Neighborhood Context and Sexual Behaviors Among Adolescents: Findings from the National Longitudinal Study of Adolescent Health

CONTEXT: *Adolescent sexual behaviors are a significant public health concern because of the risks of STDs and the negative social consequences of teenage pregnancies. Associations between neighborhood characteristics and adolescents' initiation of sex and contraceptive use are poorly understood.*

METHODS: *Multilevel logistic regression analyses of data from 14,151 adolescents in grades 7–12 in Wave 1 of the National Longitudinal Study of Adolescent Health examined the relationships between four neighborhood dimensions (socioeconomic characteristics, norms and opportunity structure, social disorganization, and racial and ethnic composition) and the initiation of sex and contraceptive use at first and most recent sex. Individual- and household-level covariates were family income, parental education, race and ethnicity, age and family structure. Multivariate analyses were stratified by gender.*

RESULTS: *All four dimensions of neighborhood context were independently associated with sexual initiation. For females, living in a neighborhood with a greater concentration of youth who were idle or black residents was associated with increased odds of sexual initiation, whereas a greater concentration of married households or Hispanic residents was associated with decreased odds of initiation. Higher initiation among males was associated with a higher concentration of poverty or idle youth, while lower initiation was found with a higher concentration of affluent households or working women. The sole association with contraceptive use was that females in neighborhoods with more idle youth had a reduced likelihood of having used contraceptives at first sex.*

CONCLUSIONS: *Neighborhood context appears to be modestly associated with the sexual initiation of adolescents. However, little support was found for neighborhood influence on contraceptive use, suggesting that other factors may play a more important role in shaping adolescents' contraceptive behaviors.*

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Sexual behaviors, including the initiation of sexual intercourse and failure to use contraceptives (or using them incorrectly), place many adolescents at risk for pregnancies and STDs, including HIV.[1] In 2000, an estimated 822,000 pregnancies occurred among females aged 15–19 in the United States,[2] and in 1994 almost 80% of teenage pregnancies were unintended.[3] More than 15 million STDs occur annually in the United States, nearly one-fourth among 15–19-year-olds.[4] Considerable socioeconomic, racial and ethnic disparities at the individual and household levels have been observed in teenage pregnancy, childbearing and STDs;[5] however, the roles that socioeconomic factors play in these racial and ethnic disparities are not clearly understood.

Studies using nationally representative data have shown that teenagers who come from poor and low-income families are more likely to be sexually experienced than are their higher income counterparts, and that black teenagers are more likely to be sexually experienced than are white teenagers.[6] However, research either has not included sufficient numbers of Hispanic youth to examine them separately or has been unable to distinguish subgroups of Hispanics, who are heterogeneous in many respects.[7]

Little is known about how socioeconomic factors and racial or ethnic identity influence contraceptive use by adolescents. Any disparities may depend on the specific method of contraception or on variations in measurement (e.g., use at first sex or most recent sex, typical use, consistency of use). In one study, contraceptive use at first sex was associated with poverty status and race or ethnicity (with the poor less likely to use contraceptives than the nonpoor, and black and Hispanic teenagers less likely to use contraceptives than white teenagers).[8] However, in another study, use of condoms and oral contraceptives at last sex showed little association with race and ethnicity, family income or the educational attainment of teenagers' parents.[9]

An ecological framework suggests that within a neighborhood, defined as a shared local environment, a variety of characteristics may independently influence the reproductive health of its residents, including the availability of goods and services (such as family planning services), norms (such as values and behaviors) and opportunity structures (such as employment and education options). One report has summarized literature examining various neighborhood influences (such as socioeconomic status, female employment and index of neighborhood quality) on a range of repro-

ductive health indicators.[10] However, very few U.S. studies have focused on how both individual and neighborhood characteristics influence individual adolescents' initiation of sex or use of contraceptives.

Several studies using the 1982 National Survey of Family Growth (NSFG) found independent neighborhood- or community-level associations with sexual behavior among both black and white adolescent females, and determined that neighborhood factors accounted for black-white differences in behavior.[11] A more recent study, using the 1995 NSFG, showed that both increasing black concentration and increasing median income at the census tract level were associated with lower risk of sexual activity among adolescent females.[12] A study of adolescents in Los Angeles suggested that adolescents' perceptions of personal threat, physical conditions and social disorder in their surroundings influenced the initiation of sex for both females and males.[13] Although studies in Chicago[14] and Michigan[15] found that disadvantaged neighborhood environments were associated with an increased risk of sexual initiation, a study using national survey data on young adults (aged 18–22) did not find an association between zip code–level neighborhood disadvantage and initiation of sex;[16] however, none of these studies looked for gender differences.

Less is known about possible neighborhood-level associations with contraceptive use. Two studies of black adolescent females, one in Chicago[17] and one using NSFG data,[18] found that neighborhood characteristics were associated with contraceptive use at first sex independently of individual characteristics. Using a nationally representative sample of adolescent females, Averett et al. found that increasing median income at the tract level was associated with a greater likelihood of contraceptive use at most recent sex,[19] while a study of adolescent males found a link between neighborhood characteristics (i.e., poverty and Hispanic concentration) and use of effective contraceptives at last sex.[20] Baumer and South found that greater neighborhood disadvantage at the zip code level was associated with an increased risk of unprotected sex, but the results were not examined separately by gender.[21]

The principal goals of this study were twofold: to determine whether neighborhood-level associations previously observed in multilevel cross-sectional studies were confirmed in cross-sectional analyses using a nationally representative data set of adolescent females and males, and to explore a wider range of neighborhood factors, including potentially protective and harmful factors (e.g., both affluence and poverty concentration), in relation to sexual initiation and contraceptive use.

METHODS
Data Source
We used data from the home surveys of Wave 1 of the National Longitudinal Study of Adolescent Health (Add Health), conducted in 1994–1995. Add Health was designed to as-

sess the health status of adolescents by focusing on their multiple social contexts, including schools, neighborhoods and peer networks. Adolescents in the home surveys (N=20,745) were a subgroup of the school-based sample (approximately 90,000 adolescents from 132 schools), and were representative of youth in grades 7–12.[22] The parent or guardian of the adolescent was also interviewed.

For this study, we randomly selected one adolescent per household whose self-reported race or ethnicity was black, Cuban American, Mexican American, Puerto Rican or white, resulting in a sample size of 14,282. These racial and ethnic groups were selected because we wanted to examine the three largest groups (black, Hispanic, white) in the United States, while including some of the ethnic diversity of the Hispanic population.* Adolescents whose residential address did not link accurately to census tract codes were excluded (N=131); thus, the final sample size for the cross-sectional analyses was 14,151. These adolescents lived in 2,100 census tracts, considered proxies for neighborhoods, throughout the United States, with an average of seven and a median of two adolescents per tract. More than 75% of the tracts included four or fewer sampled adolescents.

Measures
• *Dependent variables.* Three dependent variables were examined. After vaginal sex was defined, adolescents were asked "Have you ever had sexual intercourse?" Those who reported ever having had sex were then asked whether they or their partner had used any method of birth control the first time they had sex and the most recent time. Questions were administered via audio computer-assisted self-interview.

• *Individual- and household-level variables.* The socioeconomic factors examined were poverty status and parental education. The parent or guardian of the adolescent was asked to report before-tax family income from all sources in 1994. Using household size, we converted income into 100% increments of the federal poverty level in 1994. We included a category for missing income information because a large proportion of parents and guardians either were not interviewed (14%) or refused to answer the income question (8%). Parental education was measured as the highest education level attained by either parent. Adolescents' responses were used to impute parental education when possible (12%) in the case of missing parent interviews, after we determined that about 75% of the responses were the same when both the parent and the adolescent responses were available.

Race and ethnicity was assessed by asking adolescents to select the category that best described their background. Race was used in combination with a question on Hispanic or Latino origin to create five mutually exclusive categories: black or African American (not Hispanic or Latino); Cuban or Cuban American; Mexican, Mexican American or Chicano/Chicana; Puerto Rican; and white (not Hispanic or Latino). Family structure was categorized into four groups: two biological parents, one biological and one non-biological parent, single parent and other arrangement (e.g.,

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*Race and ethnicity are considered to be an overlapping social construct in our analysis, not mutually exclusive characteristics.

TABLE 1. Percentage distribution of adolescents in grades 7–12, and percentage reporting selected sexual behaviors, by individual, household and neighborhood characteristics, National Longitudinal Study of Adolescent Health, 1994–1995

Characteristic	Total* (N= 14,151)	Ever had sex	No birth control at first sex†	No birth control at most recent sex†	Characteristic	Total* (N= 14,151)	Ever had sex	No birth control at first sex†	No birth control at most recent sex†
Total	**100**	**39**	**35**	**32**	**Total**	**100**	**39**	**35**	**32**
INDIVIDUAL/HOUSEHOLD					NEIGHBORHOOD				
% of federal poverty level‡					**% poor**				
0–100	13	45	43	36	>20	22	50	39	35
101–200	17	40	36	33	11–20	19	43	37	33
201–300	17	36	35	30	6–10	27	36	34	29
301–400	12	31	30	28	≤5	31	32	30	30
>400	18	34	29	26					
Unknown	22	47	36	34	**% affluent**				
					>10	23	32	32	31
Parental education					6–10	25	37	32	30
≤8th grade	4	39	44	44	3–5	28	41	36	32
Some high school	8	51	43	37	≤2	25	47	38	34
High school/GED	28	45	35	35					
Some college	30	39	35	28	**% of youth idle**				
College graduate	29	28	30	28	>10	15	44	43	36
Unknown	2	75	37	34	6–10	26	45	35	32
					1–5	34	38	33	31
Race/ethnicity					0	25	32	33	30
Black	17	58	38	32					
Cuban American	1	26	43	53	**% of women working**				
Mexican American	8	34	43	45	>35	25	36	32	30
Puerto Rican	2	48	40	37	26–35	43	39	35	31
White	73	35	33	30	≤25	31	42	38	34
Age					**% of married households**				
11–14	34	15	42	38	>33	36	33	36	31
15–17	50	46	35	31	21–33	44	40	34	32
18–21	16	68	33	30	≤20	19	48	36	32
Gender					**% of stable households**				
Male	51	40	35	29	≤45	19	40	36	33
Female	49	38	35	35	46–55	23	36	36	34
					56–66	40	40	35	31
Family structure					>66	18	40	33	29
2 biological parents	53	30	31	29					
1 biological/1 non-biological parent	16	46	37	33	**% black**				
					>33	15	55	38	33
Single parent	24	46	36	33	6–33	28	41	37	33
Other	7	67	44	36	2–5	20	37	35	32
					≤1	37	33	32	30
					% Hispanic				
					>15	11	35	45	42
					6–15	15	38	34	31
					2–5	26	41	35	31
					≤1	48	39	34	31

*Percentages may not total 100 because of rounding. †Among adolescents who had ever had sex. ‡Federal poverty level in 1994. *Note:* Data are weighted to yield national probability estimates.

two nonbiological parents or group home). Age (measured in years) was also included as a covariate.

• *Neighborhood-level variables.* Among the census tract–level variables from the 1990 census that are available in Add Health, we selected several that reflect different dimensions of a neighborhood: socioeconomic characteristics, norms and opportunity structures, social disorganization, and racial or ethnic composition. This selection was based on their use in previous studies,[23] on low to moderate Pearson correlations among all the neighborhood-level measures (less than 0.6) and on our interest in selecting variables that indicated both socially advantaged and socially disadvantaged neighborhoods. Gradations within variables were assigned

on the basis of the distribution of characteristics at the tract level and group sizes.

For socioeconomic characteristics, we examined the proportions of households that were poor (i.e., had a 1989 income below that year's federal poverty level, as collected in the 1990 census) and of affluent households (i.e., had a 1989 income of $75,000 or more). For norms and opportunity structure, we considered the proportions of youth who were idle (persons aged 16–19 who were not in school or the armed forces, not high school graduates and not in the labor force) and of women who were full-time workers (females aged 16 and older who "usually" worked at least 35 hours per week for 48 weeks or more in 1989). To as-

TABLE 2. Odds ratios (and 95% confidence intervals) from logistic regression analysis assessing associations between individual- and household-level characteristics and sexual behaviors among adolescent females

Characteristic	Ever had sex (N=7,264)		No birth control at first sex (N=2,849)		No birth control at most recent sex (N=2,849)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
% of federal poverty level*						
0–100	1.45 (1.10–1.93)	0.99 (0.78–1.26)	1.70 (1.12–2.60)	1.35 (0.88–2.08)	1.61 (1.08–2.40)	1.15 (0.75–1.75)
101–200	1.17 (0.89–1.53)	0.92 (0.69–1.23)	1.38 (0.92–2.09)	1.16 (0.75–1.79)	1.64 (1.09–2.45)	1.30 (0.84–2.03)
201–300	1.04 (0.81–1.34)	0.94 (0.73–1.20)	1.16 (0.73–1.85)	1.05 (0.66–1.67)	1.21 (0.77–1.90)	1.08 (0.70–1.66)
301–400	0.92 (0.72–1.19)	0.94 (0.74–1.19)	1.08 (0.66–1.77)	1.02 (0.63–1.67)	1.24 (0.82–1.87)	1.16 (0.75–1.78)
>400 (ref)	1.00	1.00	1.00	1.00	1.00	1.00
Unknown	1.65 (1.32–2.08)	1.02 (0.81–1.29)	1.42 (0.97–2.08)	1.25 (0.82–1.90)	1.55 (1.13–2.14)	1.30 (0.92–1.83)
Parental education						
≤8th grade	1.23 (0.78–1.93)	0.92 (0.56–1.49)	1.88 (1.04–3.41)	1.72 (0.90–3.29)	2.00 (1.05–3.83)	1.39 (0.70–2.77)
Some high school	2.43 (1.77–3.32)	2.27 (1.59–3.23)	2.15 (1.38–3.35)	1.93 (1.20–3.08)	1.76 (1.13–2.75)	1.42 (0.86–2.34)
High school/GED	1.87 (1.52–2.31)	1.94 (1.51–2.48)	1.43 (1.07–1.92)	1.34 (0.98–1.83)	1.46 (1.05–2.01)	1.27 (0.91–1.78)
Some college	1.64 (1.37–1.96)	1.73 (1.40–2.13)	1.32 (0.97–1.79)	1.28 (0.95–1.72)	1.07 (0.76–1.51)	1.00 (0.70–1.44)
College graduate (ref)	1.00	1.00	1.00	1.00	1.00	1.00
Unknown	8.75 (4.70–15.98)	2.75 (1.44–5.26)	1.68 (0.90–3.15)	1.38 (0.68–2.82)	1.29 (0.76–2.18)	0.94 (0.49–1.79)
Race/ethnicity						
Black	1.85 (1.39–2.45)	1.50 (1.18–1.92)	1.07 (0.83–1.37)	0.94 (0.75–1.19)	1.24 (0.92–1.68)	1.08 (0.82–1.42)
Cuban American	0.68 (0.17–2.67)	0.47 (0.25–0.89)	1.78 (0.91–3.49)	1.61 (0.79–3.25)	3.18 (2.02–5.01)	2.86 (1.70–4.81)
Mexican American	0.73 (0.53–1.01)	0.68 (0.44–1.06)	1.36 (0.89–2.08)	1.15 (0.75–1.77)	2.18 (1.30–3.65)	1.89 (1.12–3.17)
Puerto Rican	1.36 (0.94–1.97)	1.25 (0.71–2.19)	1.40 (0.69–2.86)	1.13 (0.59–2.16)	2.43 (1.50–3.91)	2.10 (1.26–3.49)
White (ref)	1.00	1.00	1.00	1.00	1.00	1.00
Age	1.85 (1.73–1.99)	1.88 (1.75–2.02)	0.88 (0.81–0.95)	0.88 (0.81–0.95)	0.91 (0.84–0.99)	0.91 (0.84–0.99)
Family structure						
2 biological parents (ref)	1.00	1.00	1.00	1.00	1.00	1.00
1 biological/1 non-biological parent	2.26 (1.90–2.68)	2.49 (2.01–3.08)	1.36 (1.03–1.81)	1.30 (0.99–1.71)	1.12 (0.86–1.45)	1.09 (0.84–1.42)
Single parent	1.84 (1.55–2.19)	1.61 (1.34–1.94)	1.01 (0.75–1.36)	0.85 (0.63–1.15)	1.25 (0.98–1.60)	1.14 (0.89–1.46)
Other	5.09 (3.83–6.77)	2.81 (2.03–3.90)	1.47 (1.08–1.99)	1.35 (1.01–1.81)	1.42 (1.09–1.85)	1.41 (1.03–1.92)

*Federal poverty level in 1994. *Note:* ref=reference group.

sess social disorganization, we examined the proportions of households that consisted of married couples with their own children younger than 18 and of residentially stable households (among persons aged five and older, the proportion who had lived in the same house as in 1985). Finally, for racial and ethnic composition, we looked at the proportions of residents who were black or Hispanic. All of these variables had been previously calculated and are provided along with linkage information from Add Health.

Analysis

We conducted gender-specific logistic regression analyses to assess associations between both individual- or household-level and neighborhood-level characteristics and the three dependent variables of adolescent sexual behavior. SUDAAN version 8.0.0 was used to account for the survey design effects and to produce valid variance estimates,[24] and to alleviate difficulties with statistical inference introduced by multilevel research designs.[25] With a median of two adolescents sampled per tract, we did not use explicit multilevel linear modeling techniques because the data were not sufficiently nested. Furthermore, Add Health is based on a multistage clustered sample design, and multilevel modeling procedures do not correct for survey design effects. Previous studies have used a similar analytic approach.[26] All analyses incorporated weights so that results could be generalized to the U.S. adolescent population.

RESULTS

Descriptive Characteristics

Thirty percent of adolescents were from low-income households (200% or less of the federal poverty level), and 18% lived in households with incomes higher than 400% of poverty (Table 1, page 127). Income information was unknown for about one-fifth of the sample. Six in 10 adolescents had at least one parent with at least some college education. Seventy-three percent of adolescents were white, 17% were black and 8% were Mexican American. Cuban Americans and Puerto Ricans combined made up 3% of the sample. Half of the sample was aged 15–17 at Wave 1, and the proportions of males and females were nearly equal. More than half lived in households with both biological parents, whereas nearly one-fourth lived in single-parent households.

Adolescents were generally evenly distributed across neighborhoods as measured by levels of poor and affluent households. Fifteen percent lived in neighborhoods with greater than 10% of idle youth, and 25% lived in neighborhoods where more than 35% of the women were working full-time. More than one-third of the sample lived in areas with greater than 33% of married households, and fewer than one-fifth lived in areas where 45% or fewer of the households were considered stable. Fifteen percent lived in neighborhoods with the highest concentration of blacks, while only 11% lived in areas with the highest concentration of Hispanics.

TABLE 3. Odds ratios (and 95% confidence intervals) from logistic regression analysis assessing associations between individual- and household-level characteristics and sexual behaviors among adolescent males

Characteristic	Ever had sex (N=6,887)		No birth control at first sex (N=2,955)		No birth control at most recent sex (N=2,955)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
% of federal poverty level*						
0–100	1.78 (1.31–2.42)	1.05 (0.75–1.47)	2.03 (1.40–2.94)	1.73 (1.13–2.63)	1.66 (1.08–2.53)	1.39 (0.89–2.16)
101–200	1.46 (1.14–1.88)	1.02 (0.75–1.40)	1.38 (1.00–1.89)	1.26 (0.88–1.80)	1.29 (0.81–2.04)	1.15 (0.72–1.85)
201–300	1.13 (0.89–1.44)	0.90 (0.69–1.16)	1.45 (0.98–2.14)	1.42 (0.94–2.14)	1.28 (0.80–2.04)	1.22 (0.74–2.01)
301–400	0.86 (0.67–1.10)	0.75 (0.57–0.99)	0.99 (0.62–1.59)	1.00 (0.62–1.61)	0.99 (0.62–1.57)	0.96 (0.60–1.54)
>400 (ref)	1.00	1.00	1.00	1.00	1.00	1.00
Unknown	1.80 (1.43–2.27)	0.86 (0.66–1.13)	1.34 (1.00–1.80)	1.22 (0.90–1.66)	1.42 (0.92–2.20)	1.27 (0.80–2.02)
Parental education						
≤8th grade	2.00 (1.32–3.02)	1.68 (0.98–2.89)	1.79 (1.02–3.15)	1.16 (0.66–2.04)	2.14 (1.19–3.85)	1.61 (0.90–2.90)
Some high school	2.90 (2.16–3.90)	2.03 (1.43–2.88)	1.44 (0.96–2.18)	1.05 (0.68–1.63)	1.31 (0.86–1.99)	1.12 (0.71–1.77)
High school/GED	2.29 (1.88–2.81)	2.10 (1.69–2.61)	1.10 (0.78–1.55)	0.91 (0.64–1.29)	1.35 (0.98–1.86)	1.20 (0.85–1.70)
Some college	1.55 (1.29–1.87)	1.47 (1.21–1.79)	1.26 (0.90–1.75)	1.14 (0.81–1.61)	1.00 (0.73–1.37)	0.95 (0.68–1.31)
College graduate (ref)	1.00	1.00	1.00	1.00	1.00	1.00
Unknown	6.28 (3.55–11.11)	2.39 (1.25–4.58)	1.14 (0.64–2.04)	0.69 (0.37–1.30)	1.44 (0.75–2.75)	1.17 (0.55–2.51)
Race/ethnicity						
Black	3.50 (2.71–4.51)	2.92 (2.30–3.72)	1.34 (1.07–1.69)	1.14 (0.90–1.45)	0.96 (0.76–1.21)	0.84 (0.65–1.08)
Cuban American	0.61 (0.32–1.14)	0.50 (0.30–0.83)	1.19 (0.61–2.31)	1.04 (0.50–2.17)	1.95 (0.83–4.61)	1.72 (0.72–4.11)
Mexican American	1.16 (0.86–1.56)	0.93 (0.68–1.27)	1.70 (1.09–2.65)	1.50 (0.91–2.49)	1.75 (1.14–2.67)	1.44 (0.90–2.29)
Puerto Rican	2.13 (1.11–4.11)	1.96 (1.10–3.49)	1.27 (0.84–1.92)	1.13 (0.73–1.74)	0.76 (0.48–1.19)	0.65 (0.40–1.04)
White (ref)	1.00	1.00	1.00	1.00	1.00	1.00
Age	1.64 (1.54–1.74)	1.68 (1.57–1.78)	0.98 (0.92–1.05)	1.01 (0.94–1.08)	0.96 (0.87–1.05)	0.96 (0.87–1.05)
Family structure						
2 biological parents (ref)	1.00	1.00	1.00	1.00	1.00	1.00
1 biological/1 non-biological parent	1.70 (1.41–2.05)	1.70 (1.37–2.11)	1.23 (0.93–1.62)	1.19 (0.89–1.60)	1.33 (1.01–1.76)	1.31 (0.99–1.73)
Single parent	2.15 (1.82–2.54)	1.60 (1.34–1.91)	1.43 (1.09–1.87)	1.26 (0.95–1.66)	1.18 (0.89–1.57)	1.12 (0.85–1.49)
Other	4.21 (3.23–5.48)	2.22 (1.60–3.07)	1.94 (1.40–2.71)	1.91 (1.33–2.73)	1.34 (0.91–1.97)	1.22 (0.76–1.95)

*Federal poverty level in 1994. *Note:* ref=reference group.

Thirty-nine percent of adolescents reported that they had ever had vaginal sex. The proportion ranged from 31–34% for those whose families were in the two highest income levels to 45% for those with the least income. Among adolescents whose parents were college graduates, 28% reported sexual experience, compared with 51% of those whose parents had some high school. Of adolescents whose parents had an eighth grade education or less, 39% had sexual experience; this group consisted mainly of immigrant and Mexican American families. Fifty-eight percent of black adolescents and 48% of Puerto Ricans had ever had sex, compared with 26% of Cuban Americans. As expected, a higher proportion of youth aged 18–21 than of 15–17-year-olds reported that they had ever had sex (68% vs. 46%), and proportions were about the same for males and females. Adolescents in households with two biological parents reported a much lower prevalence of sexual experience (30%) than did those living with "other" arrangements (67%).

The prevalence of sexual experience was highest for adolescents living in neighborhoods with the lowest socioeconomic status. For example, the prevalence was 50% in neighborhoods with the highest poverty concentration (more than 20% of households below the federal poverty level) and 32% in neighborhoods with the least poverty (5% or fewer households in poverty). Similarly, youth in neighborhoods in which 2% or fewer of households had an income of $75,000 or more reported greater sexual experience than those in areas in which more than 10% of households were affluent (47% vs. 32%). Adolescents in neighborhoods with a high proportion of idle youth or a low proportion of women workers were also more likely to report ever having had sex, as were those in areas with a low concentration of married-couple families or of Hispanic residents, and with a high concentration of black residents.

Among adolescents who reported that they had ever had sex, 35% did not use birth control at first sex and 32% used none at most recent sex. Nonuse at both times was lowest for those in the highest income households (26–29%) and for those with highly educated parents (28–30%). Adolescents in the three Hispanic groups had higher proportions not using birth control at both times than did black and white youth. More than half of Cuban American adolescents and nearly half of Mexican Americans reported that they had not used birth control at most recent sex; these levels were higher than their levels of nonuse at first sex. Adolescents aged 11–14 reported higher levels of nonuse than did older youth at both times, and females had a higher level than males at most recent sex. Youth in households with two biological parents had a lower level of nonuse at both first and most recent sex (about 30%) than did those living with "other" arrangements (36–44%).

Rates of contraceptive nonuse at both times were higher in more disadvantaged neighborhoods, as measured by socioeconomic characteristics, norms and opportunity

TABLE 4. Odds ratios (and 95% confidence intervals) from logistic regression analysis assessing associations between neighborhood-level characteristics and adolescents' ever having had sex, by gender

Characteristic	Females		Males	
	Unadjusted	Adjusted	Unadjusted	Adjusted
% poor				
>20	1.65 (1.20–2.28)	1.27 (0.97–1.66)	2.61 (1.95–3.49)	1.68 (1.33–2.13)
11–20	1.42 (1.03–1.94)	1.13 (0.86–1.50)	1.77 (1.31–2.38)	1.37 (1.06–1.77)
6–10	1.10 (0.83–1.47)	1.01 (0.80–1.27)	1.30 (0.97–1.74)	1.21 (0.97–1.49)
≤5 (ref)	1.00	1.00	1.00	1.00
% affluent				
>10	0.67 (0.49–0.92)	0.85 (0.66–1.10)	0.43 (0.31–0.59)	0.59 (0.45–0.75)
6–10	0.69 (0.50–0.97)	0.82 (0.64–1.06)	0.65 (0.47–0.89)	0.76 (0.61–0.96)
3–5	0.93 (0.72–1.19)	1.01 (0.83–1.22)	0.68 (0.53–0.86)	0.73 (0.59–0.91)
≤2 (ref)	1.00	1.00	1.00	1.00
% of youth idle				
>10	1.80 (1.29–2.51)	1.84 (1.37–2.48)	1.56 (1.19–2.05)	1.20 (0.93–1.55)
6–10	1.62 (1.24–2.11)	1.70 (1.37–2.11)	1.78 (1.40–2.25)	1.57 (1.28–1.93)
1–5	1.40 (1.06–1.85)	1.48 (1.19–1.84)	1.17 (0.90–1.51)	1.24 (1.03–1.49)
0 (ref)	1.00	1.00	1.00	1.00
% of women working				
>35	0.88 (0.61–1.26)	0.98 (0.76–1.26)	0.70 (0.49–0.98)	0.79 (0.62–1.00)*
26–35	0.88 (0.67–1.16)	0.94 (0.76–1.16)	0.85 (0.64–1.12)	0.97 (0.78–1.21)
≤25 (ref)	1.00	1.00	1.00	1.00
% of married households				
>33	0.61 (0.42–0.88)	0.68 (0.49–0.95)	0.49 (0.34–0.68)	0.77 (0.59–1.01)
21–33	0.76 (0.56–1.02)	0.82 (0.63–1.08)	0.71 (0.54–0.93)	1.07 (0.85–1.34)
≤20 (ref)	1.00	1.00	1.00	1.00
% of stable households				
≤45	1.10 (0.76–1.61)	1.25 (0.93–1.69)	0.91 (0.61–1.35)	1.01 (0.77–1.33)
46–55	0.91 (0.63–1.33)	0.92 (0.68–1.25)	0.80 (0.55–1.16)	0.87 (0.67–1.13)
56–66	1.11 (0.81–1.52)	1.12 (0.88–1.42)	0.93 (0.68–1.26)	0.94 (0.78–1.14)
>66 (ref)	1.00	1.00	1.00	1.00
% black				
>33	1.93 (1.32–2.84)	1.51 (1.01–2.28)	3.14 (2.25–4.39)	1.27 (0.88–1.83)
6–33	1.24 (0.89–1.74)	1.19 (0.93–1.53)	1.54 (1.12–2.12)	1.21 (0.96–1.52)
2–5	1.19 (0.86–1.65)	1.12 (0.91–1.38)	1.19 (0.87–1.61)	1.10 (0.85–1.42)
≤1 (ref)	1.00	1.00	1.00	1.00
% Hispanic				
>15	0.66 (0.46–0.96)	0.49 (0.30–0.81)	0.98 (0.69–1.39)	0.72 (0.46–1.10)
6–15	0.98 (0.66–1.46)	1.06 (0.84–1.34)	0.87 (0.59–1.28)	0.84 (0.65–1.08)
2–5	1.14 (0.83–1.55)	1.08 (0.83–1.40)	1.01 (0.76–1.36)	0.98 (0.80–1.22)
≤1 (ref)	1.00	1.00	1.00	1.00

*Confidence interval does not include 1.0. *Note:* ref=reference group.

structures, and social disorganization (except for proportion of married-couple households, for which rates were similar across levels). Nonuse rates were also higher in neighborhoods that were largely black or Hispanic.

Among adolescents who had used birth control at first sex and most recent sex, the most frequent method for each was condoms alone (about 50%—not shown), followed by condoms plus oral contraceptives or implants (about 20%). The next most frequent method was condoms plus withdrawal (10% at first sex and 7% at most recent sex). Although only 2% reported oral contraceptive use alone at first sex, that proportion increased to 8% at most recent sex.

Individual- and Household-Level Disparities

Logistic regression analysis found significant disparities by poverty status in the unadjusted model for all three dependent variables among females, but differences were no longer significant in the adjusted models (Table 2, page 128). However, adjusted odds ratios were significant for parental education: Lower education was associated with an elevated likelihood of ever having had sex (odds ratios of 2.3 for some high school, 1.9 for high school or GED, and 1.7 for some college, compared with college graduates). Black females were more likely than white females to report ever having had sex (1.5), whereas Cuban American females were less likely to report sexual initiation (0.5), compared with white females. A one-year increase in age was associated with an increased risk of ever having had sex (1.9), as were all family structure arrangements compared with living with two biological parents (1.6–2.8).

We observed few significant disparities in the adjusted models for nonuse of birth control at first sex among females. Those whose parents had some high school education and those living in "other" family arrangements were more likely to report nonuse compared with their reference groups (odds ratios, 1.9 and 1.4, respectively). Older females were slightly less likely to report nonuse at first sex compared with younger females (0.9).

Although race and ethnicity was not associated with contraceptive use at first sex, Cuban American, Mexican American and Puerto Rican females were at increased risk of not having used birth control at last sex compared with white females (odds ratios, 1.9–2.9). Otherwise, results for contraceptive use at last sex were similar to those for use at first sex, except that no significant association was found for the level of parental education.

In the adjusted individual- and household-level models for males, lower parental education was associated with increased risk of ever having had sex (odds ratios of 1.5–2.1 for some high school, high school or GED, and some college, compared with college graduates—Table 3, page 129). Compared with white males, both black and Puerto Rican males were more likely to report sexual experience (2.9 and 2.0, respectively), and Cuban Americans were less likely to (0.5). As was the case for females, older age was associated with an increased risk of ever having had sex (1.7), as were all family arrangements compared with living with two biological parents (1.6–2.2).

Only two significant associations with birth control use were observed for males. Those living in the poorest households or in "other" family arrangements were more likely not to have used contraceptives at first sex (odds ratios, 1.7 and 1.9, respectively), compared with their reference groups.

Neighborhood-Level Disparities

The logistic regression analysis for neighborhood-level associations controlled for poverty status, parental education, race and ethnicity, age and family structure. Estimates for the individual- and household-level variables did not change appreciably from those in Tables 2–3 and are not presented.

Results of the neighborhood-level analysis varied by gender. Adolescent males living in neighborhoods in which more than 10% of households were below the poverty level

had an elevated likelihood of reporting sexual initiation compared with those in areas with 5% or fewer such households (odds ratios, 1.4–1.7—Table 4). Conversely, males in neighborhoods of more than 2% affluent households had decreased odds of having sexual experience compared with males in areas with 2% or fewer affluent households (0.6–0.8). No significant associations for these socioeconomic characteristics were found for females.

One variable reflecting norms and opportunity structure—a neighborhood's concentration of idle youth—was associated with the risk of ever having had sex for both females and males. Females in neighborhoods with any idle youth were more likely to report sexual initiation (odds ratios, 1.5–1.8), as were males (1.2–1.6), compared with their counterparts in areas with no idle youth. A high concentration of women workers was marginally associated with a reduced risk of sexual initiation, but only among males (0.8). In contrast, a high concentration of married-couple households in a neighborhood—an indicator of low social disorganization—was associated with a reduced risk of ever having had sex for females only (0.7).

The association of racial and ethnic composition with sexual experience applied only to females in our study. Living in a neighborhood that was more than 33% black was marginally associated with an increased risk of ever having had sex (odds ratio, 1.5), whereas living in an area that was more than 15% Hispanic was associated with decreased odds of being sexually experienced (0.5).

We found only one significant neighborhood-level association in the adjusted models for birth control use at first or most recent sex: Females living in neighborhoods with the highest concentration of idle youth were more likely to report nonuse at first sex (odds ratio, 1.6—not shown), compared with females in neighborhoods with the lowest concentration.

DISCUSSION

Our results, based on data from a nationally representative survey of adolescents, suggest that neighborhood context may be positively or negatively associated with sexual initiation, depending on gender. In contrast, the results provide little evidence for a neighborhood association with contraceptive use at first or most recent sex.

At the individual and household levels, our findings confirm conclusions from a previous study based on another nationally representative survey of adolescents: that parental education is more important than income in influencing teenagers' sexual behaviors, and that socioeconomic associations are weaker for contraceptive use than for initiation of sex.[27] One new finding is the increased risk of not having used birth control at most recent sex among all Hispanic females, perhaps identifying a population in need of attention. In addition, although adolescents living in single-parent families are often thought to be more likely to engage in risky sexual behaviors, they were just as likely to use contraceptives as those living in families with two biological parents.

In contrast to previous researchers,[28] we did not find significant associations between neighborhood socioeconomic characteristics and initiation of sex among adolescent females; direct comparisons with earlier work are difficult, however, given the different samples, study designs and modeling strategies. We did find significant associations between these characteristics and initiation of sex among males, indicating that they may be more sensitive to neighborhood conditions compared with females.

Unlike Brewster's study of neighborhood context and the sexual activity of black women,[29] ours did not reveal an increased risk of sexual initiation for young women living in neighborhoods with high proportions of full-time women workers; rather, we found that a high concentration of women workers was marginally associated with a *lower* level of sexual initiation among males. This finding may reflect the importance of providing male adolescents with positive women role models who are engaged in the workforce and who may themselves have delayed childbearing and pursued higher education. It may also imply that this aspect of the neighborhood environment provides more opportunities for young people to pursue higher education and careers, as well as intrinsically affirming those values. High concentrations of idle youth may represent the opposite—lack of positive role models or opportunities. A large presence of married-couple households in neighborhoods may reflect high levels of social control and monitoring of the sexual behaviors of adolescents; however, the findings were not significant for males.

We found that females living in neighborhoods with high concentrations of blacks had about 50% higher odds of reporting initiation of sex than those in neighborhoods with very low concentrations of blacks. By contrast, two earlier studies found no significant associations between concentration of blacks and initiation of sex,[30] and one found an association between a high concentration of blacks and a decreased risk of sex among white adolescent females.[31] Again, however, direct comparisons are difficult, given the different samples, study designs and modeling strategies. In our study, an increased risk of sexual initiation associated with living in a largely black neighborhood could indicate normative behaviors or limited opportunities that might promote sexual behavior in such communities.

Our finding that females living in a neighborhood with a high proportion of Hispanic families had decreased odds of reporting sexual initiation is consistent with a study that found that high social capital and strong cultural norms (close ties to one's home country, informal networks of social support and shared monitoring of children) were associated with lower than predicted birthrates among Hispanic females aged 15–17.[32] The sharing of cultural norms by community residents may strengthen messages about delaying sexual behavior.[33] Our results also support previous assertions that social capital protects those living in Hispanic communities from some of the negative effects of poverty; intergenerational networks of support and more homogeneous communities allow residents to identify more

strongly with each other and their home country, reducing social competition.[34] Although we were unable to examine associations between Hispanic concentration and gender separately for each racial or ethnic group, the overall association with lower sexual initiation may apply for all adolescent females.

Except for the concentration of idle youth, no neighborhood characteristics were associated with use of birth control, which contrasts with previous studies.[35] Our analysis measured use of any type of contraceptive at first and most recent sex, and did not address consistency or correctness of use. Our findings may have been different if we had examined specific methods of contraception and used measures that reflect use over time.[36] We cannot explain why neighborhood characteristics were significantly associated with initiation of sex, but not with contraceptive use, and this discrepancy requires further investigation.

We did not discuss the differences between the unadjusted and adjusted models for the neighborhood-level findings. However, it is important to acknowledge that modeling strategies and specification of the individual- and household-level variables may also affect conclusions regarding possible associations between neighborhood context and sexual behaviors. It is difficult to determine the degree to which individual- and household-level characteristics act as confounding variables, or as variables that operate on the causal pathway. For example, low-income persons are likely to live in low-income neighborhoods, and individual income is associated with sexual behaviors; hence, individual income can act as a confounder. However, individual income may be on the pathway between neighborhood income and sexual behaviors, because it is partly determined by neighborhood-level income.

Thus, the "disappearance" of a significant neighborhood association after adjustment for individual- and household-level variables does not necessarily mean that the neighborhood characteristic is irrelevant. It is probably best to consider any possible neighborhood influence as a range, lying somewhere between the unadjusted findings and the fully adjusted—and perhaps statistically insignificant—findings. In this case, the absence of significant neighborhood results in the adjusted models for contraceptive use does not necessarily mean that neighborhood environments are not influential if significant associations were found in the unadjusted models. The absence of significant associations in the adjusted models may also indicate inadequate power. On a related note, any neighborhood role could have been masked by our not examining subgroups (i.e., racial and ethnic groups) separately, which was not possible, given the small sample sizes for some racial and ethnic groups.

We cannot make inferences regarding the likely mechanisms for the neighborhood-level associations from our results. Neighborhood-level socioeconomic characteristics, norms and opportunity structures, social disorganization, and racial or ethnic concentration could each reflect to some degree the availability of family planning information and services, normative values and behaviors, employment and educational opportunities, or monitoring of youth in an adolescent's environment. Given the limitations of census-based data, further investigations—such as theoretically based qualitative research on neighborhood factors that may influence adolescent sexual behaviors and the mechanisms involved, as well as longitudinal designs—are needed to provide information for the measurement of neighborhood context and related mechanisms.

This study has several limitations. Adolescents reported sexual behaviors retrospectively, and their reports are subject to recall bias (as well as misinterpretation of the survey questions). Another important limitation is the assessment of neighborhood exposure. The 1990 census gave us a snapshot of neighborhood context measured at one time. We had no information regarding the historical context of neighborhoods and how they were changing, and very little information on how long the adolescents had been exposed to their neighborhood environments by the time of the survey (adolescents were asked whether they had moved since 1990). Also, neighborhoods were based on geographically defined census tracts, but residents may define them on the basis of patterns of social interaction. Another possible limitation is that factors associated with self-selection into a given neighborhood (e.g., a parent or guardian chose to move there for the school) or school-level characteristics (e.g., socioeconomic factors, advanced placement courses, health education) could account for the results, leading to erroneous conclusions about neighborhood effects. Finally, the results essentially represent a snapshot of some associations among neighborhood context and adolescent sexual behaviors; thus, causal inferences cannot be made.

Conclusion

These results suggest that the relationship between neighborhood context and sexual initiation among adolescents may depend on gender. However, the findings do not strongly support a role for neighborhood influence on contraceptive use, suggesting that other contexts (e.g., partner dynamics; peer, family or school influences; state-based policies and laws) may play a more important role in shaping adolescents' contraceptive behaviors. Although the associations with neighborhood factors were generally modest, the public health significance is considerable because of the number of persons at risk, as well as the serious nature of the potential consequences, including pregnancies, childbearing and STDs among teenagers. Policy or programmatic responses could range from reducing the concentration of poverty and idle youth through tax and wage policies or youth employment programs to providing role models for adolescents in disadvantaged communities.

Although we can only speculate about specific interventions, our results suggest that an exclusive focus on behavior and personal responsibility will have a limited effect on sexual initiation unless contextual influences at the neighborhood level are also addressed. More research, including qualitative approaches and longitudinal designs, is needed so that we can sufficiently understand the relevant mecha-

nisms to design programs for interventions in different settings. The findings from this study and others should draw policymakers' attention to the possible influence of neighborhood environments on teenagers' reproductive health.

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