Published in final edited form as:

J Res Adolesc. 2012 March 1; 22(1): 135–149. doi:10.1111/j.1532-7795.2011.00752.x.

Exploring the Link between Caregiver Affect and Adolescent Sexual Behavior: Does Neighborhood Disadvantage Matter?

Margo Gardner, Anne Martin, and Jeanne Brooks-Gunn

Margo Gardner, Anne Martin, and Jeanne Brooks-Gunn, National Center for Children and Families, Teachers College Columbia University

Abstract

In a sample of urban youth ($N = 1,070$), we examined the links between primary caregiver affect (i.e., warmth and hostility) and two measures of sexual behavior in adolescence – early sexual initiation and sex with multiple partners. We also examined the extent to which neighborhood disadvantage moderated associations between caregiver affect and adolescent sexual behavior. We found that caregiver hostility was positively associated with early sex and sex with multiple partners in neighborhoods characterized by high levels of disadvantage, but inversely associated with both sex outcomes in neighborhoods characterized by low levels of disadvantage. Caregiver warmth, on the other hand, was inversely associated with early sexual initiation and sex with multiple partners in all neighborhoods regardless of neighborhood disadvantage.

Accumulating research suggests that reward-seeking tendencies peak in mid-adolescence, while the ability to regulate impulsive behavior does not reach maturity until adulthood (Steinberg, 2010). Accordingly, sex can be risky for adolescents, as they are attuned to the benefits of sex but often lack the psychosocial capacities necessary to plan for contraception and effectively protect themselves against sexually transmitted diseases (STDs) and unintended pregnancy. As a consequence, youth between the ages of 15 and 24 years constitute only 25% of the sexually active population, but they make up almost 50% of new STD cases each year (Guttman Institute, 2010). Moreover, while nearly 50% of all pregnancies in the U.S. are unplanned, more than 85% of pregnancies among youth under the age of 20 are unplanned (The National Campaign, 2008). Not all sexually active adolescents are equally at risk for STDs and unintended pregnancy, however. The odds of both of these outcomes are particularly pronounced among youth who initiate sex earlier in adolescence and among youth who have sex with multiple partners (Coker et al., 1994; Kelley, Borawski, Flocke, & Keen, 2003; Narring, Michaud, & Sharma, 1996). The goal of the present study is therefore to foster a deeper understanding of the processes that place adolescents at risk for, and protect against, early sexual initiation and sex with multiple partners.

Extant research suggests that adolescents' sexual behavior and reproductive health are determined by multiple factors, including their own characteristics and behavior (e.g., demographics, problem behavior, academic achievement; Laflin, Wang, & Barry, 2008; Lansford et al., 2010; Scaramella, Conger, Simons, & Whitbeck, 1998; Upchurch, Mason, Kusunoki, & Kriechbaum, 2004), their relationships with their peers and caregivers (e.g., Belsky, Steinberg, Houts, & Halpern-Felsher, 2010; Scaramella et al., 1998; Sieving, Eisenberger, Pettingell, & Skay, 2006), and the characteristics of more distal developmental contexts such as neighborhoods (e.g., Brewster, 1994; Cubbin, Santelli, Brindis, &

Braveman, 2005). Few studies have considered the possibility that more and less proximal developmental contexts make interactive contributions to sexual behavior, however. Notable exceptions include studies that show how neighborhood disadvantage and related constructs (e.g., poverty, disorder, concentration of single-parent households) moderate associations between parenting behaviors and adolescent sexual behavior (Cleveland & Gilson, 2004; Roche & Leventhal, 2009; Roche et al., 2005). This line of inquiry reflects the precepts of ecological theory, which views human development as the product of dynamic interactions between individuals and the multiple interrelated contexts in which they are embedded (Bronfenbrenner, 1977).

With one exception (Cleveland & Gilson, 2004), studies of adolescent sex that have addressed interactions between neighborhoods and parenting have focused on one facet of parenting – behavioral control (discipline, monitoring or supervision, and knowledge of child's activities and friends; Browning, Leventhal, & Brooks-Gunn, 2005; Roche & Leventhal, 2009; Roche et al., 2005). Considerably less attention has been devoted to the possibility that neighborhood conditions moderate the influence of the affective dimensions of adolescents' relationships with their caregivers. Thus, in the present study, we examine the extent to which neighborhood disadvantage, in particular, moderates associations between caregiver affect and adolescents' sexual behavior.

Caregiver Affect and Adolescent Sexual Behavior

The links between adolescent sexual behavior and both positive and negative caregiver affect have received considerable empirical attention. Several studies have shown that caregiver hostility predicts sexual risk-taking in adolescence. For example, using data from the National Longitudinal Study of Youth 1997, investigators found that less negative and hostile parenting during mid-adolescence predicted lower scores on a composite measure of sexual risk-taking (as indexed by frequency of intercourse, frequency of unprotected sex, and number of sex partners) in late adolescence (Coley, Medeiros, & Schindler, 2008). Additionally, recent analyses of data from the NICHD Study of Early Child Care and Youth Development revealed that maternal harshness at age four and a half years was positively associated with risky sex (defined by frequency of sex, STDs, and pregnancy) at age 15 (Belsky et al., 2010). Researchers have also identified positive associations between caregiver psychological maltreatment and adolescents' early sexual initiation (Black et al., 2009).

Caregiver warmth and related constructs, on the other hand, may protect against early sexual initiation and the potential consequences of sex during adolescence (Miller, 2002). Analyses of data from both American and European youth suggest that caregiver caring (Longmore, Eng, Giordano, & Manning, 2009), caregiver involvement (an umbrella term that refers to warmth and closeness, time spent with children, and communication; Pearson, Muller, & Frisco, 2006), and authoritative parenting (parenting that is both firm and warm; Pittman & Chase-Lansdale, 2001) are inversely associated with sexual initiation in adolescence. Additionally, evidence suggests that close, supportive relationships between adolescents and their caregivers predict contraceptive use and sex with fewer partners (Hope & Chapple, 2005; Trejos-Castillo & Vazsonyi, 2009). Accordingly, greater caregiver warmth has been linked to lower odds of teen pregnancy (Scaramella et al., 1998).

Notably, a number of the above-described studies suggest that caregiver affect is associated with adolescent sexual behavior even after controlling for the influence of parental monitoring (Coley et al., 2008; Longmore et al., 2009; Hope & Chapple, 2005; Trejos-Castillo & Vazsonyi, 2009) – a behavior that tends to co-occur with caregiver warmth (de Graaf et al., 2010) and also predicts adolescents' lower sexual risk-taking (DiClemente et

al., 2001; Li, Stanton, & Feigelman, 2000; Romer et al., 1999). Although causality can only be established through experimental research, findings from these studies suggest that caregiver affect, to the extent that it does influence adolescent sexual behavior, may do so independent of the contributions of parental monitoring.

Adolescent Sexual Behavior and Caregiver Affect in the Context of Neighborhoods

Consistent with aforementioned ecological theories of development (Bronfenbrenner, 1977), adolescent sexual behavior has also been linked to contextual conditions outside the family unit. In particular, studies suggest that residence in neighborhoods characterized by economic disadvantage and related problems (e.g., violence, physical decay, and low cohesion among residents) predicts earlier sexual initiation (e.g., Brewster, 1994; Cubbin et al., 2005; Dupere, Lacourse, Willms, Leventhal, & Tremblay, 2008), failure to use contraception (Kerrigan, Witt, Glass, Chung, & Ellen, 2006), and teen pregnancy (South & Baumer, 2000). The mechanisms underlying these associations are not clear, but one possibility is that disadvantaged neighborhoods – which are often characterized by high levels of social and physical disorder (e.g., public altercations, physical decay; Sampson & Raudenbush, 1999) – are rife with cues toward morbidity and early mortality (e.g., violent public disputes, drug paraphernalia on the streets) and thus fuel a sense of reproductive urgency that leads to early sexual initiation and sex with multiple partners. Moreover, youth from economically disadvantaged neighborhoods may be confronted with severely constrained opportunities to enter the “mainstream;” thus, the social and economic benefits of delaying sexual activity and childbearing may not be obvious (Brewster, Billy, & Grady, 1993; Furstenberg, 1992, p. 239). Indeed, some scholars have argued that early sexual initiation and childbearing may actually benefit disadvantaged adolescents and their infants. Geronimus (1992, 2003), for example, points to lower rates of infant mortality among adolescent, versus adult, African American women, and suggests that the psychosocial and physical health consequences of poverty and racism accumulate as poor, African American women age, thereby placing their infants at increasing risk for poor outcomes.

Building on this research, we argue that neighborhood disadvantage may also condition the influence of caregiver affect on adolescent sexual activity. Specifically, we draw on the contextual amplification hypothesis (Ge, Brody, Conger, Simons, & Murry, 2002) and suggest that neighborhood disadvantage may strengthen associations between adolescent sexual behavior and caregiver warmth and hostility. To the extent that social cues in disadvantaged neighborhoods highlight the benefits rather than the risks of adolescent sexual activity, the pool of sexually active adolescents, and therefore the supply of potential sex partners, may be larger in more (versus less) disadvantaged neighborhoods. Disadvantaged neighborhoods may therefore be precisely where the influence of caregivers’ affect can find its fullest expression. In less disadvantaged neighborhoods, where adolescents are not so thoroughly primed to have sex, the protective effects of caregiver warmth and the detrimental effects of caregiver hostility may not be as relevant.

It is difficult to assess the level of empirical support for the amplification hypothesis in the extant literature. Only a few studies have examined the extent to which neighborhood characteristics moderate associations between parenting and adolescents’ sexual behavior, and no two of them have examined exactly the same constructs. Among three such studies, two investigated the influence of different parenting constructs related to behavioral control (Roche & Leventhal, 2009; Roche et al., 2005) and the third examined the role of a construct related to caregiver affect (i.e., parent-child warmth and closeness; Cleveland & Gilson, 2004). Each of these three studies also examined a different aspect of youths’ neighborhoods (i.e., the proportion of single parents, disorder, or socioeconomic advantage or

disadvantage). Further obscuring the specific moderating role played by neighborhoods, multiple analyses were conducted within each of these studies (i.e., separate analyses were conducted for different parenting measures or for different subgroups of youth) and findings varied somewhat across analyses within papers. Nonetheless, in each study, analyses yielded at least one interaction term that supported the amplification hypothesis; that is, associations between parenting and adolescent sex outcomes were stronger in neighborhoods characterized by more (versus less) adversity.

The Present Study

Using data from a longitudinal study of urban adolescents, we sought to investigate the associations between caregiver affect, neighborhood disadvantage, and adolescents' sexual behavior as they are depicted in Figure 1. That is, we first attempted to replicate previously identified associations between two measures of primary caregiver affect – warmth and hostility – and measures of early sexual initiation and sex with multiple partners. We examined these associations net of the contributions of several relevant youth- and neighborhood-level control variables. Next, we examined the extent to which neighborhood disadvantage amplifies associations between caregiver affect and adolescents' sexual risk-taking (early sex and sex with multiple partners). To our knowledge, only one prior study of adolescent sexual behavior has tested for interactions between neighborhood conditions and caregiver affect, and it focused solely on caregiver warmth (Cleveland & Gilson, 2004). Because warmth and hostility are not simply opposite ends of a continuum (i.e., the absence of warmth is not equivalent to the presence of hostility; Pettit, Bates, & Dodge, 1997), we cannot assume that neighborhood disadvantage moderates the influence of caregiver warmth and hostility in an identical fashion. Thus, in the present study, we tested for interactions between neighborhood disadvantage and caregiver warmth, as well as for interactions between neighborhood disadvantage and caregiver hostility.

Method

Sample

Our sample of adolescents was drawn from the Project on Human Development in Chicago Neighborhoods Longitudinal Cohort Study (PHDCN-LCS), which began in 1994. The goal of the PHDCN was to study child and adolescent development in the context of neighborhoods; thus, participants were sampled by neighborhoods using a multi-stage sampling strategy. First, findings from cluster analyses of 1990 U.S. Census data, knowledge of Chicago neighborhoods, and geographic boundaries (e.g., railroad tracks, parks, freeways) were used to assign each of Chicago's 847 census tracts to one of 343 neighborhood clusters (NCs). The resulting NCs were then stratified by ethnic composition (7 categories) and SES (3 categories: high, medium, and low), yielding 21 strata. Roughly equal numbers of NCs were randomly selected from all but three empty strata (low SES primarily White NCs, high SES primarily Latino NCs, and high SES primarily Black and Latino NCs). This selection process yielded a final representative sample of 80 NCs. Approximately 35,000 households within these 80 NCs were randomly selected and screened for eligibility (eligible households had children within 6 months of one of 7 target ages). This resulted in a sample of 6,234 children and adolescents in 7 age groups (ages 0, 3, 6, 9, 12, 15, and 18 years), or cohorts, for the first wave of data collection.

Data were collected in three waves, at roughly 2 ½-year intervals. The first wave of data collection occurred between 1994 and 1997, the second between 1997 and 1999, and the third between 2000 and 2001. Retention rates were relatively high; from the original sample, 86% enrolled at wave 2 and 77% enrolled at wave 3 (Martin & Schoua-Glusberg, 2002).

There was a home visit at each wave, during which youth and their primary caregivers completed measures of functioning in a wide variety of domains.

A subsample of youth from the PHDCN-LCS was selected for inclusion in the present study. First, because we used measures of caregiver affect from wave 2 to predict sexual behavior as reported at wave 3 (see description of measures below), we included in our analytic sample only those youth who, at wave 3, reported that they had not initiated sex prior to wave 2. This tactic does not enable us to make causal claims about the influence of caregiver affect on sexual behavior, but it ensures correct temporal ordering of our key constructs (i.e., that our measures of sexual behavior at wave 3 reflected sex that was initiated after assessments of caregiver affect at wave 2). Because we eliminated youth who initiated sex prior to wave 2, cohort 12 (i.e., those who were roughly 12 years of age at wave 1; $N = 821$) was the oldest cohort eligible for inclusion in our sample (cohort 15 and 18 youth were too old to allow for the observation of early sexual initiation between waves 2 and 3). Additionally, cohort 9 ($N = 828$) was the youngest cohort with data on sexual behavior and was therefore the youngest cohort eligible for sample inclusion. After excluding youth who initiated sex prior to wave 2, 1,557 youth from cohorts 9 and 12 remained in our analytic sample. From this sample, we also eliminated youth with missing data on sexual behavior ($N_{MissEarlySex} = 572$; $N_{MissMultPrts} = 485$; see discussion of missing data below), and youth who resided in neighborhoods for which no neighborhood-level data were available ($N = 2$). Thus, the final analytic sample included 983 youth for analyses of early sexual initiation and 1,070 youth for analyses of multiple partners.

To determine whether sample selection procedures introduced a source of bias, we compared our analytic sample (i.e., those 1,070 youth with non-missing data on at least one measure of sexual behavior) to the full cohort 9 and 12 sample ($N = 1,649$) on the following 7 demographic characteristics: gender, race and ethnicity, age at wave 3, family structure, caregiver education, income, and family size. These analyses revealed three differences: (1) at wave 3, youth in the analytic sample were slightly younger, on average, than were youth in the full sample ($M(SD)_{analytic} = 15.03(1.55)$, $M(SD)_{full} = 15.26(1.59)$, $t = -3.72$, $p < .001$), (2) a greater percentage of youth in the analytic sample (51.4%), versus the full sample (47.2%), resided in a home with two married biological parents ($\chi^2(1) = 7.59$, $p < .01$), and (3) a greater percentage of youth in the analytic sample (44.5%), versus the full sample (41.5%), had primary caregivers who had completed some education beyond high school ($\chi^2(1) = 3.94$, $p < .05$).

Measures

Our measures are described below and descriptive statistics for each are presented in Table 1. All measures of youth and family functioning were administered by trained research assistants who successfully completed a six-week training course prior to release into the field. Throughout the study, supervising staff periodically reviewed completed interview protocols as a quality assurance measure.

Sexual behavior—At wave 3, adolescents completed a short self-administered questionnaire on sexual behavior. Youth who indicated that they had ever had sexual intercourse also responded to questions regarding age at first sex and number of sexual partners. Using these data, we constructed a binary measure of *early sexual initiation* (0 = *no sex or first sex at 17 years or older*; 1 = *first sex at 16 or younger*). Our decision to use age 17 as the cutoff for early sexual initiation was based on national data from 2002 (which were collected around the same time that wave 3 data on sexual activity were collected for PHDCN) showing that the mean age at first intercourse for both women and men was 17 (Chandra, Martinez, Mosher, Abma, & Jones, 2005; Martinez, Chandra, Abma, Jones, &

Mosher, 2006). We also created a binary measure of *sex with multiple partners* (0 = 0 – 1 partner; 1 = 2 or more partners since initiating sex). The decision to use a binary measure, rather than a count of youths' sex partners, was based on concerns about small cell sizes as the number of youths' sex partners increased.

Caregiver affect—Separate measures of caregiver warmth and caregiver hostility were constructed using data from wave 2 home visits with youths' primary caregivers, 84% of whom were mothers (9% were fathers, 4% were grandmothers, and the remaining 3% were other adults). These measures, described below, were not significantly correlated with each other, confirming that they capture distinct dimensions of caregiver affect.

Our measure of *caregiver warmth* was constructed using observational data from the PHDCN Home and Life Interview, which is an adapted version of the Home Observation for the Measurement of the Environment (HOME) Inventory (Bradley et al., 2000; Caldwell & Bradley, 1984). Research assistants assessed caregivers' interactions with their children and coded for the presence of nine indicators of affectionate and affirming behavior (e.g., caregiver used a term of endearment or some diminutive for child's name when talking about or to him or her at least twice during visit; 1 = yes, 0 = no). We excluded two items from this scale that did not explicitly tap the positivity or negativity of caregivers' affect (e.g., caregiver answers youth's questions or requests verbally; 1 = yes, 0 = no), and we summed responses to the seven remaining items. Internal consistency among these items was acceptable ($\alpha = .78$). Although data on inter-rater reliability are not available, efforts were made to facilitate accurate coding of caregiver behavior. Research assistants were required to complete this measure immediately following home visits, and, during coding, they had access to a training manual with examples of the behaviors referenced by each item.

Data from primary caregivers' responses to the Conflict Tactics Scale (CTS; Straus, 1979) were used to construct a measure of *caregiver hostility* at wave 2. Characterized by robust psychometric properties (Straus, 1979), the CTS assesses caregivers' strategies for resolving problems with their children. Each caregiver reported on whether he or she or another household adult had used the following tactics during conflicts with his or her child in the year preceding the wave 2 assessment: sulking or refusing to discuss a problem, insulting or swearing at the child, stomping out of the room, saying or doing something spiteful, and threatening physical violence ($\alpha = .67$). Responses to these five items were summed.

Youth and family control variables—All analyses controlled for the following youth and family demographic characteristics measured at wave 1: youth gender (1 = male), household per capita income, primary caregiver education (1 = some education beyond high school, 0 = high school diploma or less), family size, and family structure (1 = two married biological parents, 0 = all other family structures). We also controlled for youth race and ethnicity as measured at wave 1. We created four dummy variables – one each for youth who identified themselves as African American, Hispanic, white, or a member of another race or ethnic group. White youth served as our omitted reference group. Additionally, all analyses controlled for youth age at wave 3 (when sexual behavior was measured).

Our analyses also controlled for caregiver monitoring in order to distinguish the potential influence of caregiver affect from the influence of caregivers' direct attempts to control youth behavior. Following Browning et al. (2005), we used data from two binary measures of monitoring reported by primary caregivers at wave 2. The first assessed monitoring in public spaces (1 = youth is not permitted to be unsupervised in public for more than two hours) and the second assessed monitoring of peer relationships (1 = primary caregiver has had contact with at least two of youth's friends in the past two weeks). Using these data we

constructed three dummy variables identifying (1) youth whose caregivers engaged in neither form of monitoring, (2) youth whose caregivers engaged in only one form of monitoring, and (3) youth whose caregivers engaged in both forms of monitoring. The second of these three dummies was omitted from our analyses and served as the reference group.

Finally, we included controls for several additional risk factors for risky sexual behavior – youth problem behavior, peer sexual behavior, and low academic achievement. These risk factors may alert caregivers to the heightened possibility of early or risky sexual behavior and may shape the way caregivers interact with their children. Thus, including these controls minimized the threat of capitalizing on reverse causation. Youth self-report measures of juvenile offending (Huizinga, Esbenson, & Weiher, 1991; Loeber, Stouthamer-Loeber, Van Kammen, & Farrington, 1998) and substance use (based on NIDA, 1991) from wave 1 were used to construct binary indicators of both of these behaviors. At wave 1 youth also completed a measure of peer deviance which included one item on peer sexual behavior. Youth indicated whether none, some, or all of their friends were sexually active. Using these data we constructed three dummy variables identifying (1) youth with no sexually active peers, (2) youth with some sexually active peers, and (3) youth whose peers were all sexually active. The second of these three dummies was excluded from our analyses and served as the reference group. Finally, wave 1 scores on the Reading and Word Decoding subtest of the Wide Range Achievement Test-3 (WRAT-3; Wilkinson, 1993) were used to measure achievement.

Neighborhood characteristics—Data on the socioeconomic characteristics of youths' neighborhoods were taken from the 1990 U.S. Decennial Census and were constructed at the level of the census tract ($N = 167$ tracts, each of which, on average, included 3,867 residents [$SD = 2,572$] and covered 0.26 square miles [$SD = 0.28$]). Consistent with previously published factor analyses of these data (Sampson, Raudenbush, & Earls, 1997), we identified three dimensions of neighborhood-level socioeconomic structure using principal components analysis with varimax rotation: *concentrated disadvantage*, which was defined by the percentage of residents living below the poverty level, the percentage of residents on public assistance, the percentage of female-headed households, the percentage of unemployed residents, the percentage of residents under 18 years of age, and the percentage of African American residents; *immigrant concentration*, which was defined by the percentage of foreign-born residents and the percentage of Latino residents; and, *residential stability*, which was defined by the percentage of residents in owner-occupied houses and the percentage of residents living in the same home over a five-year period. While we were primarily interested in investigating the role of concentrated disadvantage in adolescent sexual behavior, our models also controlled for factor scores on immigrant concentration and residential stability, as social disorganization theory suggests that all three dimensions of neighborhood structure play a role in shaping residents' experiences (Sampson & Groves, 1989).

Means and standard deviations for these variables are presented in Table 1. However, because factor scores are not readily interpretable, we computed some additional descriptive statistics for our main neighborhood predictor, concentrated disadvantage. We tabulated frequencies for two key census indicators (the percentages of residents who are living below the poverty level and who are unemployed) in neighborhoods that scored near the mean (i.e., $M \pm 0.5 SD$) on concentrated disadvantage. We found that these neighborhoods were characterized by a 24% poverty rate and a 13% unemployment rate. These figures are higher than national averages in 1990 (13% and 6%, respectively; U. S. Census Bureau, 2010), suggesting that neighborhoods in our sample were somewhat more disadvantaged than neighborhoods nationally.

Analytic Strategy

Treatment of missing data—Missing data on youth-level variables were multiply imputed. Multiple imputation involves: (1) Generating multiple copies of a dataset, (2) substituting plausible values for all missing values in each dataset (imputations are generated conditionally on the observed values in the dataset and random error), (3) analyzing each imputed dataset separately, and (4) combining results from separate analyses of each imputed dataset (von Hippel, 2007). We used the multivariate Imputation by Chained Equations program (ICE; Royston, 2004) in STATA 10.0 to perform imputation. Following conventional guidelines, we generated and analyzed five imputed datasets (McCartney, Burchinal, & Bub, 2006).

To ensure that imputations were based on all available information, imputation was performed prior to making the sample exclusions described above. Thus, youth who initiated sex before wave 2 were excluded from our sample after imputation. Moreover, following recent guidelines, imputed values for all predictors were retained, but imputed values on measures of early sexual initiation and multiple partners were deleted prior to analysis (imputed outcome data generate excessive noise in regression models; von Hippel, 2007).

General analytic approach—In analysis of each imputed dataset, we used two-level logistic regression models in HLM 6.08 (Raudenbush, Bryk, & Congdon, 2009) to examine the associations between caregiver affect, neighborhood disadvantage, and adolescents' sexual behavior. Sex outcomes were modeled as a function of youth-level data at level 1 and neighborhood-level data at level 2. Preliminary analyses revealed under-dispersion (smaller level-1 variance components than those assumed for two-level logistic regression models) in both sex outcomes; thus, we estimated dispersion parameters in all models instead of using the HLM 6 default parameters. Continuous predictor variables at both levels were centered around their grand means. After completing separate analyses of each imputed dataset as described in the following paragraphs, standard equations (Raudenbush & Bryk, 2002) were used to combine estimates across datasets.

Model-building—We first ran two two-level unconditional models to obtain estimates of the neighborhood-level variance in early sexual initiation and sex with multiple partners. In each model, at level 1 (see eq. 1), we modeled the log odds of each sex outcome (ϕ ; henceforth referred to generically as “sex” in discussions of modeling) for each adolescent i within neighborhood j as a function of a level-1 intercept (β_{0j} ; which is the log odds of sex among adolescents within neighborhood j) and a level-1 error term (r_{ij}). At level-2 (see eq. 2), we

$$\ln\left(\frac{\phi_{ij}}{1 - \phi_{ij}}\right) = \beta_{0j} + r_{ij} \quad (1)$$

$$\beta_{0j} = \gamma_{00} + \mu_{0j} \quad (2)$$

modeled the level-1 intercept (β_{0j}) as a function of a level-2 intercept (γ_{00} ; i.e., the average log odds of sex across j neighborhoods) and a level-2 error term (μ_{0j}). These models yielded estimates of the neighborhood-level variance (τ) in each sex outcome (Raudenbush & Bryk, 2002), and a chi-square likelihood ratio test was used to determine whether τ differed significantly from zero (i.e., whether sex varied across neighborhoods). Additionally, estimates for τ were used to compute intraclass correlation coefficients (ICC) for each sex outcome (i.e., the percentage of variance in each sex outcome that exists at the neighborhood level), using the formula, $ICC = (\tau / [\tau + \delta^2]) \times 100$, where δ^2 is equivalent to the variance at the youth level.

Building on the unconditional models represented by equation 1 and equation 2, we then examined the main effects of caregiver warmth and caregiver hostility on each sex outcome, net of all other youth- and neighborhood-level predictors. At level 1 (eq. 3), the log odds of sex (ϕ)

$$\ln\left(\frac{\phi_{ij}}{1 - \phi_{ij}}\right) = \beta_{0j} + \beta_{1j}(WARM_{1ij}) + \beta_{2j}(HOST_{2ij}) + \sum_{q=3}^{18} \beta_{qj}(X_{qij}) + r_{ij} \quad (3)$$

for each adolescent i in neighborhood j was modeled as a function of a level-1 intercept (β_{0j}), the effect (β_{1j}) of caregiver warmth, the effect (β_{2j}) of caregiver hostility, the effects (β_{qj}) of $q = 16$ individual-level control variables (X), and error (r_{ij}). At level 2 (see equation 4), the level-1

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(CONDIS_{1j}) + \gamma_{02}(IMMCON_{2j}) + \gamma_{03}(RESSTAB_{3j}) + \mu_{0j} \quad (4)$$

intercept (β_{0j}) from equation 3 was modeled as a function of a level-2 intercept (γ_{00}), the effects ($\gamma_{01} - \gamma_{03}$) of 3 neighborhood characteristics (concentrated disadvantage, immigrant concentration, and residential stability), and error (μ_{0j}). Additionally, the level-1 slopes for warmth (β_{1j}), hostility (β_{2j}), and all individual-level controls (β_{qj}) were modeled as a function of level-2 intercepts (γ_{10} , γ_{20} , and γ_{q0} , respectively; see equation 5–equation 7). In this two-level model, the

$$\beta_{1j} = \gamma_{10} \quad (5)$$

$$\beta_{2j} = \gamma_{20} \quad (6)$$

$$\beta_{qj} = \gamma_{q0} \quad (7)$$

effects of caregiver warmth and hostility on sex, averaged across j neighborhoods, are represented, respectively, by the level-2 intercepts γ_{10} and γ_{20} .

Finally, we examined the interactive effects of neighborhood disadvantage and caregiver affect on sexual behavior. Building on the two-level model represented by equation 3 through 7, we added concentrated disadvantage and a neighborhood-level error term to the level-2 models predicting the level-1 slopes for caregiver warmth (β_{1j}) and caregiver hostility (β_{2j} ; see resulting equation 8 and equation 9). In these models, the slopes γ_{11} and γ_{21} represent the interactions between neighborhood disadvantage and caregiver warmth and hostility, respectively.

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(CONDIS_{1j}) + \mu_{1j} \quad (8)$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}(CONDIS_{2j}) + \mu_{2j} \quad (9)$$

Results

Unconditional Models

Two-level unconditional models revealed significant between-neighborhood variability in early sexual initiation ($\tau = 0.31$, $\chi^2[165] = 209.40$, $p < .05$) and sex with multiple partners (τ

$= 1.04, \chi^2[166] = 278.60, p < .001$). The ICCs for early sexual initiation and sex with multiple partners were 5.02% and 9.65% respectively. These findings are consistent with evidence that neighborhood characteristics typically account for no more than 5% to 10% of the variance in child and adolescent outcomes (Leventhal & Brooks-Gunn, 2000).

Main Effects Models

Analyses of the main effects of caregiver affect are presented in Table 2, Models 1 and 3. Caregiver hostility was not significantly associated with either measure of sexual behavior. Caregiver warmth, however, was inversely and significantly associated with early sexual initiation ($\gamma [SE] = -0.14[0.05], t = -2.90, p < .01$) and sex with multiple partners ($\gamma [SE] = -0.21[0.06], t = -3.77, p < .01$), net of all youth- and neighborhood-level controls. Converting these coefficients to odds ratios reveals that each unit increase in caregiver warmth was associated with a 14% reduction in the odds of early sexual initiation and a 19% reduction in the odds of sex with multiple partners.

Among those predictors included as controls, only three variables were consistently and significantly associated with both sex outcomes. Delinquency, male gender, and youth age were positively associated with both early sexual initiation ($\gamma [SE]_{\text{delinquency}} = 0.47[0.18], t = 2.55, p < .05$; $\gamma [SE]_{\text{male}} = 0.58[0.18], t = 3.29, p < .01$; $\gamma [SE]_{\text{age}} = 0.71[0.07], t = 10.59, p < .001$) and sex with multiple partners ($\gamma [SE]_{\text{delinquency}} = 0.76[0.20], t = 3.73, p < .001$; $\gamma [SE]_{\text{male}} = 0.96[0.20], t = 4.95, p < .001$; $\gamma [SE]_{\text{age}} = 0.63[0.07], t = 8.60, p < .001$). Additionally, though not associated with multiple sex partners, residence in a two-parent family was inversely associated with early sexual initiation ($\gamma [SE] = -0.53[0.20], t = -2.70, p < .01$), and African American ethnicity was positively associated with early sexual initiation ($\gamma [SE] = 1.13[0.37], t = 3.08, p < .01$). To ensure the most conservative estimates of the associations between caregiver affect and youth sexual behavior, we retained all originally selected controls in our analyses regardless of statistical significance.

Cross-Level Interaction Models

Findings from models including cross-level interactions between neighborhood disadvantage and caregiver affect are presented in Table 2, Models 2 and 4. Concentrated disadvantage did not moderate the inverse association between caregiver warmth and either measure of sexual behavior. Interactions between concentrated disadvantage and caregiver warmth were therefore dropped from our regression models. There were, however, significant interactions between concentrated disadvantage and caregiver hostility in models predicting both early sex ($\gamma [SE] = 0.35[0.13], t = 2.70, p < .01$) and sex with multiple partners ($\gamma [SE] = 0.59[0.20], t = 2.98, p < .01$).

We used “regions of significance” testing to determine the regions on the concentrated disadvantage scale within which caregiver hostility was significantly associated with early sexual initiation and sex with multiple partners (see Preacher, Curran, & Bauer, 2006 for procedures and a description of the web utility used to perform these tests). These tests were performed separately on estimates from each imputed dataset and the boundaries of the significant regions were averaged across datasets. We found that, on average, caregiver hostility was (1) significantly and *positively* associated with early sexual initiation when scores on concentrated disadvantage were more than 1.06 *SDs* above the sample mean, (2) significantly and *negatively* associated with early sexual initiation when scores on concentrated disadvantage were more than 0.72 *SDs* below the sample mean, and (3) not significantly associated with early sexual initiation when scores on concentrated disadvantage were between -0.72 *SDs* and 1.06 *SDs* (see Figure 2).

Similarly, caregiver hostility was (1) significantly and *positively* associated with multiple sex partners when scores on concentrated disadvantage were more than 0.99 *SDs* above the sample mean, (2) significantly and *negatively* associated with multiple sex partners when scores on concentrated disadvantage were more than 0.28 *SDs* below the sample mean, and (3) not significantly associated with multiple sex partners when scores on concentrated disadvantage were between -0.28 *SDs* and 0.99 *SDs* (see Figure 3).

Discussion

In the present study, caregiver warmth and hostility predicted adolescents' reports of early sexual initiation and sex with multiple partners two and a half years later. Associations between caregiver affect and adolescents' sexual behavior were significant even after controlling for parental monitoring and many other youth- and neighborhood-level risk factors for adolescent sex. Although it is impossible to prove causality without an experimental design, the longitudinal nature of our data and our extensive battery of controls suggests that a causal role for caregiver affect in the development of adolescents' sexual behavior is at least plausible.

Our findings also suggest that the links between some aspects of caregiver affect and adolescents' sexual behavior may be contingent on neighborhood residence. We found that associations between caregiver hostility and adolescent sex outcomes varied markedly as a function of neighborhood disadvantage. We expected that caregiver hostility would predict increased odds of early sex and sex with multiple partners, and that neighborhood disadvantage would amplify these associations. Consistent with this hypothesis, we found that when scores on neighborhood disadvantage surpassed roughly $+1$ *SDs*, caregiver hostility was significantly and positively associated with both sex outcomes. Moreover, as scores on neighborhood disadvantage increased beyond $+1$ *SDs*, the positive associations between hostility and sex increased in magnitude. Counter to our hypothesis, however, we found that when scores on neighborhood disadvantage fell below roughly $-\frac{1}{4}$ *SDs*, caregiver hostility was significantly and *inversely* associated with sex with multiple partners, and that when scores on neighborhood disadvantage fell below approximately $-\frac{3}{4}$ *SDs*, an additional significant inverse association emerged between caregiver hostility and early sex. In other words, in the least disadvantaged neighborhoods, the odds of early sex and sex with multiple partners actually declined as caregiver hostility increased (see Figures 2 and 3).

We expected the *magnitude* of the associations between caregiver hostility and adolescents' sexual behavior to vary as function of neighborhood disadvantage, but we did not expect the *direction* of these associations to vary across neighborhoods. We offer one speculative explanation for these findings that should be explored in future research. Perhaps caregiver hostility predicts sexual initiation and multiple partners in the most disadvantaged neighborhoods, but protects against these outcomes in the least disadvantaged neighborhoods, because the interactional style adopted by children of hostile caregivers has different consequences for peer acceptance and sexual opportunity across the two types of neighborhoods. Prior studies show that the children of verbally aggressive caregivers are more likely to be verbally aggressive with peers, and, as a result, to be rejected by peers (for a review see Patterson, DeBaryshe, & Ramsey, 1990). Unpopular youth may, in turn, have limited opportunities for sex (Mayeux, Sandstrom, & Cillessen, 2008). However, ethnographic research points to the high premium placed on toughness, verbal acuity, and physical prowess in some highly disadvantaged adolescent populations, perhaps because conventional pathways to social status appear unattainable (Anderson, 1999; Fagan & Wilkinson, 1998; Prinz & Miller, 1991). Therefore, the same verbal aggression that would induce peer rejection and reduce sexual opportunity in the least disadvantaged

neighborhoods might not damage and may even increase adolescents' popularity and sexual opportunity in the most disadvantaged neighborhoods.

Notably, such neighborhood-dependent mechanisms are not needed to explain the links between caregiver warmth and adolescents' sexual behavior. We found that caregiver warmth was inversely associated with early sexual initiation and sex with multiple partners in all neighborhoods. Moreover, these associations were similar in magnitude regardless of neighborhood disadvantage. The public health implications of this finding are encouraging; caregiver warmth may play a key role in deterring sexual risk-taking, even in neighborhoods where the risks for early sexual initiation loom large. Scientifically, however, it is puzzling that we found an interaction between neighborhood disadvantage and caregiver hostility, but not between neighborhood disadvantage and warmth. Nonetheless, because warmth and hostility represent two distinct constructs rather than two ends of a continuum, it is quite possible that warmth does not influence adolescent sexual behavior in a manner that perfectly mirrors the influence of hostility. The fact that warmth was inversely associated with both sex outcomes across all neighborhoods suggests the primacy of its role in adolescents' sexual behavior. More research is needed to substantiate this claim, however. One limitation of our study is that warmth was measured observationally while hostility was measured via self-report. Future studies comparing caregivers' positive and negative affect should use similarly structured assessments of these constructs.

Future research might expand on our study in several other ways as well. First, data on caregiver affect in the PHDCN were collected only from primary caregivers, most of whom were mothers. Extant findings suggest that adolescents have different kinds of conversations about sex with mothers versus fathers (DiIorio, Kelley, & Hockenberry-Eaton, 1999; Miller, Kotchick, Dorsey, Forehand, & Ham, 1998). Moreover, mothers' and fathers' parenting practices are not identically associated with adolescent sex outcomes (Coley, Votruba-Drzal, & Schindler, 2009). Thus, future research might consider the extent to which neighborhood disadvantage similarly moderates associations between maternal versus paternal affect and adolescent sexual behavior.

Second, to maximize sample size and power, our analyses combined youth in two age groups – cohort 9, whose sexual behavior was measured between the ages of approximately 11 and 13½ years, and cohort 12, whose sexual behavior was measured between the ages of roughly 14 and 16½ years. Thus, cohort 9 youth who initiated sex and had sex with multiple partners during our study period did so at considerably younger ages than did cohort 12 youth who engaged in these behaviors. It is conceivable that the predictors of sexual behavior in pre- or early adolescence differ from the predictors of sexual behavior later in adolescence. In particular, neighborhoods may be less salient for younger adolescents who have stronger ties to family and weaker ties to peers than do older adolescents (Steinberg & Silverberg, 1986). Future research should thus investigate the possibility that caregiver affect differentially predicts early versus very early adolescent sexual behavior, and that neighborhood disadvantage differentially moderates these associations.

Third, our study does not consider the possibility that associations between caregiver affect and adolescent sexual behavior depend on caregiver attitudes toward adolescent sex. Research suggests that parents' acceptance of adolescent sex is positively associated with sexual activity during adolescence (Longmore et al., 2009; Kan, Cheng, Landale, & McHale, 2010; Miller, Forehand, & Kotchick., 1999). Thus, in the context of permissive caregiver attitudes toward sex, caregiver warmth may not protect against early sexual initiation, particularly in disadvantaged neighborhoods where youth may have access to a larger pool of potential sex partners. Future studies might therefore consider the possibility

of three-way interactions between caregiver warmth, caregiver attitudes about sex, and neighborhood disadvantage.

Finally, future studies should attempt to extend our findings to other measures of adolescents' sexual risk-taking and reproductive health, such as contraceptive use, pregnancy, and childbearing. Studies sometimes find that different sexual behaviors and reproductive health outcomes have different predictors (e.g., Brewster, 1994; Miller et al., 1999; Romer et al., 1999); thus, our conclusions regarding the predictors of early sexual initiation and sex with multiple partners may or may not extend to other adolescent sex outcomes. Moreover, neighborhood norms regarding sex figure prominently in our arguments about neighborhood-level moderation of associations between caregiver affect and sex outcomes; to the extent that neighborhood norms regarding contraceptive use, pregnancy, and childbearing differ from norms regarding sexual initiation and sex with multiple partners, we might therefore expect different findings in analyses of those outcomes.

Any such future attempts to build on the small body of extant studies examining the interactive contributions of neighborhoods and parenting to adolescent sexual behavior will make important contributions to the literature. Studies that consider the multiplicative influence of neighborhoods and caregivers acknowledge the reality that the contexts of adolescent development cannot be considered in isolation from one another. Indeed, our analyses revealed that while caregiver warmth was inversely associated with early sex and sex with multiple partners in all neighborhoods, the direction of the associations between caregiver hostility and both sex outcomes was contingent on neighborhood disadvantage. In neighborhoods characterized by high levels of disadvantage, hostility was positively associated with adolescents' sexual behavior, but in neighborhoods characterized by relatively low levels of disadvantage, hostility was inversely associated with adolescents' sexual behavior. These findings suggest that a parenting practice that acts as a risk factor in one neighborhood may not act as a risk factor in another neighborhood. Studies that consider interactions between neighborhoods and parenting therefore have important implications for intervention; they suggest that attempts to promote the reproductive health of adolescents in different neighborhoods may require different approaches.

Acknowledgments

This paper was supported by a grant from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (#1R01HD060719). The authors also thank Laurence Steinberg for providing critical comments on an early draft of our manuscript.

References

- Anderson, E. *Code of the street: Decency, violence, and the moral life of the inner city*. New York: W.W. Norton & Company, Inc; 1999.
- Belsky J, Steinberg L, Houts RM, Halpern-Felsher BL. The development of reproductive strategy in females: Early maternal harshness → earlier menarche → increased sexual risk taking. *Developmental Psychology*. 2010; 46:120–128. [PubMed: 20053011]
- Black MM, Oberlander SE, Lewis T, Knight ED, Zolotor AJ, Litrownik AJ, English DE. Sexual intercourse among adolescents maltreated before age 12: A prospective investigation. *Pediatrics*. 2009; 124:941–949. [PubMed: 19706574]
- Bradley RH, Corwyn RF, Caldwell BM, Whiteside-Mansell L, Wasserman GA, Mink IT. Measuring the home environments of children in early adolescence. *Journal of Research on Adolescence*. 2000; 10:247–288.
- Brewster KL. Neighborhood context and the transition to sexual activity among young black women. *Demography*. 1994; 31:603–614. [PubMed: 7890095]

- Brewster KL, Billy JOG, Grady WR. Social context and adolescent behavior: The impact of community on the transition to sexual activity. *Social Forces*. 1993; 71:713–740.
- Bronfenbrenner U. Toward an experimental ecology of human development. *American Psychologist*. 1977; 32(7):513–531.
- Browning CR, Leventhal T, Brooks-Gunn J. Sexual initiation in early adolescence: The nexus of parental and community control. *American Sociological Review*. 2005; 70:758–778.
- Caldwell, B.; Bradley, R. Home Observation for Measurement of the Environment (HOME) – Revised Edition. Little Rock, AR: University of Arkansas, Little Rock; 1984.
- Chandra, A.; Martinez, GM.; Mosher, WD.; Abma, JC.; Jones, J. Fertility, family planning, and reproductive health of U.S. women: Data from the 2002 National Survey of Family Growth. Washington, DC: U.S. Government Printing Office; 2005.
- Cleveland HH, Gilson M. The effects of neighborhood proportion of single-parent families and mother-adolescent relationships on adolescents' number of sexual partners. *Journal of Youth and Adolescence*. 2004; 33:319–329.
- Coker AL, Richter DL, Valois RF, McKeown RE, Garrison CZ, Vincent ML. Correlates and consequences of early initiation of sexual intercourse. *The Journal of School Health*. 1994; 64:372–377. [PubMed: 7877279]
- Coley RL, Medeiros BL, Schindler HS. Using sibling differences to estimate effects of parenting on adolescent sexual risk behaviors. *Journal of Adolescent Health*. 2008; 43:133–140. [PubMed: 18639786]
- Coley RL, Votruba-Drzal E, Schindler HS. Fathers' and mothers' parenting predicting and responding to adolescent sexual risk behaviors. *Child Development*. 2009; 80:808–827. [PubMed: 19489905]
- Cubbin C, Santelli J, Brindis CD, Braveman P. Neighborhood context and sexual behaviors among adolescents; Findings from the National Longitudinal Study of Adolescent Health. *Perspectives on Sexual and Reproductive Health*. 2005; 37:125–134. [PubMed: 16150660]
- de Graaf H, Vanwesenbeeck I, Woertman L, Keijsers L, Meijer S, Meeus W. Parental support and knowledge and adolescents' sexual health: Testing two mediational models in a national Dutch sample. *Journal of Youth and Adolescence*. 2010; 39:189–198. [PubMed: 20084564]
- DiClemente RJ, Wingood GM, Crosby R, Sionean C, Cobb BK, Harrington K, Oh MK. Parental monitoring: Association with adolescents' risk behaviors. *Pediatrics*. 2001; 107:1363–1368. [PubMed: 11389258]
- DiIorio C, Kelley M, Hockenberry-Eaton M. Communication about sexual issues: Mothers, fathers, and friends. *Journal of Adolescent Health*. 1999; 24:181–189. [PubMed: 10195801]
- Dupere V, Lacourse E, Willms JD, Leventhal T, Tremblay RE. Neighborhood poverty and early transition to sexual activity in young adolescents: A developmental ecological approach. *Child Development*. 2008; 79:1463–1476. [PubMed: 18826536]
- Fagan, J.; Wilkinson, DL. Social contexts and functions of adolescent violence. In: Elliott, DS.; Hamburg, BA.; Williams, KR., editors. *Violence in American schools: A new perspective*. New York: Cambridge University Press; 1998. p. 55-93.
- Furstenberg FF. Teenage childbearing and cultural rationality: A thesis in search of evidence. *Family Relations*. 1992; 41:239–243.
- Ge X, Brody G, Conger RD, Simons R, Murry VM. Contextual amplification of pubertal effects on deviant peer affiliation and externalizing behavior among African American children. *Developmental Psychology*. 2002; 28:42–54. [PubMed: 11806701]
- Geronimus AT. The weathering hypothesis and the health of African-American women and infants: Evidence and speculations. *Ethnicity and Disease*. 1992; 2:207–221. [PubMed: 1467758]
- Geronimus AT. Damned if you do: culture, identity, privilege, and teenage childbearing in the United States. *Social Science and Medicine*. 2003; 57:881–893. [PubMed: 12850113]
- Guttmacher Institute. Facts on American teens sexual and reproductive health. New York, NY: Author; 2010 January.
- Hope TL, Chapple CL. Maternal characteristics, parenting, and adolescent sexual behavior: The role of self-control. *Deviant Behavior*. 2005; 26:25–45.
- Huizinga D, Esbenson F, Weiher A. Are there multiple paths to delinquency? *The Journal of Criminal Law and Criminology*. 1991; 82:83–118.

- Kan ML, Cheng YA, Landale NS, McHale SM. Longitudinal predictors of change in number of sexual partners across adolescence and early adulthood. *Journal of Adolescent Health*. 2010; 46:25–31. [PubMed: 20123254]
- Kelley SS, Borawski EA, Flocke SA, Keen KJ. The role of sequential and concurrent sexual relationships in the risk of sexually transmitted diseases among adolescents. *Journal of Adolescent Health*. 2003; 32:296–305. [PubMed: 12667734]
- Kerrigan D, Witt S, Glass B, Chung S, Ellen J. Perceived neighborhood social cohesion and condom use among adolescents vulnerable to HIV/STI. *AIDS and Behavior*. 2006; 10:723–729. [PubMed: 16845598]
- Laflin MT, Wang J, Barry M. A longitudinal study of adolescent transition from virgin to nonvirgin status. *Journal of Adolescent Health*. 2008; 42:228–236. [PubMed: 18295130]
- Lansford JE, Yu T, Erath SA, Pettit GS, Bates JE, Dodge KA. Developmental precursors of number of sexual partners from ages 16 to 22. *Journal of Research on Adolescence*. 2010; 20:651–677. [PubMed: 20823951]
- Leventhal T, Brooks-Gunn J. The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin*. 2000; 26:309–337. [PubMed: 10748645]
- Li X, Stanton B, Feigelman S. Impact of perceived parental monitoring on adolescent risk behaviors over 4 years. *Journal of Adolescent Health*. 2000; 27:49–56. [PubMed: 10867352]
- Loeber, R.; Stouthamer-Loeber, M.; Van Kammen, W.; Farrington, D. Development of a new measure for self-reported antisocial behavior for young children: prevalence and reliability. In: Klein, M., editor. *Cross National Research in Self-Reported Crime and Delinquency*. New York, NY: Springer; 1989. p. 203-225.
- Longmore MM, Eng AL, Giordano PC, Manning WD. Parenting and adolescents' sexual initiation. *Journal of Marriage and Family*. 2009; 71:969–982. [PubMed: 20160871]
- Martin, KR.; Schoua-Glusberg, A. Project on Human Development in Chicago Neighborhoods Longitudinal Cohort Study: Field data collection report. Cambridge, MA: Harvard University; 2002 June.
- Martinez, GM.; Chandra, A.; Abma, JC.; Jones, J.; Mosher, WD. Fertility, contraception, and fatherhood: Data on men and women from Cycle 6 (2002) of the National Survey of Family Growth. Washington, DC: U.S. Government Printing Office; 2006.
- Mayeux L, Sandstrom MJ, Cillessen AHN. Is being popular a risky proposition? *Journal of Research on Adolescence*. 2008; 18:49–74.
- McCartney K, Burhcin MR, Bub KL. Best practices in quantitative methods for developmentalists. *Monographs of the Society for Research in Child Development*. 2006; 71 (3, Serial No. 285).
- Miller BC. Family influences on adolescent sexual and contraceptive behavior. *Journal of Sex Research*. 2002; 39:22–26. [PubMed: 12476252]
- Miller KS, Forehand R, Kotchick BA. Sexual behavior in two ethnic minority samples: The role of family variables. *Journal of Marriage and Family*. 1999; 61:85–98.
- Miller KS, Kotchick BA, Dorsey S, Forehand R, Ham AY. Family communication about sex: What are parents saying and are their adolescents listening? *Family Planning Perspectives*. 1998; 30:218–222. +235. [PubMed: 9782044]
- Narring F, Michaud P, Sharma V. Demographic and Behavioral Factors Associated with Adolescent Pregnancy in Switzerland. *Family Planning Perspectives*. 1996; 28:232–236. [PubMed: 8886767]
- NIDA. National Household Survey on Drug Abuse: Population estimates, 1991. Rockville, MD: Author; 1991.
- Osburn HG. Coefficient alpha and related internal consistency reliability coefficients. *Psychological Methods*. 2000; 5:343–355. [PubMed: 11004872]
- Patterson GR, DeBaryshe B, Ramsey E. A developmental perspective on antisocial behavior. *American Psychologist*. 1990; 44:329–355. [PubMed: 2653143]
- Pearson J, Muller C, Frisco ML. Parental involvement, family structure, and adolescent sexual decision making. *Sociological Perspectives*. 2006; 49:67–90.
- Peterson RA. A meta-analysis of Cronbach's coefficient alpha. *Journal of Consumer Research*. 1994; 21:381–391.

- Pettit GS, Bates JE, Dodge KA. Supportive parenting, ecological context, and children's adjustment: A seven-year longitudinal study. *Child Development*. 1997; 68:908–925.
- Pittman LD, Chase-Lansdale PL. African American adolescent girls in impoverished communities: Parenting style and adolescent outcomes. *Journal of Research on Adolescence*. 2001; 11:199–224.
- Preacher KJ, Curran PJ, Bauer DJ. Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics*. 2006; 31:437–448.
- Prinz RJ, Miller GE. Issues in understanding and treating childhood conduct problems in disadvantaged populations. *Journal of Clinical Child Psychology*. 1991; 20:379–385.
- Raudenbush, SW.; Bryk, AS. *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, NJ: Sage; 2002.
- Raudenbush, S.; Bryk, A.; Congdon, R. *HLM 6: Hierarchical Linear and Nonlinear Modeling (Version 6.08)*. Lincolnwood, IL: Scientific Software International, Inc; 2009. [Computer software]
- Roche KM, Leventhal T. Beyond neighborhood poverty: Family management, neighborhood disorder, and adolescents' early sexual onset. *Journal of Family Psychology*. 2009; 23:819–827. [PubMed: 20001140]
- Roche KM, Mekos D, Alexander CS, Astone NM, Bandeen-Roche K, Ensminger ME. Parenting influences on early sex initiation among adolescents: How neighborhood matters. *Journal of Family Issues*. 2005; 26:32–54.
- Romer D, Stanton B, Galbraith J, Feigelman S, Black MM, Li X. Parental influence on adolescent sexual behavior in high-poverty settings. *Archives of Pediatric and Adolescent Medicine*. 1999; 153:1055–1062.
- Royston PA. Multiple imputation of missing values. *The Stata Journal*. 2004; 4:227–241.
- Sampson RJ, Groves B. Community structure and crime: Testing social-disorganization theory. *The American Journal of Sociology*. 1989; 94:774–802.
- Sampson RJ, Raudenbush S. Systematic social observation of public spaces: A new look at disorder in urban neighborhoods. *American Journal of Sociology*. 1999; 99:603–652.
- Sampson RJ, Raudenbush SW, Earls F. Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*. 1997; 277:918–924. [PubMed: 9252316]
- Scaramella LV, Conger RD, Simons RL, Whitbeck LB. Predicting risk for pregnancy by late adolescence: A social contextual perspective. *Developmental Psychology*. 1998; 34:1233–1245. [PubMed: 9823508]
- Sieving RE, Eisenberg ME, Pettingell S, Skay C. Friends' influence on adolescents' first sexual intercourse. *Perspectives on Sexual and Reproductive Health*. 2006; 38:13–19. [PubMed: 16554267]
- South SJ, Baumer EP. Deciphering community and race effects on adolescent premarital childbearing. *Social Forces*. 2000; 78:1379–1408.
- Steinberg L. A dual systems model of adolescent risk-taking. *Developmental Psychobiology*. 2010; 52:216–224. [PubMed: 20213754]
- Steinberg L, Silverberg SB. The vicissitudes of autonomy in early adolescence. *Child Development*. 1986; 57:841–851. [PubMed: 3757604]
- Straus MA. Measuring intrafamily conflict and violence: The Conflict Tactics Scales. *Journal of Marriage and the Family*. 1979; 41:75–88.
- The National Campaign. *Unplanned pregnancy among 20-somethings: The full story*. Washington, DC: Author; 2008 May.
- Trejos-Castillo E, Vazsonyi AT. Risky sexual behaviors in first and second generation Hispanic immigrant youth. *Journal of Youth and Adolescence*. 2009; 38:719–731. [PubMed: 19636766]
- U. S. Census Bureau. 1990 Summary Tape File 3. Generated by A. Martin using American FactFinder. 2010 May. Available at : <http://factfinder.census.gov>
- Upchurch DM, Mason WM, Kusunoki Y, Kriechbaum MJ. Social and behavioral determinants of self-reported STD among adolescents. *Perspectives on Sexual and Reproductive Health*. 2004; 36:276–287. [PubMed: 15687086]

- Von Hippel PT. Regression with missing Ys: An improved strategy for analyzing multiply imputed data. *Sociological Methodology*. 2007; 37:83–117.
- Wilkinson, G. WRAT-3: Wide Range Achievement Test, Administration Manual. Wilmington, DE: Wide Range, Inc; 1993.

Figure 1.
Conceptual model reflecting potential neighborhood-level moderation of the youth-level link between caregiver affect and adolescent sexual behavior.

Figure 2.

Graph represents the interaction between caregiver hostility and concentrated disadvantage in models predicting early sexual initiation. Unshaded area shows the values of concentrated disadvantage at which the effect of caregiver hostility is significant.

Figure 3.

Graph represents the interaction between caregiver hostility and concentrated disadvantage in models predicting multiple sex partners. Unshaded area shows the values of concentrated disadvantage at which the effect of caregiver hostility is significant.

Table 1

Descriptive Statistics for all Variables

Variables	Percent of sample	Mean (SD)
<i>Sexual behavior</i>		
Early sexual initiation (w3)	17.7%	--
Multiple sex partners (w3)	8.3%	--
<i>Caregiver affect</i>		
PC warmth (w2)	--	3.63(2.00)
PC hostility (w2)	--	0.93(1.25)
<i>Youth-level controls</i>		
PC monitoring (w2)		
No monitoring	4.3%	--
Peer OR place monitoring	40.2%	--
Peer AND place monitoring	55.5%	--
Peer sexual activity (w1)		
No peers active	85.5%	--
Some peers active	13.5%	--
All peers active	1.0%	--
Youth delinquency (w1)	34.1%	--
Youth substance use (w1)	4.7%	--
Youth reading achievement (w1)	--	97.11(20.07)
Family size (w1)	--	5.45(2.03)
Household per capita income (w1)	--	6261.24(5026.70)
PC education (w1)		
Greater than high school	44.5%	--
High school or less	55.5%	--
Family structure (w1)		
Two married biological parents	51.4%	--
Other	48.6%	--
Youth race and ethnicity		
Hispanic	47.4%	--
African American	33.4%	--
White	15.1%	--
Other	4.2%	--
Youth gender		
Male	48.8%	--
Female	51.2%	--
Youth age (w1)	--	10.49(1.52)
Youth age (w2)	--	12.48(1.56)
Youth age (w3)	--	15.03(1.55)
<i>Neighborhood characteristics</i>		
Concentrated disadvantage	--	-0.00(0.97)

Variables	Percent of sample	Mean (SD)
Immigrant concentration	--	0.05(0.96)
Residential stability	--	0.11(0.89)

Note. PC = primary caregiver; w = wave. $N = 1,070$ cases in youth-level sample. $N = 167$ census tracts in neighborhood-level sample.

Table 2

Regression Estimates From Two-Level Models Predicting Early Sexual Initiation and Multiple Partners

Predictors	Early sexual initiation		Multiple partners	
	Model 1 γ (se)	Model 2 γ (se)	Model 3 γ (se)	Model 4 γ (se)
Intercept	-2.26(0.44) ***	-2.21(0.43) ***	-4.20(0.53) ***	-4.78(0.56) ***
<i>Level 1 predictors</i>				
PC warmth (w2)	-0.14(0.05) **	-0.17(0.04) ***	-0.21(0.06) **	-0.24(0.05) ***
PC hostility (w2)	0.01(0.07)	-0.04(0.11)	-0.06(0.08)	-0.16(0.15)
PC monitoring (w2) ¹				
No monitoring	-0.05(0.42)	-0.07(0.46)	0.59(0.40)	0.77(0.46)
Peer & place monitoring	-0.12(0.19)	-0.17(0.18)	0.13(0.22)	0.16(0.21)
Peer sexual activity (w1) ²				
No peers active	-0.13(0.28)	-0.20(0.29)	-0.03(0.32)	-0.10(0.33)
All peers active	-0.18(0.89)	-0.08(0.86)	-1.82(1.03)	-1.22(1.00)
Youth delinquency (w1)	0.47(0.18) *	0.56(0.18) **	0.76(0.20) ***	0.91(0.20) ***
Youth substance use (w1)	0.40(0.37)	0.51(0.39)	0.14(0.39)	-0.05(0.40)
Youth reading achievement (w1)	0.00(0.01)	0.01(0.00)	0.00(0.01)	0.00(0.01)
Family size (w1)	-0.00(0.05)	-0.00(0.05)	-0.02(0.06)	-0.06(0.06)
Household per capita income (w1)	-0.00(0.00)	-0.00(0.00)	-0.00(0.00)	-0.00(0.00)
PC education > high school (w1) ³	-0.33(0.21)	-0.49(0.20) *	-0.16(0.23)	-0.22(0.24)
Two married biological parent family (w1) ⁴	-0.53(0.20) **	-0.53(0.19) **	-0.36(0.22)	-0.37(0.22)
Youth race and ethnicity ⁵				
African American	1.13(0.37) **	1.10(0.38) **	0.78(0.42)	0.84(0.45)
Hispanic	0.29(0.33)	0.21(0.32)	0.09(0.40)	0.18(0.42)
Other	0.66(0.54)	0.47(0.55)	0.57(0.55)	0.44(0.58)
Male youth ⁶	0.58(0.18) **	0.56(0.17) **	0.96(0.20) ***	1.19(0.20) ***
Youth age (w3)	0.71(0.07) ***	0.74(0.07) ***	0.63(0.07) ***	0.70(0.07) ***
<i>Level 2 predictors</i>				
Concentrated disadvantage	0.13(0.14)	0.27(0.16)	0.16(0.19)	0.26(0.22)
Immigrant concentration	0.14(0.14)	-0.18(0.15)	-0.33(0.22)	-0.27(0.24)
Residential stability	0.11(0.12)	0.19(0.13)	0.18(0.19)	0.23(0.22)
<i>Cross-level interactions</i>				
PC hostility X concentrated disadvantage	--	0.35(0.13) **	--	0.59(0.20) **

Note. PC = primary caregiver; w = wave. Each model is a two-level logistic regression model predicting the outcome specified at the top of the column.

¹ Reference group = peer OR place monitoring (not both)

² Reference group = some peers active

³Reference group = PC education $\leq$ high school

⁴Reference group = all other family types

⁵Reference group = white

⁶Reference group = female youth

*
p<.05

**
p<.01

p<.001