The Longitudinal Relationship Between Drug Use and Risky Sexual Behaviors Among Colombian Adolescents

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Objective: To identify the longitudinal relationships between drug use and risky sexual behaviors and early pregnancy in Colombian adolescents.

Design: Confidential survey of adolescents, consisting of structured individual interviews, at 2 time points, 2 years apart. A standard self-report questionnaire was adapted to ensure linguistic and cultural relevance.

Setting: Community samples representing differing levels of risky sexual behavior and drug use. Cohorts were drawn from higher- and lower-risk geographic areas and from various self-reported ethnic groups.

Participants: Adolescents (N = 2226) randomly selected from 3 major Colombian cities: Bogotá, Medellín, and Barranquilla.

Main Outcome Measures: Data were collected concerning adolescent drug use, sexual behaviors, and a history of pregnancy. The youths' drug use included measures of all illegal drugs.

Results: By using regression analyses (controlling for demographic variables) a reciprocal longitudinal relationship between risky sexual behaviors and drug use was identified. Those adolescents who reported higher levels of drug use at time 1 also had more sexual partners, had higher frequencies of unprotected sex, and were more likely to have experienced early pregnancy at time 2. The reverse relationship was true as well. The level of violence experienced by the adolescent emerged as a moderator of some of these relationships.

Conclusions: Reducing adolescent drug use may also reduce levels of risky sexual behavior and early pregnancy and vice versa. Furthermore, the importance of addressing violence as a risk factor for both problem behaviors is emphasized.

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Risky sexual behaviors among adolescents and young adults have received growing attention during the past decade because of the increasing threat of an acquired immunodeficiency virus syndrome epidemic among this population.1-3 Worldwide, 2.6 million adolescents are newly infected every year,4 with sexual transmission being the most common way the human immunodeficiency virus is contracted by adolescents.5 Risky sexual behaviors are defined as sexual activities that may compromise an individual's health by exposing him or her to the risk of infection with sexually transmitted diseases and/or the human immunodeficiency virus. Among these behaviors, researchers7,8 have focused on unprotected sex (intercourse without using condoms) and engaging in sexual activities with multiple partners. Compared with other age groups, teenagers are more likely to have multiple sex partners and to engage in unprotected sex.9

The risk of early pregnancy is related to these sexual behaviors. Extensive research in this area has demonstrated that early pregnancy is associated with adverse outcomes for mother and child, and that it inflicts a high cost on society.10 Adolescent mothers are at a higher risk for poor physical and mental health,11 low educational achievement,12,13 and unemployment and welfare dependency.13,14 Children born to adolescent mothers are at higher risk for poor health, cognitive, and socioemotional outcomes.11,13,15,16

In this context, the relationship between adolescents' risky sexual behaviors, early pregnancy, and illicit drug use is of particular relevance.17 Previous research18,19 has found that illicit drug use and risky sexual behaviors tend to co-occur within a cluster of deviant behav-
deviant behaviors (eg, risky sexual activities) is caused by the lack of conventional attachments to societal values, its institutions, and particularly the family.24,44 We include maternal identification (the degree to which the adolescent identifies with his or her mother) to test the possibility that the absence of a close bond with one’s mother may underlie the relationship between drug use and risky sexual behaviors.

Theories that emphasize the importance of individual differences for the initiation into unconventional behaviors have focused on intrapersonal factors such as personality traits and behavioral skills.25 We include a personality variable, rebelliousness, that has been linked to problem behaviors by previous research45,46 to test whether a youth’s rebellious stance may underlie drug use and risky sexual behaviors.

Finally, because of the Colombian locale of the study, the level of violence experienced by the individual at time 1 (T1) was included as a possible moderator variable in this study.

The present study examines the reciprocal relations between illegal drug use and aspects of risky sexual behavior in a sample of Colombian adolescents. We test whether a third factor (maternal identification or rebelliousness) may underlie the association between the 2 phenomena. We also examine the extent to which exposure to violence moderates the relationship between illegal drug use and aspects of risky sexual behavior.

**METHODS**

**SAMPLE**

Data for this study came from a longitudinal study of Colombian adolescents who were interviewed first in June 1995 to February 1996 and then again 2 years later in August 1997 to February 1998. Random samples of adolescents, aged between 12 and 17 years, were selected from 3 Colombian cities: Barranquilla, Medellín, and Bogotá. Households with at least 1 child aged between 12 and 17 years were eligible for the study. Within each city, a sample was obtained from census data, moving from census tracts to sections, to households, and finally to individuals while preserving random sampling procedures at each stage. A description of the sample is shown in Table 1. Those adolescents who did not participate at time 2 (T2) differed from adolescents who stayed in the study in several ways. More of them were male (57%; χ² = 6.34, P = .01), and their fathers had more education (t = 3.36, P < .001). They also used illegal drugs more frequently (t = 2.55, P = .01), had had more sexual partners (t = 3.70, P < .001), and had unprotected sex more frequently (t = 2.54, P = .01) at T1. No statistically significant difference existed between the groups regarding early pregnancy (χ² = 1.97, P = .16).

**PROCEDURE**

Informed consent was obtained from adolescents and their parents. Face-to-face structured interviews were then conducted in private in the adolescents’ homes by trained Colombian interviewers. Questionnaires were translated into Spanish and then back-translated into English by native Colombians to ensure the linguistic and cultural appropriateness of the instruments. The interviews took approximately 2 hours. Interviewers read each question aloud and recorded the participants’ responses. The adolescents were given US sports apparel as an incentive.
Rebelliousness was measured with a 7-item scale, tapping the adolescent’s agreement with statements such as “When rules and regulations get in the way you sometimes ignore them.” Answers ranged from 1 (true) to 4 (false). Items were reverse coded and summed to create a score for rebelliousness (Cronbach’s $\alpha = .53$).

Maternal identification was assessed by 14 items that measured the adolescent’s admiration of, emulation of, and similarity to his or her mother. A sample item from this scale reads, “How much do you want to be like your mother in your role as a parent?” Answers were as follows: 1, not at all; 2, in just a few ways; 3, in some ways; 4, in most ways; and 5, in every way. A sum score of the scale items was computed (Cronbach’s $\alpha = .90$).

### DATA ANALYTIC PROCEDURES

Regression analyses included participant’s age and gender and father’s educational level (as an indicator of socioeconomic status) as control variables. (These variables were related to the outcome variables [T2 risky sexual behaviors and early pregnancy and T2 illicit drug use] at a statistically significant level. The significant $t$ values for the correlations between the father’s educational level and the outcome variables ranged between $P = .03$ and .001. The $P$ values for the correlations between gender and the outcome variables were all $P < .001$. The $P$ values for the correlations between age and the outcome variables were all $P < .001$. The only nonsignificant $P$ value was for father’s educational level and participant’s multiple sex partners, which was $P = .60$.) Because we expected to find gender differences in risky sexual behaviors, we created the following interaction terms: gender with illicit drug use and gender with...
risky sexual behaviors and early pregnancy. Although we found a few significant interactions between our independent variables and gender, they were ordinal and small, indicating that, although slightly stronger for male adolescents, the relationships between our independent and dependent variables were essentially the same for both genders. Therefore, the analyses were performed for the whole sample. We also tested whether the variances of the observations differed across the 3 cities of participants' origins. This was not the case, so analyses were conducted treating cities as coming from the same distribution.

We used linear and logistic regression analyses to assess the relationship between T1 drug use and risky sexual behavior at T2. To examine the role of T1 risky sexual behaviors and early pregnancy in predicting T2 drug use, we used linear regression. For each of these 2 models (T1 drug use predicting T2 risky sex and T1 risky sex predicting T2 drug use), we first regressed the T2 criterion variable on the T1 independent variable and the control variables (age, gender, and father's educational level) and on the T1 measure of the T2 criterion variable. To test whether having been a victim of violence would alter the relationship between the T1 predictor and the T2 outcome, we created interactions terms with the T1 predictors (recent drug use and risky sexual behaviors) and T1 violence toward the subject and added them into each of the equations (eg, T1 drug use × T1 violence toward the subject). Finally, to test whether another construct might underlie the T1 predictor and the T2 criterion, we added T1 rebelliousness into each of the equations instead of the interaction term. In another regression analysis, T1 maternal identification was substituted for rebelliousness. If either of these constructs were to underlie the T1 predictor and the T2 outcome, the effect of the T1 predictor should be reduced. To make the data consistent with the assumptions of linear regression analysis, we performed a log transformation to those outcome variables that were negatively skewed (number of sex partners and condom use).

**RESULTS**

**CROSS-SECTIONAL FINDINGS: ILLEGAL DRUG USE AND RISKY SEXUAL BEHAVIORS**

Cross-sectional analyses showed that there was a concurrent relationship between T1 illegal drug use and inconsistent condom use ($r = 0.38$, $P < .001$), number of sex partners ($r = 0.34$, $P < .001$), and early pregnancy ($r = 0.20$, $P < .001$). At T2, the correlations between illegal drug use and inconsistent condom use ($r = 0.28$, $P < .001$), number of sex partners ($r = 0.20$, $P < .001$), and early pregnancy ($r = 0.08$, $P < .001$) were also statistically significant.

**LONGITUDINAL FINDINGS**

**T1 Illegal Drug Use and T2 Risky Sexual Behaviors**

The first set of regression analyses examined the effect of T1 drug use on T2 risky sexual behaviors and early pregnancy. Three equations were estimated, with T1 drug use as the predictor and T2 unprotected sex, T2 number of partners, or T2 early pregnancy as the outcome. Illicit drug use at T1 emerged as a statistically significant predictor for all 3 outcome variables, controlling for age, gender, father's educational level, and the T1 measure of the criterion (ie, T1 number of partners [$\beta = .06$, $P < .001$], frequency of unprotected sex [$\beta = .05$, $P < .001$], and early pregnancy [odds ratio = 1.12, $P = .004$]). Regression coefficients and odds ratios are displayed in Table 2. Next, we entered the interaction term (T1 violence toward the subject × T1 drug use) and T1 violence toward the subject into each of the 3 regression equations. All 3 interaction terms were statistically significant (multiple sex partners and unprotected sex, $P < .001$ for both; early pregnancy, $P = .04$). Results showed that having experienced violence at T1 moderated the relationship between T1 drug use and T2 risky sexual behaviors: T1 nondrug users who were at the lower end of the T1 violence toward the subject scale had the fewest sexual partners and engaged in unprotected sex least often at T2. Similarly, those T1 nondrug users who had not experienced violence were least likely to have gotten (someone) pregnant at T2.

The final analytic strategy used with this set of predictor and criterion variables was to add T1 rebelliousness first and T1 maternal identification second, separately, into each regression equation to see whether this would reduce the predictive effect of T1 drug use on T2 sexual behaviors. Results indicated that neither the marker variable for unconventionality nor the marker variable for the mother-child bond eliminated the significant association between T1 drug use and T2 engagement in risky sexual behaviors or getting (someone) pregnant at a young age. Rather, T1 drug use predicted these outcomes at T2 above and beyond T1 rebelliousness (multiple sex partners and unprotected sex, $P < .001$ for both; early pregnancy, $P = .02$) and T1 maternal identification (multiple sex partners and unprotected sex, $P < .001$ for both; early pregnancy, $P = .01$) (Table 2).

<table>
<thead>
<tr>
<th>T1 Independent Variables</th>
<th>Multiple Sex Partners†</th>
<th>Unprotected Sex†</th>
<th>Early Pregnancy‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violence toward the subject</td>
<td>.07 (.06 to .08)</td>
<td>.06 (.05 to .07)</td>
<td>1.05 (0.99 to 1.12)</td>
</tr>
<tr>
<td>Interaction of recent drug use × violence toward the subject</td>
<td>.01 (-.02 to -.01)</td>
<td>-.01 (-.02 to 0)</td>
<td>0.99 (0.97 to 0.99)</td>
</tr>
<tr>
<td>Drug use net of covariates and T1 sexual risk behavior</td>
<td>Plus T1 rebelliousness</td>
<td>.05 (.03 to .06)</td>
<td>.04 (.02 to .06)</td>
</tr>
<tr>
<td></td>
<td>Plus T1 maternal identification</td>
<td>.05 (.04 to .07)</td>
<td>.04 (.03 to .06)</td>
</tr>
</tbody>
</table>

*Table 2. Regression Coefficients and Logistics Regression Odds Ratios and 95% Confidence Intervals for T1 Drug Use on T2 Sexual Risk Behavior and Early Pregnancy*

†Data are given as β regression coefficient (95% confidence interval).
‡Data are given as odds ratio (95% confidence interval).
T1 Risky Sexual Behavior and T2 Illegal Drug Use

The second set of regression analyses examined the relationships between T1 risky sexual behaviors and early pregnancy as they related to T2 illicit drug use. Controlling for age, gender, father’s educational level, and T1 drug use, we found that T1 number of sex partners, T1 unprotected sex, and T1 early pregnancy predicted T2 drug use (Table 3).

We then created interaction terms between T1 violence toward the subject and (a) T1 number of partners, (b) T1 unprotected sex, and (c) T1 early pregnancy to see whether the experience of violence at T1 would alter the relationship between earlier sexual behavior and later drug use. Only 2 of the 3 interactions terms reached statistical significance. The interaction between T1 violence toward the subject and T1 early pregnancy was not statistically significant (P=0.18). Similar to results from the first set of regression analyses, adolescents who reported not having had multiple partners and not engaging in unprotected sex frequently, and who also had not experienced high levels of violence, reported the least drug use at T2.

Finally, when T1 rebelliousness was added separately into the 3 regression equations with the T1 predictors (2 risky sexual behaviors and early pregnancy), their effect on T2 drug use was still statistically significant (multiple sex partners and unprotected sex, P<0.001 for both; early pregnancy, P=0.02). Similarly, when T1 maternal identification replaced T1 rebelliousness in the regression equation, the predictive effect of T1 sexual behaviors on T2 drug use remained statistically significant (multiple sex partners and unprotected sex, P<0.001 for both; early pregnancy, P=0.05) (Table 3).

The findings of the present study are consistent with previous cross-sectional investigations conducted in the United States and Western Europe. More important, in accord with other investigators in the United States, these analyses suggest that illegal drug use and risky sexual behavior and early pregnancy are not only associated within time (ie, within early adolescence and within late adolescence) but that these risk behaviors are also associated over time. The impact of earlier illegal drug use seems to be pervasive in that it was associated with all 3 types of problematic outcomes, namely, multiple sex partners, unprotected sex, and early pregnancy. This was so despite the fact that we controlled for these variables assessed at an earlier time point. The 3 outcome variables were only moderately correlated with one another (r>0.30).

The study extends previous research in several ways. First, because the study is longitudinal, we are in a better position to identify a reciprocal relationship between illegal drug use and risky sexual behavior. Thus, we increased our predictive power, as one can predict later sexual risk behavior and early pregnancy from earlier illicit drug use and vice versa. Second, this study was conducted in a different cultural context, Colombia, than previous research on the relationship between illicit drug use and risky sexual behaviors and early pregnancy. Colombia is a country characterized by violence and heavy drug trafficking. Because unprotected sex in this predominantly Roman Catholic country may be normative, the relationship between drug use and risky sexual behavior may not pertain. However, our results did not support this hypothesis because a reciprocal relationship was found. Third, this study is based on a large and diverse population of adolescents living in the community rather than on adolescents attending a treatment facility. Fourth, we controlled for some of the covariates that may account for the relationship between drug use and risky sexual behavior (maternal identification and rebelliousness). These covariates are indicators of a network of variables subtending the areas of the mother-child relationship and nonconventional aspects of the personality. By showing that illegal drug use and sexual behavior are related despite controlling for maternal identification and rebelliousness, our findings do not support the hypothesis of a common factor underlying these 2 behaviors. However, there may be other unmeasured factors that account for the longitudinal and reciprocal relationships between illicit drug use and risky sexual behaviors and early pregnancy.

Future research needs to assess the mechanisms that intervene between illegal drug use and risky sexual behavior. Drug use may interfere with cognitive functioning and rational decision making, which in turn are related to risky sexual behavior and early pregnancy. This relationship could be due to the psychopharmacological or toxic effects of illegal drug use on brain functioning or metabolism. For instance, the neurotransmitter dopamine has been implicated in the positive reinforcing actions of tetrahydrocannabinol, the major psychoactive component of marijuana. Another mechanism is through intrapersonal functioning. There is a
Previous research has found a relationship between adolescent drug use and risky sexual behaviors. However, most of this research is cross-sectional in nature and, thus, does not permit the temporal ordering of these adolescent risk behaviors. Because most studies were conducted in the United States and Western Europe, having data from Colombia, a drug-exporting nation, adds to the generalizability of their findings.

Our study shows that the relationship between illegal drug use and risky sexual behaviors is reciprocal and sustained over time. The data also showed that a cultural factor, contextual violence, moderated the relationship between these risk behaviors, a fact that should be addressed in preventive efforts.

growing recognition that drug use is associated with psychiatric disorders. Psychiatric disorders are also related to risky sexual behavior.23

Risky sexual behavior also predicts later illegal drug use. One possible mechanism that intervenes between early risky sexual behavior and later illegal drug use is the peer group. Adolescents who engage in early risky sexual behavior are more likely to be involved with adolescents who engage in other problem behaviors, such as illegal drug use. Adolescents who use illegal drugs have more difficulty assuming age-appropriate behaviors than those who do not use illegal drugs. The difficulties illegal drug users face are likely to be exacerbated by the damaging consequences of such risky sexual behaviors as unprotected sex or having a child outside of marriage at an early age.

Our study supports the significance of studying violence in Colombia because this variable emerged as an important interactive effect. We were able to show that low or no violence aimed at the adolescent served as a protective factor in conjunction with no illegal drug use. That is, adolescents who reported having been exposed to little or no violence and who did not use drugs had the lowest incidence of unprotected sex, sex with multiple partners, and early pregnancy. Conversely, little or no violence directed toward the adolescent in conjunction with abstention from risky sexual behavior decreased the incidence of later illegal drug use. These findings are particularly important in light of the high rates of violence directed at the general population in Colombia. They emphasize the importance of shielding Colombian youth from violence to protect them also from the adverse effects of subsequent risky sexual behaviors and illegal drug use. Thus, to be most effective, preventive efforts need to be directed not only at illegal drug use or risky sexual behaviors alone but also at any accompanying violence. Because community violence seems to be an important characteristic of Colombia, further research is needed to examine the long-term consequences of exposure to violence for adolescents.

Several limitations of this study should be noted. First, all of our measures were self-reported. Thus, associations between the variables could be the result of shared-method variance. However, prior research has demonstrated the validity of self-report data in the area of adolescent drug use. Furthermore, our measures of sexual behaviors and early pregnancy and illicit drug use did not encompass equivalent periods (ever vs past 2 months). Future research should measure these constructs during the same period to confirm the associations that we found in our study. Second, the adolescents who withdrew from the study after the T1 assessment used illegal drugs more frequently, had more sexual partners, and used condoms less consistently at T1 than those who continued to participate. Thus, the longitudinal sample presented herein seems to represent a more conventional group in terms of deviant behavior than it would have been had the entire sample continued to participate at T2. However, it is unlikely that our results would have been substantially different.

The present study provided a unique opportunity to examine the longitudinal relationships between 2 major public health problems — illegal drug use and risky sexual behavior — in a broad community sample of Colombian adolescents. To our knowledge, this is the first study that demonstrates a strong link over time between illegal drug use and risky sexual behavior in a developing country like Colombia. We also noted the impact of exposure to violence on the relationship between these 2 problem behaviors. Although it is impossible to shield adolescents from all levels of violence inherent in living in Colombia (eg, from political violence), it seems worthwhile to intervene at the interpersonal level (eg, with adolescents themselves and with their families) to at least reduce the impact of violence in these proximal contexts.

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