientiousness (range, 1–7)	5.2 (1.1)

†Withdrawal, diaphragm, cervical cap, sponge or fertility awareness. ‡Excludes the current event or partner. §Includes only women who reported use (181 women across 977 months). *Notes:* Data for which no ranges are shown are percentages. Figures in parentheses are standard deviations.

STD, such as gonorrhea or genital herpes?" Responses were rated on a scale from 1 (no chance) to 5 (very high).

Scales were used to assess parental and peer characteristics. In October 2009, participants completed eight items, adapted from a subscale of the Parenting Style Index,[54] indicating parental connectedness (e.g., "I can count on my parents to help me out if I have some kind of problem"). Responses were scored on a scale from 1 (strongly disagree) to 4 (strongly agree) and were averaged to create a total score (Cronbach's alpha, 0.91). In August 2010, participants answered two items about how their parents would feel about their using birth control at this point in their life; responses were rated on a scale from 1 (strongly disapprove) to 5 (strongly approve).[55] Items were averaged for participants reporting on both parents (Cronbach's alpha, 0.75); single items were used for those reporting on only one parent. In March 2010, participants completed items from the Parent-Adolescent Communication Scale[56] indicating how often since starting college they and their parents had discussed five sexual topics (e.g., protecting themselves from pregnancy and how to use condoms); the scale ranged from 0 (never) to 4 (often). These items were averaged to create a total score (Cronbach's alpha, 0.91). Finally, in March 2010, participants indicated how often in the past month they had discussed three sexual topics with peers: having sex, protection against STDs and protection against pregnancy; responses were scored on a scale from 1 (never) to 6 (nearly every day). Items were adapted from a peer alcohol communication assessment[57] and were averaged to create a total score (Cronbach's alpha, 0.82).

Three scales assessed personality. At baseline, impulsivity and sensation-seeking were measured using six items each from subscales of the Impulsiveness–Monotony Avoidance Scale.[58] Participants indicated how well each item (e.g., "I often throw myself too hastily into things" and "I like doing things just for the thrill of it") applied to them, using a Likert scale from 1 (not at all like me) to 4 (very much like me). Scores were averaged to create a total score (Cronbach's alpha, 0.82 for each scale). Finally, in June 2010, participants responded to items from the Ten-Item Personality Inventory[59] indicating how strongly they agreed that various traits represented them; responses were scored on a scale from 1 (strongly disagree) to 7 (strongly agree). Two items represented conscientiousness ("dependable" and "self-disciplined") and were averaged to create a total score (Cronbach's alpha, 0.42).

Several demographic variables were also assessed. A dummy variable was created to indicate whether participants were older than 18 at baseline, and two other variables indicated whether participants identified themselves as white, black or Asian, or as Latina. Socioeconomic status was assessed using a 10-point ladder,[60] on which participants ranked their family relative to other U.S. families. Finally, participants reported the extent to which they considered themselves religious (from "not religious" to "very religious") and their frequency of attending religious services (from "never" to "more than once a week"). These items were averaged, and higher scores on a 0–3 scale indicated greater religiosity (Cronbach's alpha, 0.80).

Analysis

Completion rates for monthly surveys ranged from 82% (in month 11) to 100% (in month 1); on average, participants completed 11.8 months of data collection (standard deviation, 2.2). To maintain the entire sample, we used multiple imputation to replace missing values.[61] Multiple imputation is a method for dealing with missing data that avoids biases associated with the use of only complete cases or with single imputations.[62] We imputed 100 complete data

sets using Mplus 7,[63] and all study variables were included in the imputation. Analyses were conducted with all 100 data sets, and parameter estimates were pooled using the imputation algorithms in Mplus.

We used multilevel modeling in Mplus 7 to analyze the data. A total of 1,843 sexual events were reported by 296 participants. Given that hormonal contraceptive use is unlikely to vary between events occurring in the same month, we first explored associations between hormonal use and month-level and person-level characteristics. Next, we examined associations between event-, month- and person-level characteristics and condom use in 977 events reported by 181 women in which hormonal contraceptives were also used. Coefficients for variables that were highly nonsignificant ($z<1.00$) were constrained to zero to increase model parsimony and stabilize estimates.[64] Odds ratios (from logistic regression analyses at the event and month levels), unstandardized betas (from linear regression analyses at the person level) and 95% confidence intervals are reported throughout.

RESULTS

Sample Characteristics

The majority of vaginal intercourse events occurred with established romantic partners (53%); events with new romantic partners (22%) and friends (15%) were the next most common (Table 1). Participants reported using alcohol prior to 20% of events, and marijuana before 7%. For 30% of intercourse events, women had used a less reliable contraceptive method.

The average duration of romantic relationships was nine months. Binge drinking and marijuana use occurred 2–3 times per month, on average, but cigarette smoking was relatively uncommon. Women reported a monthly average of 5.5 intercourse events with romantic partners and 0.4 events with casual partners; most women did not report more than one romantic or casual partner in a given month. On average, women who used hormonal contraceptives did so for four months during college.

The great majority of participants (96%) were age 18; the mean age was 18.1 (standard deviation, 0.2—not shown). Most women were white (71%); the remainder were black (13%), Asian (8%) or of other race (7%). Overall, 11% of women were Latina. On average, participants reported being middle- to upper-middle class and had a relatively low level of religiosity.

Participants perceived themselves to be at relatively low risk of STD infection, despite reporting two sexual partners, on average, prior to college; few women reported a history of either STD diagnosis or pregnancy. On average, women reported a high level of connectedness with their parents, perceived their parents to have neutral or positive attitudes toward birth control, and reported communicating about sex with both their parents and peers relatively infrequently. Finally, women reported moderate levels of impulsivity and sensation-seeking, and a high level of conscientiousness.

TABLE 2. Percentage of vaginal intercourse events reported by first-year college women, by contraceptive method used

Method	%
Condom	**63**
Male	63
Female	0.1
Hormonal method†	**53**
Pill/patch/ring	53
Injectable	0.3
Less reliable method‡	**30**
Withdrawal	30
Fertility awareness	2
Diaphragm	0.3
No method	**6**
Multiple methods	**45**
Condom plus hormonal method	28
Condom plus less reliable method	13
Hormonal plus less reliable method	14
≥2 methods	45
≥3 methods	5

†No women reported IUD use. ‡Some women reported more than one of these methods.

Patterns of Contraceptive Use

Across 1,843 sexual intercourse events, women reported using a variety of contraceptive methods (Table 2). Male condoms were used in 63% of events; the pill, patch or ring in 53%; withdrawal in 30%; and no method in 6%. Other methods were used rarely.

Multiple contraceptive methods were used in 45% of events. Condoms and hormonal methods (the combination of primary interest in this study) were used together in 28% of events, condoms and less reliable methods in 13%, and hormonal and less reliable methods in 14%. In 5% of all cases, a condom, a hormonal method and a less reliable method were used in combination.

Of the 296 women who engaged in intercourse over the course of the study, 39% did not report any hormonal contraceptive use, while 34% reported such use during all intercourse events. The remaining 27% reported inconsistent use of hormonal methods across the year; these women either initiated use (13%), stopped use (7%) or reported other patterns of use (6%).

Forty-six percent of women were consistent condom users across all reported events, while 11% never used condoms; the remaining 43% reported inconsistent condom use. Only 14% of women were consistent dual method users; 53% never used dual methods, and the remaining 33% used dual methods inconsistently.

Correlates of Method Use

•***Hormonal methods.*** Our multilevel model (Table 3) showed that women were more likely to use a hormonal contraceptive if they reported more frequent intercourse with romantic partners (odds ratio, 1.1) and perceived that their parents had more positive attitudes toward birth control (coefficient, 1.2). In contrast, women had a reduced

TABLE 3. Results of multilevel modeling estimating odds ratios assessing associations between event- and month-level characteristics of vaginal intercourse events and hormonal contraceptive use or dual method use, and unstandardized coefficients assessing associations between person-level characteristics and such use

Characteristic	Hormonal use	Dual use
Event level		
Partner type		
Stranger	na	‡
Acquaintance	na	‡
Friend	na	2.47 (1.001–6.11)*
Ex-boyfriend	na	0.42 (0.09–1.88)
New romantic	na	‡
Established romantic (ref)	na	1.00
Used alcohol before intercourse	na	1.68 (0.81–3.50)
Used marijuana before intercourse	na	‡
Used less reliable contraceptive	na	0.24 (0.11–0.52)***
Month level		
Month of data collection	1.10 (0.99–1.21)†	1.11 (0.97–1.28)
Months of romantic relationship	‡	na
No. of days engaged in binge drinking	‡	1.05 (0.95–1.15)
No. of days used marijuana	1.06 (0.96–1.17)	‡
Smoked cigarettes	0.58 (0.25–1.36)	‡
No. of intercourse events		
With romantic partner	1.11 (1.05–1.17)***	0.97 (0.93–1.01)
With casual partner	‡	‡
No. of intercourse partners		
Romantic	‡	2.65 (0.96–7.32)†
Casual	‡	‡
Months of hormonal contraceptive use	na	0.80 (0.66–0.96)*
Person level		
Age >18	–4.71 (–8.72 to –0.69)*	–4.66 (–8.76 to –0.55)*
Race		
White	ref	ref
Black	–4.25 (–6.60 to –1.90)***	‡
Asian	‡	1.59 (–0.21 to 3.40)†
Latina	‡	‡
Family socioeconomic status	0.33 (–0.11 to 0.77)	‡
Religiosity	–0.96 (–1.88 to –0.04)*	0.75 (0.01–1.49)*
No. of intercourse partners before college	‡	–0.34 (–0.59 to –0.08)**
Perceived STD risk	–0.47 (–1.34 to 0.40)	‡
Ever had STD diagnosis before college	1.97 (–0.88 to 4.82)	2.88 (1.17–4.59)***
Ever pregnant before college	‡	‡
Parental connectedness	‡	–0.92 (–1.96 to 0.12)†
Parental attitude toward birth control	1.16 (0.46–1.86)***	0.47 (–0.07 to 1.02)†
Parental communication about sex	‡	‡
Peer communication about sex	0.35 (–0.28 to 0.98)	‡
Impulsivity	–1.09 (–2.26 to 0.09)†	–0.71 (–1.45 to 0.03)†
Sensation-seeking	‡	‡
Conscientiousness	0.36 (–0.28 to 1.00)	0.31 (–0.17 to 0.79)
R^2 within	*0.18 (0.03–0.32)**	*0.29 (0.15–0.43)****
R^2 between	*0.25 (0.15–0.35)****	*0.20 (0.07–0.34)***

*p<.05. **p<.01. ***p<.001. †p<.10. ‡Measure was constrained to 0 in the model. *Notes:* Odds ratios are from logistic regression analyses, and unstandardized coefficients are from linear regression analyses. Figures in parentheses are 95% confidence intervals. na=not applicable, because measure was not included in the model. ref=reference group.

likelihood of reporting hormonal use if they were older than 18 (–4.7), black (–4.3) or more religious (–1.0). This model explained 18% of the event-level variance and 25% of the person-level variance.

•***Dual methods.*** Women were more likely to report dual method use when their partner was a friend rather than an established romantic partner (odds ratio, 2.5). In analyses that compared all partner categories (not shown), women were more likely to be dual users when their partner was a friend rather than a new romantic partner (2.5; 95% confidence interval, 1.0–6.1) or an ex-boyfriend (2.8; 95% confidence interval, 1.2–6.6); differences were not found between any other categories.

Women had a reduced likelihood of reporting dual method use if they had used a less reliable contraceptive method (odds ratio, 0.2) or had more months of experience with hormonal methods (0.8). At the person level, women were less likely to report dual use if they were older than 18 (coefficient, –4.7) or had had a greater number of past partners (–0.3). They were more likely to have been dual users if they reported greater religiosity (0.8) or had received an STD diagnosis prior to entering college (2.9). This model explained 29% of the event-level variance and 20% of the person-level variance.

DISCUSSION

Hormonal contraceptives and condoms were used together in only a quarter of intercourse events reported by participants; half of the women said they had never used dual methods, and a third reported inconsistent dual use. The inconsistency of dual method use among our participants indicates the need to examine associated characteristics using event-level, time-varying data rather than cross-sectional data. The prevalence of dual method use in our sample appears to be similar to that in other populations.[7] Given the high rates of STDs and unplanned pregnancy among women aged 18–19,[2,3] and the ubiquity of serial monogamy during the college years,[65] increasing the rates of dual method use among college women should be a goal for health educators and providers.

Our study showed that dual use declined as experience with hormonal contraceptives increased—by 20% with each additional month of use. One previous study[26] addressed the decline in condom use with increasing experience with hormonal contraceptives; however, these researchers noted a decline primarily among injectable users, but not among pill users. We found a negative association between hormonal experience and dual method use, even though the great majority of hormonal users in our study were using the pill, patch or ring. Women who used a less reliable contraceptive in conjunction with a hormonal method were also relatively unlikely to use a condom. Women may feel more confident about pregnancy prevention without a condom as their experience with hormonal methods increases, or if they use withdrawal or natural family planning methods in addition to a hormonal contraceptive. However, these less effective methods do not protect against STD transmission.

Women's number of past sexual partners was inversely related to their reports of dual method use. This finding contrasts with results from other studies, in which young people with more recent partners were more likely to use condoms.[39,40] The reduced likelihood of dual use among women with more previous partners may be due to the tendency for condom use to decline more rapidly in each successive sexual relationship.[23] Although relatively few women in our sample had received an STD diagnosis, those who had had an STD were more likely than others to engage in dual method use, consistent with theories that invoke perceived risk as a determinant of health

behaviors.[66] Interestingly, however, our measure of STD risk perception was not associated with dual use. Women with past diagnoses may perceive themselves as being at lower risk as a result of their condom use. Future research should employ multi-item measures of risk perceptions.

Religiosity had a complex relationship with contraceptive use in our sample. Although women who were more religious were less likely than others to use hormonal contraceptives, among those who used these methods, religiosity was positively associated with dual method use. The role of religiosity should be further explored in future studies.

Compared with women who were having sex with romantic partners (both short- and long-term), those having sex with friends were more likely to report dual method use. Previous studies have found that dual use is less common with romantic than with casual partners,[24,25] but they did not examine associations between specific partner types and dual method use. Although "hookups" (casual sexual encounters, which often occur with friends[30]) are often framed in a negative light, this finding suggests that some hookup experiences may involve protection against both pregnancy and STDs.

A number of variables investigated in our study, including sensation-seeking, conscientiousness, and parental and peer communication about sex, were not associated with dual method use. Surprisingly, substance use—at either the month or the event level—was not associated with dual use, in contrast to another study's finding that situational alcohol use was negatively related to dual method use among men and women aged 20–23.[14] Future studies might examine gender-specific associations between situational substance use and dual method use, ideally using event-level data.

Limitations and Future Directions

Several limitations of the current study suggest directions for future research. First, our data came from first-year female students at one university; generalizability to other settings and populations is not certain. Future studies should collect data from males and from students at a range of institutions. In addition, although use of event-level measures is a major strength, we cannot determine causal relationships from our data; some variables could be either predictors or outcomes of dual method use. Moreover, a number of our variables were assessed only once; future studies using event-level data should assess some of these variables (such as religiosity, parent and peer characteristics, and risk perceptions) over time, as more precise measurement may strengthen the assessment of their relationship with dual method use. Finally, our study did not assess some proximal variables, such as attitudes and intentions related to dual method use, that have been studied more commonly than event-level features in the past.[16,40] Given the inconsistency of dual method use, future research should consider both event-level characteristics and constructs from ecological and health behavior theories.[67] Ideally, this research should be based on specific theoretical models; our exploratory study suggests some variables that these models should incorporate.

Conclusions

This study identified a number of characteristics that are associated with dual method use, which occurred in only a quarter of reported intercourse events. A better understanding of such characteristics may aid in intervention design; if our results are borne out by more generalizable studies, the implication may be that women need to be counseled on the importance of maintaining use of condoms as their sexual relationships become more serious, as they gain experience with hormonal contraceptives and even when they are also using less reliable methods, such as withdrawal. Our findings demonstrate the importance of considering event-level and time-varying characteristics that may be associated with dual method use, in addition to the person-level characteristics that are more commonly considered. Future research should collect further data related to event-level characteristics to begin to inform potential intervention efforts. Moreover, longitudinal research is needed to identify predictors of dual method use.

REFERENCES

1. Centers for Disease Control and Prevention (CDC), *STD Trends in the United States: 2011 National Data for Chlamydia, Gonorrhea and Syphilis,* Atlanta: CDC, 2013.

2. CDC, *Sexually Transmitted Disease Surveillance 2009,* Atlanta: CDC, 2010.

3. Finer LB, Unintended pregnancy among U.S. adolescents: accounting for sexual activity, *Journal of Adolescent Health,* 2010, 47(3):312–314.

4. Singh S and Darroch JE, Adolescent pregnancy and childbearing: levels and trends in developed countries, *Family Planning Perspectives,* 2000, 32(1):14–23.

5. Holmes KK, Levine R and Weaver M, Effectiveness of condoms in preventing sexually transmitted infections, *Bulletin of the World Health Organization,* 2004, 82(6):454–461.

6. Hatcher RA, Trussell J and Nelson AL, eds., *Contraceptive Technology,* 19th rev. ed., New York: Ardent Media, 2007.

7. Williams RL and Fortenberry JD, Dual use of long-acting reversible contraceptives and condoms among adolescents, *Journal of Adolescent Health,* 2013, 52(4, Suppl.):S29–S34.

8. Chandra A et al., Fertility, family planning, and reproductive health of U.S. women: data from the 2002 National Survey of Family Growth, *Vital and Health Statistics,* 2005, Series 23, No. 25.

9. Cooper ML, Agocha VB and Powers AM, Motivations for condom use: Do pregnancy prevention goals undermine disease prevention among heterosexual young adults? *Health Psychology,* 1999, 18(5):464–474.

10. Fortenberry JD et al., Condom use as a function of time in new and established adolescent sexual relationships, *American Journal of Public Health,* 2002, 92(2):211–213.

11. U.S. Department of Health and Human Services (DHHS), *Healthy People 2020: The Road Ahead,* Washington, DC: DHHS, 2010.

12. Crosby RA et al., Correlates of using dual methods for sexually transmitted diseases and pregnancy prevention among high-risk African-American female teens, *Journal of Adolescent Health,* 2001, 28(5):410–414.

13. Corbin WR and Fromme K, Alcohol use and serial monogamy as risks for sexually transmitted diseases in young adults, *Health Psychology,* 2002, 21(3):229–236.

14. Bailey JA et al., Romantic relationship characteristics and alcohol use: longitudinal associations with dual method contraception use, *Journal of Adolescent Health,* 2012, 50(5):450–455.

15. Eisenberg DL et al., Correlates of dual-method contraceptive use: an analysis of the National Survey of Family Growth (2006–2008), *Infectious Diseases in Obstetrics and Gynecology,* 2012, doi: 10.1155/2012/717163, accessed May 6, 2013.

16. Sieving RE et al., Adolescent dual method use: relevant attitudes, normative beliefs and self-efficacy, *Journal of Adolescent Health,* 2007, 40(3):275.e15–275.e22, <http://www.jahonline.org/article/S1054-139X(06)00393-4/abstract>, accessed Dec. 4, 2012.

17. Kotchick BA et al., Adolescent sexual risk behavior: a multi-system perspective, *Clinical Psychology Review,* 2001, 21(4):493–519.

18. Hovell MF et al., A behavioral-ecological model of adolescent sexual development: a template for AIDS prevention, *Journal of Sex Research,* 1994, 31(4):267–281.

19. Schroder KE, Carey MP and Vanable PA, Methodological challenges in research on sexual risk behavior. II. accuracy of self-reports, *Annals of Behavioral Medicine,* 2003, 26(2):104–123.

20. Weinhardt LS and Carey MP, Does alcohol lead to sexual risk behavior? Findings from event-level research, *Annual Review of Sex Research,* 2000, 11(1):125–157.

21. Civic D, College students' reasons for nonuse of condoms within dating relationships, *Journal of Sex & Marital Therapy,* 2000, 26(1):95–105.

22. Hammer JC et al., When two heads aren't better than one: AIDS risk behavior in college-age couples, *Journal of Applied Social Psychology,* 1996, 26(5):375–397.

23. Ku L, Sonenstein FL and Pleck JH, The dynamics of young men's condom use during and across relationships, *Family Planning Perspectives,* 1994, 26(6):246–251.

24. Wilson EK and Koo HP, Associations between low-income women's relationship characteristics and their contraceptive use, *Perspectives on Sexual and Reproductive Health,* 2008, 40(3):171–179.

25. Poppen PJ and Reisen CA, Women's use of dual methods of sexual self-protection, *Women & Health,* 2000, 30(2):53–66.

26. Sayegh MA et al., The developmental association of relationship quality, hormonal contraceptive choice and condom non-use among adolescent women, *Journal of Adolescent Health,* 2006, 39(3):388–395.

27. Weisman CS et al., Consistency of condom use for disease prevention among adolescent users of oral contraceptives, *Family Planning Perspectives,* 1991, 23(2):71–74.

28. Misovich SJ, Fisher JD and Fisher WA, Close relationships and elevated HIV risk behavior: evidence and possible underlying psychological processes, *Review of General Psychology,* 1997, 1(1):72–107.

29. Noar SM et al., Safer sex and sexually transmitted infections from a relationship perspective, in: Harvey JH, Wenzel A and Sprecher S, eds., *Handbook of Sexuality in Close Relationships,* Mahwah, NJ: Lawrence Erlbaum, 2004, pp. 519–544.

30. Lewis MA et al., Predictors of hooking up sexual behaviors and emotional reactions among U.S. college students, *Archives of Sexual Behavior,* 2012, 41(5):1219–1229.

31. Furman W and Shaffer L, Romantic partners, friends, friends with benefits, and casual acquaintances as sexual partners, *Journal of Sex Research,* 2011, 48(6):554–564.

32. Steele CM and Josephs RA, Alcohol myopia: its prized and dangerous effects, *American Psychologist,* 1990, 45(8):921–933.

33. Lane SD et al., Acute marijuana effects on human risk taking, *Neuropsychopharmacology,* 2005, 30(4):800–809.

34. Scott-Sheldon LAJ, Carey MP and Carey KB, Alcohol and risky sexual behavior among heavy drinking college students, *AIDS and Behavior,* 2010, 14(4):845–853.

35. Bryan AD, Schmiege SJ and Magnan RE, Marijuana use and risky sexual behavior among high-risk adolescents: trajectories, risk factors, and event-level relationships, *Developmental Psychology,* 2012, 48(5):1429–1442.

36. Duncan SC, Strycker LA and Duncan TE, Exploring associations in developmental trends of adolescent substance use and risky sexual behavior in a high-risk population, *Journal of Behavioral Medicine,* 1999, 22(1):21–34.

37. Guo J et al., Developmental relationships between adolescent substance use and risky sexual behavior in young adulthood, *Journal of Adolescent Health,* 2002, 31(4):354–362.

38. Soskolne V et al., Condom use with regular and casual partners among women attending family planning clinics, *Family Planning Perspectives,* 1991, 23(5):222–225.

39. Harvey SM, Henderson JT and Branch MR, Protecting against both pregnancy and disease: predictors of dual method use among a sample of women, *Women & Health,* 2004, 39(1):25–43.

40. Pack RP et al., Psychosocial correlates of dual methods for contraception and STI protection in urban adolescents, *ISRN Obstetrics and Gynecology,* 2011, doi: 10.5402/2011/469610, accessed May 6, 2013.

41. CDC, Sexually transmitted diseases treatment guidelines, 2010, *Morbidity and Mortality Weekly Report,* 2012, Vol. 59, No. RR-12.

42. O'Sullivan LF et al., A cognitive analysis of college students' explanations for engaging in unprotected sexual intercourse, *Archives of Sexual Behavior,* 2010, 39(5):1121–1131.

43. Santelli JS et al., The use of condoms with other contraceptive methods among young men and women, *Family Planning Perspectives,* 1997, 29(6):261–267.

44. Miller BC, Family influences on adolescent sexual and contraceptive behavior, *Journal of Sex Research,* 2002, 39(1):22–26.

45. Charnigo R et al., Sensation seeking and impulsivity: combined associations with risky sexual behavior in a large sample of young adults, *Journal of Sex Research,* 2013, 50(5):480–488.

46. Sales JM et al., Differences between dual-method and non–dual-method protection use in a sample of young African American women residing in the southeastern United States, *Archives of Pediatrics & Adolescent Medicine,* 2010, 164(12):1125–1131.

47. Hoyle RH, Fejfar MC and Miller JD, Personality and sexual risk taking: a quantitative review, *Journal of Personality,* 2000, 68(6):1203–1231.

48. Zaleski EH and Schiaffino KM, Religiosity and sexual risk-taking behavior during the transition to college, *Journal of Adolescence,* 2000, 23(2):223–227.

49. McCree DH et al., Religiosity and risky sexual behavior in African-American adolescent females, *Journal of Adolescent Health,* 2003, 33(1):2–8.

50. Abma JC, Sexual activity among teenagers in the United States, in: Weissberg RP et al., eds., *Long-Term Trends in the Well-Being of Children and Youth: Issues in Children's and Families' Lives,* Washington, DC: Child Welfare League of America, 2003, pp. 103–128.

51. Fielder RL, Carey KB and Carey MP, Are hookups replacing romantic relationships? A longitudinal study of first-year female college students, *Journal of Adolescent Health,* 2013, 52(5):657–659.

52. Walsh JL et al., Changes in women's condom use over the first year of college, *Journal of Sex Research,* 2013, 50(2):128–138.

53. Fielder RL et al., Predictors of sexual hookups: a theory-based, prospective study of first-year college women, *Archives of Sexual Behavior,* 2013, 42(8):1425–1441.

54. Steinberg L et al., Impact of parenting practices on adolescent achievement: authoritative parenting, school involvement, and encouragement to succeed, *Child Development,* 1992, 63(5):1266–1281.

55. Harris KM et al., The National Longitudinal Study of Adolescent Health: research design, 2003, <http://www.cpc.unc.edu/projects/addhealth/design>, accessed June 25, 2013.

56. Sales JM et al., Validation of a parent-adolescent communication scale for use in STD/HIV prevention interventions, *Health Education & Behavior,* 2008, 35(3):332–345.

57. Real K and Rimal RN, Friends talk to friends about drinking: exploring the role of peer communication in the theory of normative social behavior, *Health Communication,* 2007, 22(2):169–180.

58. Schalling D, Psychopathy-related personality variables and the psychophysiology of socialization, in: Hare RD and Schalling D, eds., *Psychopathic Behavior: Approaches to Research,* New York: Wiley, 1978, pp. 85–105.

59. Gosling SD, Rentfrow PJ and Swann WB, Jr., A very brief measure of the Big-Five personality domains, *Journal of Research in Personality,* 2003, 37(6):504–528.

60. Adler NE et al., Relationship of subjective and objective social status with psychological and physiological functioning: preliminary data in healthy white women, *Health Psychology,* 2000, 19(6):586–592.

61. Schafer JL, *Analysis of Incomplete Multivariate Data,* New York: Chapman and Hall, 1997.

62. Schafer JL, Multiple imputation: a primer, *Statistical Methods in Medical Research,* 1999, 8(1):3–15.

63. Muthén LK and Muthén BO, *Mplus User's Guide,* seventh ed., Los Angeles: Muthén & Muthén, 2012.

64. Bentler PM and Mooijaart A, Choice of structural model via parsimony: a rationale based on precision, *Psychological Bulletin,* 1989, 106(2):315–317.

65. MacDonald NE et al., High-risk STD/HIV behavior among college students, *Journal of the American Medical Association,* 1990, 263(23):3155–3159.

66. Rosenstock IM, The health belief model and preventive health behavior, *Health Education & Behavior,* 1974, 2(4):354–386.

67. Fisher JD and Fisher WA, Theoretical approaches to individual-level change in HIV risk behavior, in: Peterson JL and DiClemente RJ, eds., *Handbook of HIV Prevention, AIDS Prevention, and Mental Health,* New York: Kluwer Academic/Plenum, 2000, pp. 3–55.

Acknowledgment

This research was supported by grant R21-AA018257 from the National Institute on Alcohol Abuse and Alcoholism.

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