Community Characteristics, Sexual Initiation, and Condom Use among Young Black South Africans*

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Individual and household-level characteristics that influence sexual behavior have been extensively studied in South Africa, but community characteristics have received limited attention. We use multilevel discrete time hazard models and multilevel logistic regression models to analyze data from a representative sample of young people in KwaZulu Natal, and from several sources of community data. Results suggest that, net of individual and household characteristics, higher levels of community concentrated disadvantage are associated with increased hazard of sexual initiation and higher risk of unprotected sex. Social disorder increases the hazard of sexual initiation, while greater community social cohesion is associated with delayed sexual debut, although the latter association appears stronger for young men than for young women. We discuss these results and the ways they vary from predictions based on U.S. theory in light of conditions prevailing in contemporary South Africa.

The HIV/AIDS epidemic in South Africa is threatening the social and economic progress of a nation that emerged from the racist apartheid system only about 15 years ago. Understanding how structured inequality is influencing the sexual behavior of young South Africans is thus crucially important. Individual and household-level inequities influencing sexual behavior and HIV risk have been studied extensively in South Africa (e.g., Macintyre et al. 2004; MacPhail and Campbell 2001; Manzini 2001; Varga 2003; Zambuko and Mturi 2005), but the influence of community characteristics has received far less attention. This is a serious omission because the strict racial residential segregation of the apartheid era strongly shaped opportunities and health risks for residents of different communities (Eaton, Flisher, and Aarø 2003; Kaufman et al. 2004), and because the increased mobility and independence of young people in adolescence make community characteristics increasingly influential at this stage of the life course (Duncan and Raudenbush 2001; Leventhal and Brooks-Gunn 2000). In this article, we exam-

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ine associations among community characteristics, sexual initiation, and unprotected sex among black youth to provide a more comprehensive view of the social context that shapes sexual behavior in South Africa.

A long history of institutionalized racial discrimination in South Africa has led to dramatic socioeconomic disadvantage for blacks relative to whites and other population groups, creating enormous disparities in health.[1] For example, 12 percent of blacks aged 15–24 are infected with HIV, compared to less than 2 percent of whites, coloureds, or Asians (Shisana et al. 2005). Since about four out of five young South Africans are black, this represents a large group at high risk. Because population group differences in individual socioeconomic resources and health outcomes are well-documented, we shift to relatively understudied issues: inequality within the black population and across communities. The crumbling of official racial residential restrictions and introduction of policies to improve the well-being of non-whites after the end of apartheid in 1994 have contributed to slowly rising within-group disparities as some families have been able to take advantage of new economic opportunities while others have been unable (Adato, Carter, and May 2006). Rising within-group inequality in resources and community contexts may contribute to stratified profiles of risk for young black South Africans.

The majority of theoretical and empirical work in sociology that examines how community conditions influence individual behavior has been developed in reference to conditions in the U.S., making it unclear whether existing evidence applies to other social contexts (Villareal and Silva 2006). In this study we examine the independent and joint effects of three community characteristics central to theories developed in the U.S., but with obvious relevance in South Africa: concentrated disadvantage, social disorder, and social cohesion. We explore the associations among these characteristics and two sexual behaviors that place young people at risk of HIV: sexual initiation and unprotected sex. The analysis is strengthened by the use of a separate survey of community residents and census data to obtain measures of social disorder and concentrated disadvantage, rather than relying solely on aggregated responses of the respondents reporting on their behavior. Our findings provide an important counterpoint to the largely U.S.-focused research on the consequences of structural disadvantage and social disorganization for adolescent behavior, and they inform intervention planning in this high-risk population.

WHY DOES COMMUNITY CONTEXT MATTER?

One of the core community characteristics thought to influence residents' behavior and life chances is economic deprivation, which may contribute to dysfunctional social processes including high levels of social disorder and low social cohesion. Scholars in the U.S. have argued that, because of racism and other social and economic processes, low-income racial-ethnic minorities have been concentrated in communities that are spatially and socially isolated from "mainstream" society (Massey and Denton 1993; Wilson 1996) in environments of concentrated economic disadvantage and social disorganization. In addition to lacking resources for building social and human capital (Jencks and Mayer 1990; Sampson, Raudenbush, and Earls 1997), young people in such communities come into regular contact with individuals who work irregularly or receive public assistance, have children during adolescence or outside of marriage, and engage in other behaviors that U.S. mainstream society considers problematic. They lack role models who demonstrate the advantages of staying in school, deferring parenthood, getting a job, or refraining from risk-taking (Jencks and Mayer 1990; Leventhal and Brooks-Gunn 2000).

Community concentrated disadvantage may also influence young people by fostering detrimental social processes, including high levels of social disorder and low community social cohesion. Social disorder—manifesting in crime, violence, and gang activity—can drive residents into their homes, reducing collective control over undesirable activities in the community and limiting sanctions on youth behavior (Massey and Denton 1993; Upchurch et al. 1999). Social disorder may thus reduce informal social control and social cohesion, or the extent to which residents know and trust each other, share expectations for youth behavior, and are willing to intervene if these expectations are not met (Sampson et al. 1997).

Based on these elements of extant theory, conditions prevailing in many black South African communities would seem to have considerable potential to influence young people's

sexual behavior. The unemployment rate among black South Africans is estimated at 31 percent (Banerjee et al. 2007), making joblessness, blocked opportunities, and concentrated economic disadvantage common in many black communities. Adolescent childbearing is also common in South Africa, with more than one-third of black females having a child by age 20 (Republic of South Africa 1998), which could reduce social pressures to avoid sexual behavior that could lead to a pregnancy. South African communities also face very high levels of crime and violence (Burton et al. 2003), which potentially could reduce informal social control and social cohesion.

However, it is important to examine whether community economic disadvantage and some of its sequelae necessarily lead to low social control or social cohesion across all societal contexts. A study of urban Brazil, for example, showed that poorer neighborhoods actually had higher levels of social cohesion than wealthier neighborhoods, due to patterns of settlement in these communities and reliance of residents upon one another for assistance obtaining work and other resources in the informal economy (Villareal and Silva 2006). South Africa is an interesting third case to consider when exploring the links among community structural characteristics and detrimental social processes. On the one hand, economically disadvantaged South African black communities may have high levels of social cohesion that could influence sexual behavior among young residents, as in urban Brazil. The streets in disadvantaged South African communities are often full of activity because high unemployment rates leave many adults unoccupied (Banerjee et al. 2007), and small houses and large families make socializing indoors difficult. Community residents may find it easier to interact with and monitor young people searching for privacy than they might in quieter, more isolated neighborhoods. On the other hand, social cohesion may be relatively low in disadvantaged black communities, as U.S. theories would suggest, owing to the disruptive apartheid-era relocation of black families to "homeland" areas without regard to ethnicity or community structure (Ward 2007), and high levels of labor migration (Van Donk 2002). Using a sample of South African black youth, we examine the connections between community concentrated disadvantage, social disorder, and social cohesion, as well as their consequences for sexual behavior, in a societal context that differs considerably from the one that shaped contemporary theory about community effects.

SEXUAL DEBUT, CONDOM USE, AND COMMUNITY CHARACTERISTICS

In the context of the South African HIV epidemic, the initiation of sexual activity and the failure to use a condom when having sex are markers of increased risk of infection, as well as having other important consequences for young people. While considerable prior research has demonstrated the influence of individual and household characteristics on sexual debut and condom use, a smaller number of studies have also shown mixed support for the influence of community characteristics. Some U.S.-based studies have found that concentrated disadvantage is associated with increased sexual activity and earlier sexual debut among young people (Browning, Leventhal, and Brooks-Gunn 2004; Browning, Leventhal, and Brooks-Gunn 2005; Cubbin et al. 2005; Upchurch et al. 1999), though others find no association (Baumer and South 2001; Billy et al. 1994). Concentrated disadvantage has also been linked to an increased risk of unprotected sex (Baumer and South 2001; Mosher and McNally 1991). A lack of social and economic opportunities for young people in disadvantaged communities means that they may engage in sex at an early age or pursue a pregnancy by forgoing condom use as alternative markers of adulthood (Gage 1998; Varga 2003). Without adequate employment opportunities or the diversions available in more advantaged communities, youths may also face large amounts of unstructured time that could lead to engagement in precocious sexual activity (Kaufman et al. 2004). Additionally, availability and affordability of condoms may be lower in disadvantaged communities.

Relatively few studies have examined the consequences of community social disorder or social cohesion for the timing of sexual initiation or condom use, and we have found none that focus on South African youth. Social disorder, measured with an index of perceived ambient hazards, including perceived threat from events like drive-by shootings, has been linked to earlier sexual debut among U.S. young people (Upchurch et al. 1999). Exposure to high levels of social disorder may lead to a sense of powerlessness or hopeless-

ness (Wei et al. 2005), leading to risky behaviors as means of coping. Alternatively, in South African communities where violence is commonplace, young women in particular may fear violent repercussions if they refuse sex or demand the use of condoms (Varga 1997, 2003).

Among young people in the U.S., community collective efficacy, a more elaborated measure of social cohesion, is associated with delayed sexual debut (Browning et al. 2004). While U.S. adolescents' individual-level perceptions of community social cohesion were not associated with the timing of sexual debut in one study (Moore and Chase-Lansdale 2001), they were associated with increased condom use in another (Kerrigan et al. 2006). High levels of community social cohesion may increase the amount of monitoring and scrutiny young people face, limiting their perceived opportunities to engage in risky behaviors such as early sexual debut. It is less clear how heightened monitoring by neighborhood adults would influence the decision to use condoms among youth who are already sexually active, but social cohesion could also reinforce norms about appropriate sexual behavior. These shared norms could serve as a resource to draw upon in sexual encounters, or could act to limit the kinds of partners adolescents choose, influencing their ability to negotiate condom use with them (Kerrigan et al. 2006).

THE PRESENT STUDY

Theories of community effects developed to describe conditions in the U.S. suggest that concentrated disadvantage and social disorder may increase risky behavior, while social cohesion could reduce it. We build upon largely U.S.-based empirical evidence by turning to contextual influences on black young people's sexual behavior in South Africa, where community conditions and social processes differ in some respects from those in the U.S. We examine three research questions. First, are concentrated disadvantage and social disorder associated with earlier sexual debut and greater risk of unprotected sex among young black South Africans? Second, does social cohesion protect against early sexual debut and unprotected sex in South Africa? Finally, are these associations robust in the presence of controls for important individual, household, and other community characteristics?

DATA AND METHODS

Data Sources

We use two data sources in this analysis: (1) the "Transitions to Adulthood in the Context of HIV/AIDS" study (hereafter, the Transitions study) conducted in the Durban metropolitan area of KwaZulu-Natal, South Africa between 1999 and 2001 (Rutenberg et al. 2001) and (2) the 10 percent sample of the 1996 South African Census (Statistics South Africa 1996). KwaZulu-Natal is the largest province in South Africa and contains about one-fifth of the country's population. Close to half the residents live in urban areas (as classified by the South African Census Bureau), and Durban is the country's largest port and third-largest city. About one-quarter of South Africa's black population lives in the province, with primarily Zulu-speaking Africans making up about 82 percent of the population, Indian/Asians making up another 9 percent, and whites and coloureds together comprising the remaining 9 percent. A stratified, multi-stage cluster sampling method was used in sample selection, with enumeration areas (EAs) from the 1996 census serving as the primary sampling units. Interviews were first conducted in 1999 with all willing young people aged 14–24 years within each enumeration area and with the head of the young person's household (N = 3,052). The overall response rate for the wave 1 sample was 82.2 percent of adolescents identified in selected households, with 90.9 percent of rural African adolescents and 83.6 percent of their urban counterparts responding, and lower response rates among Indian/Asians (69.6 percent) and whites (67.5 percent). Respondents were re-interviewed in 2001, along with new youths from the same sampling frame; 2,222 wave 1 youths were re-interviewed, along with 1,963 additional young people. The overall attrition rate between the wave 1 and wave 2 surveys among youth was 27 percent, mainly due to migration out of the area (Hallman and Grant 2004). We use all black respondents who responded to the 2001 survey wave to obtain the largest possible analytic sample.

For this study, a community is defined as an enumeration area, the smallest administrative unit at which data are typically collected in South Africa. The size and boundaries of enumeration areas are influenced by terrain and other topological conditions, as well as by literacy levels of the population, sociopolitical

and administrative boundaries, and the population density of the area. Enumeration areas for the 1996 South African census consisted of about 80 to 170 dwelling units in most types of areas, and up to 250 units in more densely populated urban formal areas. By comparison, U.S. Census tracts, often treated as communities in empirical analyses, consist of between 1,500 and 8,000 people, with an optimum size of 4,000 people. This means that South African enumeration areas are smaller than U.S. Census tracts, and as they are drawn to preserve social homogeneity as described above, South African enumeration areas probably equally or better represent what people consider to be their neighborhoods than do census tracts in the U.S.

Six months after the 1999 respondent survey, the Transitions study also collected community characteristics using street intercept interviews with about 40 residents in each sampled enumeration area, targeting an equal representation of men and women, and of people over and under the age of 30 (Rutenberg et al. 2001). Those who were verified to be residents of the enumeration area were asked about their experiences with crime and perceptions of safety in the community (N = 4,469).[2] We use intercept interview data to construct a measure of social disorder, and we use census data to construct a measure of community concentrated disadvantage (both described below). Census data provide a more representative sample of the conditions at the enumeration area level than the Transitions data, though only certain structural characteristics are available from the Census.[3]

We use two analytic samples: for analyses of sexual initiation, the sample includes 2,736 black respondents age 14 to 24 with complete information on household and community characteristics, while for analyses of unprotected sex, the sample includes those 1,697 respondents who reported ever having experienced penetrative sexual intercourse. We omitted respondents missing household-level predictors because a household interview had not been completed (N = 194), and those who lived in an enumeration area where intercept interviews were not conducted (N = 200) or where census data were unavailable (N = 50). The final samples are nested within 79 to 91 enumeration areas, each with an average of 30 young people (ranges from 1 to 95). About 80 percent of communities have more than five respondents in the main analytic sample.

Measures

Sexual behaviors. Respondents were asked if they had experienced penetrative sexual intercourse, and those who reported affirmatively were asked their age at first sex. Our sexual debut measure indicates the number of years from age 10 to the age of first sex, or age at interview in 2001 if the respondent had not yet had sex. Among those who have had sex we also assess whether the respondent had unprotected sex, where a positive report indicates that no condom was used during last sex with the most recent partner during the previous 12 months.

Community-level variables. In the intercept interviews mentioned above, residents were asked whether they felt unsafe walking around their community during the day and at night and whether they felt unsafe in any area of their community. They were also asked whether in the last 12 months they or any relatives living in the community had experienced burglary, robbery, assault, vehicular crime, or murder or attempted murder, whether they were aware of any gang activity in the area, and whether they had witnessed a fight in the community during the previous 12 months. Using these responses we created a social disorder index using a three-level logistic regression item response model and HLM 6.0 software (Raudenbush and Sampson 1999). A discussion of the procedure and its strengths is available in Appendix A. The social disorder index ranges from –2.4 to 4.2, with more positive values indicating greater social disorder, and has a reliability of .968. Using another item-response model, we created an index of social cohesion by aggregating responses to two items on the individual questionnaire: "People in my neighborhood trust one another: agree [coded 1] or disagree [0]?" and "The adults in my neighborhood/community will help other families when they are in trouble: agree [coded1] or disagree [0]?" Values for the index range from .25 to 2.7, with higher scores indicating greater social cohesion, and the reliability is .690.

Census data were used to construct an indicator of community concentrated disadvantage, based on the proportion of households in the enumeration area with electricity (for cooking, heating, and/or lighting), regular refuse collection, flush toilets, piped water at the

dwelling, the percentage of residents aged 25 and older who completed secondary schooling, and the percentage aged 25 and older who were currently employed. Standardized items were summed; the sum was divided by the number of items available, and the scale was multiplied by –1 so that higher scores indicated more concentrated disadvantage. Values for the index range from –1.33 to 1.38, with a mean of zero.[4]

Individual- and household-level predictors. The respondent's age in years (ranges from 13 to 24) and sex (male = 1) are included because the extent to which the community influences individual behavior may vary by age and sex, the risk of sexual debut rises with age, and the factors influencing decision-making about sexual behavior may also vary by age and sex (Gage 1998). Institutions such as church and school may also shape young peoples' sexual behavior. The importance of religion to respondents is coded so that 0 = "not at all important," 1 = "somewhat important," and 2 = "very important." Not being currently enrolled in school could influence a young person's quantity of free or unsupervised time; here 1 = "not currently enrolled." We also include measures of the respondent's connectedness to the local community, with indicators of the number of residential moves in the respondent's lifetime (ranges from 0 to 13) and community group membership (ranges from 0 to 8).[5] Moving from one community to another could fracture important social ties or increase stress levels, increasing risky sexual behavior, or it could remove a young person from the negative influences of a particular setting, reducing such behavior (DeWit 1998). Affiliation with organizations such as religious groups, sports teams, or study groups may help to buffer the impact of stressful, negative influences and reduce risky behaviors (Kaufman et al. 2004). In models of condom nonuse only, we also include the respondent's predicted propensity to have sex, to account for potential biases associated with selection into the subsample of sexually-experienced young people. We obtained this predicted value by estimating a multilevel logistic regression model of ever having had sex, using the individual-, household-, and community-level covariates described here. The predicted propensity to have sex ranges from –3.7 to 7.4, with higher values indicating greater propensity.

Family environment and resources also influence young people's sexual behavior. Household assets are measured with indicators of home construction materials, type of toilet facilities and water supply, access to electricity, and telephone ownership. We created an index of these items, with value for each standardized and summed; the Cronbach's alpha value is .79, and it ranges from –2.4 to .77, with a higher score indicating greater assets. We include an indicator of fewer than two adults (25 years or older) residing in the household at the time of the survey, as such individuals could support and supervise the respondent. Previous U.S. research has found family structure to be associated with a range of sexual behaviors, including sexual debut (Browning et al. 2004). We also include a count of negative household events in the previous two years (ranges from 0 to 5), including a death or serious illness, job loss, loss of remittance or grant, divorce or abandonment, theft, fire, or property destruction.

Analytic Strategy

We use two-level hierarchical logistic regression models and multilevel discrete time hazard models with HLM 6.0 software to accommodate the structure of these data, with young people nested within enumeration areas. The level one model (individuals) for reporting unprotected sex is:

$$\eta_{ij} = \beta_{0j} + \beta_{Male\,j}\,(Male)_{ij} + \beta_{2j}X_{2ij} + \ldots + \beta_{pj}X_{pij} \quad (1)$$

where η_{ij} is the log-odds of reporting unprotected sex, β_{0j} is the expected value of the behavior when all covariates are equal to zero, $Male_{ij}$ is the dichotomous variable distinguishing respondent *i* from community *j* as male or female, $\beta_{Male\,j}$ is the estimated difference between male and female respondents in unprotected sex in community *j,* X_{2ij} indicates the value of predictor variable two for respondent *i* from community *j,* and β_{2j} represents the effect of predictor variable two for community *j.* The level two model (communities) is:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}W_{1j} + \gamma_{02}W_{2j} + \gamma_{03}W_{3j} + \gamma_{04}W_{4j} + u_{0j}, \qquad u_{0j} \sim N(0,\tau_{00}) \quad (2)$$

$$\beta_{Male\,j} = \gamma_{10} + \gamma_{11}W_{1j} + \gamma_{12}W_{2j} + \gamma_{13}W_{3j} + \gamma_{14}W_{4j} \quad (3)$$

where γ_{00} is the conditional average log-odds of unprotected sex across communities, u_{0j} represents the deviation of the average respondent in community *j* from the average behavior across communities, and τ_{00} is the variance between communities in the community-average log-odds of the behavior. The W_{1j} and γ_{01} terms represent the value of, and effect of, the first community characteristic on a respondent's behavior in community *j,* respectively.

While the bulk of our analysis focuses on the pooled sample of young men and women, we also explore cross-level interactions between the respondent's sex and community characteristics. A strong research tradition in adolescent development suggests the importance of gender in the patterning of sexual decision-making (Gage 1998; Nathanson 1993), and norms about sexual behavior are strongly gendered in South Africa (Varga 2003; Wood, Lambert, and Jewkes 2007). Moreover, limited empirical evidence has suggested that there may be gender differences in the consequences of community characteristics for sexual behavior. For example, a study of South African youth found that positive educational and employment opportunities in the community were linked to less frequent sex for girls, though they were associated with decreased condom use for boys (Kaufman et al. 2004). In models including cross-level interaction terms, equation 3 for $\beta_{Male\,j}$ in equation 1 models the estimated difference in behavior between males and females as a function of community characteristics. A statistically significant value for γ_{11}, γ_{12}, γ_{13}, or γ_{14} would indicate that the community characteristic is differently associated with behavior for males and females.[6] In models without cross-level effects, equation 3 is not estimated.

We use two-level discrete time hazard models to estimate the hazard of sexual debut (Barber et al. 2000). These models are very similar to the multilevel logistic regression models described above, but the individual-level model is based on person-year observations—one for each year during which the respondent is at risk of sexual debut—and indicators of years of duration since entering risk at age 10 (and duration squared) are included to model the hazard of sexual initiation. Respondents leave risk at the age they report having had sex for the first time, or at the age they were at the time of the survey, if they have not had sex. In all relevant models for both outcomes, respondent's age, household assets, and all community characteristics are centered relative to the sample-wide grand mean to aid in interpretation of coefficients. Descriptive and multivariate analyses are weighted at the individual-level using sampling weights provided with the Transitions data.

RESULTS

Descriptive Results

Table 1 presents descriptive information separately by sex for individual- and household-level characteristics, and overall for community characteristics. Figures are weighted except for community-level figures and column totals. About 59 percent of females and 67 percent of males report ever having had sex, and among those who have had sex, average age at sexual debut was 16.4 years for females and 15.3 years for males. About 45 percent of females versus 30 percent of males reported not using a condom during the most recent sexual encounter in the past year, a gender gap that has been found in other studies of South African youth (Dinkelman, Lam, and Leibbrandt 2007). Sex differences in these outcomes are statistically significant. Sample members were about 18 years of age on average, rate the importance of religion as nearest to very important (1.8), and have moved an average of once, with no sex differences on these measures. Females are significantly more likely to report not being enrolled in school (38%) than males (31%) and belong to significantly fewer community groups (1 and 1.7, respectively). Males live in households with significantly greater assets than females (–.25 versus –.28, respectively), and have a greater predicted propensity to have sex (1.4 versus .78, respectively) but there is no sex difference in the likelihood of living with fewer than two adults (about 25%) or in the average number of negative household events (just over 1).

To explore the interrelationship among the community characteristics in KwaZulu Natal, we calculated correlation coefficients between pairs of characteristics (using community level data, N = 91). Counter to expectations from U.S.-based theory and empirical evidence, we find that concentrated disadvantage is not associated with social disorder (–.03), and is weakly positively associated with social cohe-

TABLE 1. Means and Percentages for Key Variables by Sex, Black South African Respondents from the Transitions Study, 2001

	Range/Coding	*N*	Females (*N* = 1,479) (Mean/SD) /%	Males (*N* = 1,257) (Mean/SD) /%	*p* for diff.
Dependent Variables					
Ever had sex	1 = Yes	2,736	58.5%	67.1%	< .001
Age at sexual debut, among those who have had sex	10–22 years	1,697	16.43 (1.80)	15.28 (2.18)	< .001
No condom used during last sex in past 12 months, among those who have had sex	1 = Yes	1,697	44.6%	29.5%	< .001
Individual- & Household-level Independent Variables					
Age (years)	13–24 years	2,736	18.29 (2.86)	18.22 (2.72)	.075
Importance of religion	0 = Not at all, 2 = Very	2,736	1.78 (.476)	1.76 (.519)	.507
Residential moves (number)	0–13 moves	2,736	1.01 (1.37)	.95 (1.29)	.671
Not currently enrolled in school	1 = Yes	2,736	38.2%	31.0%	< .001
Community group membership (number)	0–8 organizations	2,736	1.02 (1.02)	1.65 (1.30)	< .001
Household assets	–2.40 to .767	2,736	–.280 (.699)	–.254 (.725)	.029
Predicted propensity to have sex	–3.66 to 7.38	2,736	.783 (2.253)	1.361 (2.138)	< .001
Fewer than 2 adults in household	1 = Yes	2,736	26.2%	24.8%	.173
Negative household events (number)	0–5 events	2,736	1.01 (1.00)	1.12 (1.04)	.230
Community-level Independent Variables				All Enumeration Areas	
Social disorder	–2.42 to 4.18	91		.561 (.962)	
Social cohesion	.248 to 2.71	91		1.34 (.466)	
Concentrated disadvantage	–1.33 to 1.38	91		.00 (.889)	

Note: Figures based on weighted data, except column totals and t-tests or Kruskal-Wallis tests for difference across female and male samples. Figures for age at sexual debut and unprotected sex are based on sample of respondents who have had sex, *N* (female) = 884, *N* (male) = 813. Figures for community characteristics are based on sample of enumeration areas (*N* = 91).

sion (.13). More in keeping with expectation, social cohesion and social disorder are negatively associated across these communities (–.33).

Multivariate Results

Table 2 presents unstandardized coefficients from multilevel discrete time hazard models of sexual initiation. Models 1 through 3 focus on the influence of community characteristics, controlling only for the respondent's age, duration at risk, duration-squared, and sex. Here, the age coefficient captures any secular trend in the timing of first sex, as the respondent's age is used to construct the measures of duration at risk. We start by examining only concentrated disadvantage (model 1), then add social disorder (model 2), and finally add social cohesion (model 3) to assess the gross association between community conditions and sexual behavior, and the way that the others may reflect the indirect effects of concentrated disadvantage. Model 4 adds all other individual- and household-level predictors to examine how the nonrandom distribution of young people across communities might partially account for the associations between community characteristics and sexual behavior, while model 5 adds cross-level interaction terms to explore whether the associations vary by sex.[7]

Model 1 in Table 2 shows that, net of sex, age, and duration of risk, concentrated disadvantage is positively associated with the hazard of sexual initiation ($\beta = .253$). Risk of sexual initiation increases with time since entering risk, though the duration-squared term indi-

TABLE 2. Unstandardized Coefficients from Multilevel Discrete Time Hazard Models of Sexual Debut, Transitions Study 2001

	Model 1	Model 2	Model 3	Model 4	Model 5
Community-level Variables					
Concentrated disadvantage	.253**	.260***	.278***	.281***	.302***
	(.071)	(.066)	(.068)	(.071)	(.080)
Social disorder	—	.192**	.145*	.130*	.182*
		(.068)	(.064)	(.059)	(.084)
Social cohesion	—	—	–.336**	–.319*	–.143
			(.122)	(.127)	(.143)
Male × Concentrated disadvantage	—	—	—	—	–.054
					(.090)
Male × Social disorder	—	—	—	—	–.111
					(.087)
Male × Social cohesion	—	—	—	—	–.382*
					(.172)
Individual- & Household-level Variables					
Age	.037*	.037*	.036*	–.021	–.021
	(.015)	(.015)	(.015)	(.015)	(.015)
Duration	1.174***	1.177***	1.176***	1.190***	1.194***
	(.050)	(.052)	(.052)	(.054)	(.054)
Duration squared	–.064***	–.064***	–.064***	–.064***	–.064***
	(.005)	(.005)	(.005)	(.005)	(.005)
Male	.494***	.497***	.501***	.564***	.585***
	(.070)	(.071)	(.071)	(.070)	(.073)
Importance of religion	—	—	—	–.204**	–.208**
				(.063)	(.063)
Residential moves	—	—	—	.093***	.092***
				(.022)	(.022)
Not currently enrolled in school	—	—	—	.507***	.503***
				(.067)	(.068)
Community group membership	—	—	—	–.035	–.030
				(.023)	(.023)
Household assets	—	—	—	–.034	–.036
				(.065)	(.065)
Fewer than 2 adults in household	—	—	—	.255**	.258**
				(.090)	(.091)
Negative household events	—	—	—	.056	.057
				(.035)	(.035)
Intercept	–6.334***	–6.384***	–6.390***	–6.540***	–6.557***
	(.149)	(.150)	(.152)	(.190)	(.188)
Level 2 Variance	.202***	.166***	.145***	.153***	.160***
N (person years)	22,221	22,221	22,221	22,221	22,221
N (individuals)	2,736	2,736	2,736	2,736	2,736
N (EAs)	91	91	91	91	91

Note: Models are weighted using level-one weight for Transitions sample members.
*** $p < .001$; ** $p < .01$; * $p < .05$.

cates that the increase slows over time, as a greater fraction of all individuals become sexually active. Males have a substantially higher hazard of sexual debut than females. Model 2 shows that social disorder is significantly associated with sexual initiation ($\beta = .192$), but its inclusion does not reduce the association between concentrated disadvantage and sexual debut. Results of model 3 show that social cohesion is strongly associated with the hazard of initiating sexual activity ($\beta = -.336$), while concentrated disadvantage and social disorder remain positive predictors, though the coefficient for social disorder is reduced slightly in magnitude and significance. Model 4 shows that this pattern of results is very similar even when all other individual- and household-level predictors are added to the model. Finally, model 5 adds cross-level interactions between sex and community characteristics and suggests that social cohesion delays sexual initiation more strongly among males than females ($\beta = -.382$).

Considering only respondents who have had sex, Table 3 presents unstandardized coefficients from multilevel logistic regression models of unprotected sex. Models 1 though 4 show that concentrated disadvantage is associated with a significantly greater likelihood of not using a condom with the last partner in the

TABLE 3. Unstandardized Coefficients from Hierarchical Logistic Regression Models of Condom Non-use among Those who Have Had Sex, Transitions Study 2001

	Model 1	Model 2	Model 3	Model 4	Model 5
Community-level Variables					
Concentrated disadvantage	.487***	.432**	.407**	.357**	.294
	(.114)	(.117)	(.120)	(.131)	(.159)
Social disorder	—	–.205**	–.161*	–.149	–.067
		(.072)	(.074)	(.088)	(.101)
Social cohesion	—	—	.287	.067	.103
			(.205)	(.184)	(.207)
Male × Concentrated disadvantage	—	—	—	—	.129
					(.180)
Male × Social disorder	—	—	—	—	–.190
					(.117)
Male × Social cohesion	—	—	—	—	–.122
					(.242)
Individual- & Household-level Variables					
Age	–.167*	–.191*	–.206**	.018	.025
	(.073)	(.076)	(.077)	(.225)	(.224)
Male	–.751***	–.782***	–.796***	–.406	–.428
	(.136)	(.137)	(.139)	(.292)	(.296)
Predicted probability of having sex	.344**	.379**	.400**	.031	.018
	(.106)	(.111)	(.114)	(.374)	(.372)
Importance of religion	—	—	—	.073	.074
				(.111)	(.111)
Residential moves	—	—	—	.064	.071
				(.100)	(.099)
Not currently enrolled in school	—	—	—	.431	.465
				(.588)	(.587)
Community group membership	—	—	—	–.184*	–.175*
				(.078)	(.079)
Household assets	—	—	—	–.258*	–.259*
				(.115)	(.116)
Fewer than 2 adults in household	—	—	—	.213	.222
				(.165)	(.161)
Negative household events	—	—	—	.087	.095
				(.078)	(.078)
Intercept	2.200	2.643*	2.889*	–1.238	–1.382
	(1.229)	(1.280)	(1.310)	(4.128)	(4.110)
Level 2 Variance	.203***	.176***	.163***	.137**	.134**
N (individuals)	1,697	1,697	1,697	1,697	1,697
N (EAs)	83	83	83	83	83

Note: Models are weighted using level-one weight for Transitions sample members.
*** $p < .001$; ** $p < .01$; * $p < .05$.

past year. Unexpectedly, social disorder is significantly negatively associated with unprotected sex in this sample (models 2 and 3), though this association is no longer significant in model 4, when individual and household characteristics are included. We do not observe any association between social cohesion and unprotected sex, and we find no significant cross-level interactions between sex and the community characteristics.

The results presented in Tables 2 and 3 show that community characteristics are associated with risky sexual behaviors, but they provide only weak evidence for gender differences in the associations, with only one statistically significant cross-level interaction out of a possible six. Pursuing that sole significant interaction in sex-specific models of sexual debut not shown here, we found that social cohesion significantly delays sexual debut for males, while the association is in the same direction, but not statistically significant for females. These weak findings are somewhat surprising given the considerable research attention to gendered power differentials in South Africa (Varga 2003; Wood et al. 2007). Our results suggest that manifestations of the gendered power differential do not vary greatly across advantaged and disadvantaged communities, but future research should consider further the intersection of gender, community structural conditions, and social processes.

DISCUSSION

South Africa provides a compelling and distinct societal case in which to examine theoretical expectations developed largely in reference to the U.S. about the influence of community context on individual sexual behavior. In this study we asked if community concentrated disadvantage and social disorder are associated with earlier sexual initiation and greater risk of unprotected sex among young black South Africans, if community social cohesion is associated with later sexual debut and less unprotected sex, and if the associations are robust to controls for individual and household characteristics that might influence sexual behavior or lead to residence in particular kinds of communities. This study goes beyond the limited evidence from South Africa in its use of rigorous multilevel logistic and hazard rate models, and use of a separate survey of community residents and census data to obtain measures of social disorder and concentrated disadvantage.

Results show that, as expected, young black South Africans in communities with relatively high levels of concentrated disadvantage have a greater hazard of sexual initiation and a higher risk of unprotected sex than their counterparts in more advantaged communities. These associations are not explained by levels of community social disorder or social cohesion, and are robust to controls for individual and household characteristics. An earlier study using the 1999 Transitions sample found that positive educational and employment opportunities in the community were associated with lower levels of unprotected sex among young women, but that higher levels of educational attainment were associated with lower condom use among young men (Kaufman et al. 2004). One possible reason for our differing findings is variation in measures used in the studies. Our measure of concentrated disadvantage was generated using data from adult respondents and households in the South African census and includes a broad range of economic, social, and structural indicators, while Kaufman and colleagues (2004) created measures of community socioeconomic conditions by aggregating responses about education and employment from the young people also reporting on their sexual behavior. Moreover, our indicator of condom use refers to the last time respondents had sex with their most recent partner in the past 12 months, while Kaufman and colleagues considered respondents to be condom users only if they used a condom at last sex with all of their partners (up to three) over the last year. Nonetheless, the variation in findings suggests further exploration of the consequences of community concentrated disadvantage with these and other South African samples.

Our results also suggest that community social processes are associated with sexual behavior among young black South Africans. Social disorder is positively associated with the hazard of sexual initiation, as has been found for women and men in the U.S. (Upchurch et al. 1999). We also find that greater community social cohesion is associated with delayed sexual debut, although the association appears stronger for young men than for young women, while a U.S. study found that collective efficacy, an elaborated measure of social cohesion, delayed sexual debut among both sexes (Browning et al. 2005). In South Africa, young men spend more time "hanging out" outside the home than young females do (Kaufman and Stavrou 2002), so they may be more strongly influenced by community social cohesion as it is reflected in their encounters with community adults in street life. Overall, however, we find relatively limited evidence that community conditions are associated with sexual behavior in ways that differ dramatically for young men and young women.

More broadly, these results do not provide strong support for the interrelationship of community structural disadvantage, resultant social processes, and young people's sexual behaviors that is proposed by social disorganization theory and its more recent iterations in the U.S.. First, we find that correlations among the three community characteristics in KwaZulu Natal differ from those posited by these theories. Concentrated disadvantage is not correlated with social disorder and is weakly positively correlated with social cohesion, countering theoretical expectations for a positive association in the first case and a negative association in the second. We may find little association between concentrated disadvantage and social disorder because our measure of the latter is focused on experiences and perceptions of crime, and criminal activity is relatively common across many communities in South Africa (Burton et al. 2003). The positive association between concentrated disadvantage and social cohesion that we find in KwaZulu Natal, how-

ever, was also observed in poor communities of urban Brazil (Villareal and Silva 2006), and it was even stronger in that context.

At least partially because of these unexpected interrelationships among community characteristics in KwaZulu Natal, multivariate results contradict our expectation that social disorder and social cohesion act as mediators of community concentrated disadvantage. The addition of these social process indicators in models 2 and 3 only reduces the estimated association between concentrated disadvantage and condom nonuse by about 16 percent (Table 3), while the association actually strengthens in models of sexual debut (Table 2). Social disorder and social cohesion are associated with an increased hazard of sexual debut, as expected, but there are no remaining associations between these social process indicators and the likelihood of engaging in unprotected sex in the fully adjusted model. While community conditions—including high levels of crime and violence and low levels of cohesion among local adults—may affect some key decisions adolescents make, like the decision to become sexually active, the differences in results across our outcome measures suggest that community conditions may have little effect on the conditions that prevail within young people's existing sexual relationships, such as the ability to negotiate condom use. Prior research suggests that the relationship context, characterized by the nature and duration of the sexual relationship (Maharaj 2006) or the allocation of power between male and female partners (Gage 1998), may have more consistent associations with different measures of sexual risk-taking by adolescents. Such factors could also have greater influence on condom use than community characteristics, and should be examined in future analyses of the multiple contexts that affect youths' sexual decision-making.

At least two conclusions can be drawn from the differences we observe in KwaZulu-Natal as compared to expectations derived from communities in the U.S. One interpretation is that the specific path diagram implied by these U.S.-based theories may not apply universally across societal contexts, but there is nonetheless an important influence of both structural features of communities and the social processes therein on young peoples' sexual behavior. A more cautious interpretation suggests, instead, that the links between community characteristics and youths' sexual behavior are tenuous or vary so substantially across contexts or outcomes that general theories may be inappropriate. A recent study comparing young people in Burkina Faso, Ghana, and Zambia, for example, found that, while the rate of adult male employment in the community was associated with less risky sexual behavior among male youth in Burkina Faso, this indicator was associated with more risky behavior among female youth in Ghana, and was not associated with sexual behavior among young men or women in the comparison countries (Stephenson 2009). While there is a good chance that differences in measurement underlie some of the mixed results across studies, sociological research on community effects must engage the challenge of highly variable societal contexts. As one scholar has noted, a re-evaluation of the lessons from a previous generation of demographic research in developing country settings may be useful, and could help to broaden the variety of measures and mechanisms implicated in theories of community effects (Entwisle 2007).

There are several important limitations of these analyses that should qualify the interpretation of our findings. First, we examine sexual behavior and community characteristics only among young blacks, in part because of the small sample of nonblacks available, a reflection of the demographics of the South African population. While our results demonstrate significant variation within the black population, we cannot generalize our findings to South Africa overall. Nevertheless, while future studies will continue to reveal persistent and large between-race differences in South Africa, within-race inequality is increasingly important; race should not be the only characteristic used to determine appropriate targets of program and policy interventions. Second, this study focuses on community social and economic context, limiting our ability to examine parent-child relationships, though these are also important predictors of sexual debut and unprotected sex. This means we do not assess whether parents may alter their parenting behavior according to the community context, as suggested by Browning and colleagues (2005). Future studies of context and young people's behavior should include indicators across multiple levels of influence and explore how factors at different levels interact, as suggested by

the ecological systems theory of child and adolescent development (Bronfenbrenner 1979).

This study also has some methodological limitations common to many analyses of community effects, including the endogeneity of community choice and problems of temporal ordering of independent and dependent variables. Endogeneity of community choice refers to the possibility that underlying and unmeasured characteristics that determine residential location are also determinants of the outcome in question (Jencks and Mayer 1990). While self-selection into communities may have been minimally influential during apartheid, when residential restrictions were in place, those restrictions had been lifted for several years before the Transitions survey took place. At least some individuals and families, and most likely those with greater socioeconomic resources, took advantage of this new freedom to relocate. While we include some measures of household resources in our models, we cannot rule out the possibility that purposive selection into particular communities influences our results. In addition, we cannot address the issue of endogenous program placement, such as the targeting of HIV informational or prevention programs and distribution of free condoms toward communities with higher risk of HIV transmission. Future work should explore how purposive interventions to reduce risk could create or mute associations between community characteristics and risky sexual behavior.

Problems associated with the temporal ordering of exposures and focal outcomes are common to studies relying on cross-sectional data. In this study, we use a retrospectively reported measure of age at first sex and of condom use in the past 12 months. In some cases, measures of independent predictors such as school enrollment status or community concentrated disadvantage reflect conditions prevailing after the respondent's first sex or most recent sexual encounter. This means that the decision to drop out of school may have been determined by the timing of sexual debut, rather than the opposite (as is implied by our analysis). While it was not possible to obtain measures of individual and household characteristics from a period prior to the occurrence of our focal outcomes, in analyses not shown here we re-estimated our models using subsamples of respondents who had lived in their enumeration area of residence for at least one, five, and ten years before the year they became sexually active. Importantly, close to half the respondents had always lived at their current residence. If we assume that community characteristics did not change dramatically over these periods, then these subsamples include only respondents for whom community conditions temporally preceded their sexual decisions. We found that the association between social disorder and sexual debut weakened somewhat as the sample was increasingly restricted to longer-term residents, while the association between social cohesion and sexual debut became slightly stronger. The results for models of condom nonuse did not change dramatically across these subsamples. Thus, the problem of temporal order in our measures does not appear to have dramatically shaped our results, but future studies using longitudinal data on exposures and outcomes would be useful for more convincingly establishing associations and their causal directionality.

Despite the limitations in this and other studies, our findings and the growing body of literature on community effects in the U.S. and elsewhere suggest that broader social contexts influence young peoples' behavior and merit further empirical investigation and theoretical development. The persistence of sexual risk-taking behavior despite decades of prevention efforts and movement toward better economic and social opportunities for all South Africans since the end of apartheid suggests that new avenues of research and programming are needed. If community characteristics influence decisions that young black South Africans make about whether to have sex and whether to use condoms, as our results suggest they do, increased attention to structural disadvantage and social processes may offer new leverage in HIV prevention efforts, as well as improving life chances more generally.

APPENDIX A. CONSTRUCTING COMMUNITY MEASURES WITH MULTILEVEL ITEM RESPONSE MODELS

We used three-level logistic regression item response models to create enumeration area-level measures of social disorder and social cohesion because they have several key advantages over simpler scale construction methods. These models can address appropriately the multiple levels of data clustering (items within respondents, and respondents within communities), help to address error in measurement of

particular items, and they can handle missing data at the item or respondent levels. These models can also assess the "ecometric" properties of community-level measures by quantifying both: (1) how consistently individuals respond to different component items, and (2) the degree to which residents rate their neighborhood similarly, and they produce reliability scores (Mujahid et al. 2007; Raudenbush and Sampson 1999).

In the case of our measure of social disorder, at level one, our item-response model takes into account the varying likelihoods of experiencing a given negative event, such as feeling unsafe walking around the community at night versus reporting an assault, and adjusts individual-level latent social disorder scores for missing data on any of the 11 items. The level one model (within respondents) is constructed as follows:

$$Y_{ijk} = \pi_{jk} + \sum_{p=1}^{10} \alpha_p D_{pijk}, \qquad (4)$$

where Y_{ijk} is the dichotomous response to item i for person j in enumeration area k, π_{jk} is the respondent-specific intercept, and D_{pijk} is a dummy variable with a value of 1 if response i for person j in enumeration area k is for item p in the social disorder scale, 0 otherwise. Only ten dummy variables are included in the model, with the reference item value set to 0, so α_p represents the difference in log-odds of a positive response between item p and the reference item. At level two, estimated across the up to 40 respondents per enumeration area, we model as follows:

$$\pi_{jk} = \beta_{0k} + r_{jk}, \qquad r_{jk} \sim N(0, \sigma^2) \qquad (5)$$

where β_{0k} represents the enumeration area-specific intercept and r_{jk} is an independently and normally-distributed random effect with mean 0 and variance σ^2. At level three, the enumeration area-specific intercepts can be modeled:

$$\beta_{0k} = \gamma_{00} + u_{0k}, \qquad u_{0k} \sim N(0, \tau_{00}) \qquad (6)$$

where γ_{00} is the sample-wide grand mean and u_{0k} is an enumeration area-level random effect. To obtain the final social disorder scale score for each enumeration area, we add the enumeration area-specific empirical Bayes residual (from level three) to the grand mean value γ_{00}. These residuals represent the deviation in a given enumeration area's social disorder score from the predicted score for that enumeration area after adjusting for the variables in the model. Empirical Bayes residuals "downweight" (toward the grand mean value γ_{00}) those areas with fewer respondents and can address missing data at the item or respondent level.

NOTES

1. Under the apartheid system, in place from 1948 to1994, South Africans were officially assigned to one of four population groups: black/African, coloured, Asian, or white. Although apartheid ended in 1994, we use the same labels here because these categories still index groups' relative rankings within the social structure (Kaufman and Stavrou 2002).
2. Five of the 118 enumeration areas were excluded from data collection because of safety concerns or because local authorities would not permit access to the area. As noted by one reviewer, the street interviewees may represent a select sample of individuals who are already inclined to use public space and may see the community as safer than those who avoid the street. Especially in the poorer communities with small homes where black residents are concentrated, however, South African street life is vibrant and many residents were likely eligible to be interviewed.
3. South African census 2001 data were not publicly available at the level of enumeration area. Moreover, the 1996 census data are more likely to capture conditions experienced by these young people during their childhoods and earlier adolescence, when community characteristics may begin to exert their effects.
4. We also explored other commonly-included community characteristics implicated in social disorganization theory, including level of racial diversity among enumeration area residents and prevalence of labor migration, but these were not significantly associated with the outcomes studied. Moreover, most young black South Africans live in communities where the overwhelming majority of residents are also black.
5. Because the continuous variables for number of moves and number of community organizations were highly skewed, we tested both a logged version and a categorical ver-

sion of these variables. Results were substantively similar, so we present results based on the untransformed continuous measure.

6. Models predicting condom nonuse failed to converge when we added a random effect term to equation 3. While it was possible to include this random effect for the multilevel hazard model of sexual debut, our main results were unchanged when it was included. To be consistent across outcomes, we have not included a random effect term for equation 3.
7. In addition to including social disorder and social cohesion both together and individually in the models predicting sexual initiation and unprotected sex, we also explored an interaction between them (results not shown). Using a dichotomous indicator of living in a community with high social disorder and low social cohesion (in addition to the continuous indicators of each characteristic), we did not find any significant evidence for interaction.

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