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Love, Sex, and Crime: Adolescent Romantic Relationships and Offending

Bill McCarthy
University of California-Davis

Teresa Casey
University of California-Davis

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The following summarizes the measurements and equations we considered as alternatives to those we use in our study. Table S1 presents results for these alternatives.

MEASURING ROMANTIC RELATIONSHIPS

Our analyses restrict the measure of romantic relationships to those that began in the 18 months prior to the in-home survey. We considered but did not include a measure of the length of the relationship. The variable is right censored. Carver and colleagues (2003) report that about 50 percent of Wave 1 relationships in the Add Health data were ongoing at the time of the study. In addition, an unknown number of youth reported the length of the time they knew their partner, rather than the length of their romantic involvement. To assess the effect of relationship length, we introduced a series of dummy variables that divided youth in terms of their romantic relationship history: no romantic relationships currently or in the past, romantic relationships exclusively in the preceding year, romantic relationships only in prior years (none in the preceding year), and romantic relationships in the preceding year and before (Alternative 1 in Table S1).

The Add Health data contain dating information on three groups of youth who did not self-designate as being in a romantic relationship. The first group (classified as “liked” in Add Health) indicated that they had participated in three activities common in dating (i.e., hand-holding, kissing, and telling their partners they were in love). A second group indicated that they had done these three activities and had engaged in sex (classified as “rx”), and a third group had engaged in sex but indicated that they had not participated in these three dating activities (classified as “nr”). The first two

groups answered the series of relationship questions we use to measure love and sexual activity, but the third group did not. The items in the relationship series asked of the youth in the first two groups overlap with the questions used to select youth into these groups. There is thus little variation between these two groups on three of the key questions in our love scale. Also, the third group did not answer the three questions about sexual activity. Instead, they provided information only on one inquiry about sexual intercourse. We used three approaches for these hard-to-categorize youth. In our original analyses, we respected their self-designation as not having been in a romantic relationship and coded them as non-daters. In an alternative analysis, we classified the first two groups as being in a romantic relationship (they answered questions about dating activities) and treated the third group as non-daters (Alternative 2). We then treated these three groups as missing (Alternative 3).

MEASURING SEXUAL ACTIVITY AND LOVE

We rejected three items when making our love and sexual activity scales: saw friends less, group dating, and talking about contraception. The loading scores for the first two items were too low to warrant inclusion in the love factor, and the third item’s loading scores were moderate for both factors but higher on the sexual activity factor. (We also excluded two questions about pregnancy and marriage because they apply to a smaller set of relationships.) As alternatives, we added discussed birth control to our list of sexual activity items (Alternative 4), and the items saw friends less and group dated to our love measure (Alternative 5).

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ESTIMATING A SELECTION EQUATION

Our correction for selection focuses on selection into romantic relationships. As an alternative, we changed our selection model to focus on selection into sexual intercourse (Alternative 6). A systematic review suggests that many of the factors that predict dating also predict the onset of sexual intercourse (Buhi and Goodson 2007). We used the variables from our dating equation in the equation for sex.

MODEL ESTIMATION

The level of measurement and distribution of our dependent variables, combined with the need to address potential selection bias, pose several problems for analysis. As noted in the text, we were unable to estimate a variety of models with the substance-use items. We examined different combinations of items using the frequency data, but we could not create a theoretically and empirically meaningful measure that could be successfully examined in a negative binomial model. In substance-specific negative binomial models, love has significant negative effects on the use of alcohol, tobacco, cocaine, and inhalants, while sexual activity has significant positive effects on the use of each of the six substances in our scale.

We considered an ordered-logit model for a scale that added the dichotomous measures of substance use, but the scale did not satisfy the proportional odds assumption. We estimated logit models separately for each of the items that constitute our scale and found the same pattern reported for the scale for each item. For inhalants, however, the love effect is significant only with a one-tailed test, and for marijuana, it loses significance.

Our measure of serious crime is not normally distributed and more closely approximates a negative binomial distribution; however, it is not a count. Our data do not meet the proportional odds assumption of an ordered logit model. Thus, negative binomial regression seems to be the most reasonable estimation approach. The negative binomial model includes a residual variance parameter that captures overdispersion in the dependent variable. This parameter also accounts for unexplained variation among cases that arises from differences associated with unobserved predictors. As an alternative, we recoded our indicators of serious crime and substance use as zero or one and constructed measures based on a count of the types of crime committed and substances used (Alternative 7).

We include our dichotomous measure of substance use as a control in our model of serious crime (Alternative 8). Models that replace this measure with a count of the types of substances used or with a scale measure of the frequency of each item used produce results similar to those reported here (results available on request).

We correct for selection by adding the IMR from a probit model to our substantive equation. We use the IMR because a hazard rate conceivably captures some unobserved heterogeneity. As an alternative, we replaced the IMR with the predicted probability of being in a relationship. This approach does not assume any particular correlation structure for the errors (Alternative 9).

We estimate first- and second-wave cross-sectional models in Alternatives 10 and 11. Although the Add Health study collected data on the dates when romantic relationships began and ended, most

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questions on offending refer to the entire 12-month periods before the first- and second-wave surveys. Cross-sectional analyses from either Wave 1 or Wave 2 thus cannot rule out the possibility that offending occurred before a romantic relationship started.

MISSING DATA

We used a combination of listwise deletion, mean substitution, and dummy variable inclusion to deal with missing data. We also considered multiple imputation, which increased our sample to 13,494. We used the Ice command (Stata) to impute missing values by applying switching regression, an iterative multivariable regression technique. We used nonmissing data to predict values for missing data in five new data sets with imputed values. Stata analyzes each data set independently and produces a single estimate based on the average for the five data sets. The standard errors reflect the uncertainty inherent in the estimates based on imputed values (Alternative 12).

EMOTIONAL STATES AS INTERVENING BETWEEN SEXUAL ACTIVITY AND CRIME

General strain theory suggests that several emotional states—anger, frustration, shame, and depression, among others—intervene between strain and crime. Unfortunately, the Add Health data contain few sophisticated measures of emotional states. Moreover, the emotions measured refer to different periods. For example, anger is measured with a single dichotomous item asked of parents at Wave 1 (i.e., Does the respondent have a bad temper?). Measures of depression (scale) and happiness (single item) refer to the week before the interviews, and a measure of suicide

ideation (perhaps an emotional state) refers to the preceding 12 months.

Recognizing these shortcomings, we estimate, but do not present, a series of equations to assess the extent to which emotions intervene between sexual activity and offending (the results are available from the authors). Reduced equations indicate that the direct effects of sexual activity on substance use and serious crime diminish in models that begin with this variable and then add measures of four emotional states (i.e., first-wave anger and second-wave happiness, depression, and suicide ideation). For serious crime, the effect for sexual activity drops by about 20 percent ($b = .465$, $se = .071$; $b = .369$, $se = .074$), whereas it drops by about 8 percent for substance use ($b = 1.049$, $se = .102$; $b = .980$, $se = .101$). All four emotions are significantly related to both types of illegal behavior (however, the negative associations for happiness are significant only with a one-tailed test). Adding emotions to our full equations (i.e., Equation 3.2 from Table 3 and Equation 4.2 from Table 4), however, has little consequence for the direct effects of sexual activity on serious crime ($b = .200$, $se = .063$) or substance use ($b = .281$, $se = .097$).

The measurement issues described above, and the absence of clear measures of strain, limit these analyses. In general, however, the findings are consistent with our hypothesis that sexual activity may increase strain for adolescents, and that this strain may encourage an array of emotional responses that intervene between sexual activity, strain, and crime.

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Table S1. Effects for Love, Sex, and IMR for Alternative Models of Second Wave Crime and Substance Use

Results replicating Equations 3.2 and 4.3 with changes noted below	Crime		Substance Use	
	b	Robust SE	b	Robust SE
Love	-.239	(.108)*	-.345	(.153)*
Sexual activity	.206	(.062)**	.291	(.096)**
Hazard of relationship	.508	(.094)**	1.343	(.138)**
Alternative 1: Add dummy variables for the length of romantic relationship				
Love	-.210	(.105)*	-.380	(.156)*
Sexual activity	.207	(.062)**	.282	(.095)**
Hazard of relationship	.507	(.093)**	1.354	(.137)**
Alternative 2: Include youth in “liked” groups as being in a relationship				
Love	-.141	(.080)+	-.309	(.126)*
Sexual activity	.190	(.067)**	.320	(.087)**
Hazard of relationship	.474	(.094)**	1.273	(.137)**
Alternative 3: Code “liked” youth as missing				
Love	-.293	(.137)*	-.412	(.168)*
Sexual activity	.248	(.084)**	.240	(.124)+
Hazard of relationship	.724	(.144)**	1.360	(.167)**
Alternative 4: Add discussed contraception to sexual activity scale				
Love	-.221	(.107)*	-.348	(.152)*
Sexual activity	.196	(.064)**	.291	(.101)**
Hazard of relationship	.511	(.093)**	1.345	(.139)**
Alternative 5: Use 12 items to construct love scale				
Love	-.223	(.107)*	-.353	(.158)*
Sexual activity	.200	(.063)**	.292	(.095)**
Hazard of relationship	.510	(.093)**	1.345	(.139)**
Alternative 6: Use selection into sexual intercourse				
Love	-.202	(.106)+	-.263	(.148)+
Sexual activity	.186	(.063)**	.280	(.096)**
Hazard of relationship	.397	(.069)**	.871	(.112)**
Alternative 7: Use a count of the number of different types of illegal activities committed				
Love	-.142	(.086)+	-.218	.151
Sexual activity	.124	(.056)*	.064	.099
Hazard of relationship	.411	(.070)**	.946	.145**
Alternative 8: Adding a measure of substance use to the crime model				
Love	-.209	(.112)+	—	—
Sexual activity	.130	(.062)*	—	—
Hazard of relationship	.351	(.095)**	—	—
Alternative 9: Substitute the predicted probability of being in a relationship (for the IMR)				
Love	-.231	(.108)*	-.349	(.153)*
Sexual activity	.206	(.062)**	.324	(.096)**
Predicted probability of relationship	.989	(.188)**	2.212	(.260)**
Alternative 10: Wave 1 cross-sectional				
Love	-.201	(.088)*	-.176	(.145)
Sexual activity	.252	(.048)**	.777	(.114)**
Hazard of relationship	.720	(.077)**	1.300	(.149)**
Alternative 11: Wave 2 cross-sectional				
Love	-.198	(.115)*	-.360	(.142)*
Sexual activity	.358	(.076)**	.619	(.116)**
Hazard of relationship	.554	(.090)**	1.477	(.122)**
Alternative 12: Multiple imputation				
Love	-.208	(.108)+	-.330	(.151)*
Sexual activity	.223	(.064)**	.348	(.099)**
Hazard of relationship	.539	(.097)**	1.333	(.136)**

* $p < .05$ (two-tailed); ** $p < .01$ (two-tailed); + $p < .05$ (one-tailed).