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Individual and Neighborhood Correlates of HIV Testing among African American Youth Transitioning from Adolescence into Young Adulthood

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Abstract

Disparities in HIV testing rates exist among socially-disadvantaged communities. Using a longitudinal sample of urban African American youth followed from adolescence into young adulthood ($N = 396$; 51% female), we examined whether HIV testing was associated with individual (i.e., gender, SES, education, and STI history) and area (i.e., neighborhood disadvantage and HIV prevalence) characteristics. In our multilevel regressions, we found females were more likely to have tested for HIV, with the magnitude of this association increasing if they lived in areas of greater disadvantage, yet decreasing in higher HIV prevalence areas. Those without a high school degree, with a lower SES, or with a history of STIs in adolescence were less likely to test if they lived in greater disadvantage and HIV prevalence areas. We discuss the implications of these findings from an ecological perspective and propose recommendations for increasing testing among African American youth.

Keywords

HIV/AIDS; Testing; Neighborhoods; Disadvantage; Gender; Youth

The HIV/AIDS epidemic remains a major public health concern in the United States and globally. While prevention efforts slowed the rates of infection over the first two decades of the epidemic, current estimates suggest that HIV/AIDS incidence rates are rising. Between 2004 and 2007, new HIV infections increased by 15% (CDC, 2007a). More disconcerting is the persistent and unequal distribution of HIV across the US population by age, race, sex, and socioeconomic status (Hall, Byers, Ling, & Espinoza, 2007; Lane et al., 2004). Most HIV infections occur during adolescence and young adulthood (15–24 years), with over half of the approximately 59,000 newly diagnosed HIV cases reported yearly in the United States occurring among individuals of reproductive age (Guttman Institute, 2005). According to the CDC (2009), African Americans make up 51% of all new HIV infections. The racial disparities in HIV incidence are even greater when stratified by sex: African American men make up 44% of the male incidence rate, while African American women comprise 68% of new HIV diagnoses amongst females (CDC, 2009). HIV incidence is also associated with non-completion of high school and lower SES (Ford & Lepkowski, 2004). Given these

disparities, we sought to examine how individual and neighborhood characteristics may be associated with the likelihood of HIV testing in an urban sample of African American youth.

Marks, Crepaz, and Janssen (2006) estimate that as many as 50–70% of new cases of HIV are spread by people who are unaware of their status, underlining the effect of underutilization of HIV testing on disease incidence. As HIV+ individuals are made aware of their serostatus, they often decrease their sex risk behaviors (i.e., reduce the number of sexual partners, or increase condom use during intercourse), which in turn decreases the potential of virus transmission (Sherr et al., 2007; Marks, Crepaz, Senterfitt, & Janssen, 2005). Discovering HIV in its early stages is also ideal for patient treatment, as it allows physicians to begin monitoring their patients before the onset of the symptoms with serious and costly complications, a benefit both to the individual and to those financing the medical care (Branson et al., 2006). Routine testing may also encourage health promotion among HIV negative persons (i.e., beyond the knowledge of their serostatus). George, Green, and Murphy (1998) found that rates of STI infection in their sample decreased a year after an HIV test, regardless of HIV test results—potentially indicating that routine testing serves as a cue to action in maintaining safer sexual practices. Similarly, programs that utilize the voluntary counseling and testing model (i.e., including a personalized counseling component with a patient's HIV test) have proven to be particularly efficacious in reducing the amount of unprotected sex reported by their clients (Denison, O'Reilly, Schmid, Kennedy, & Sweat, 2008).

In light of these findings, the CDC has identified HIV testing as pivotal to slowing the spread of HIV, and currently recommends routine testing as part of primary care for adults, adolescents, and pregnant women (Branson et al., 2006). Previously, due to the stigma surrounding HIV infection and HIV testing (e.g., fear of discriminatory treatment if discovered to have tested or received positive results), many patients were reluctant to disclose their complete sexual and drug history to their health care providers or to ask for an HIV test (Chesney & Smith, 1999). As a strategy to mitigate stigma, these new CDC guidelines encourage the incorporation of HIV tests into primary routine care to better the odds of reaching the approximately 56% adult Americans who have never tested (Inungu, 2002). HIV testing has been further streamlined with the development of rapid testing devices, decreasing the waiting time for results down to 20 minutes, removing the barrier of patients needing a second appointment to find out their HIV Status (Bogart, Howerton, Lange, Becker, & Setodji, 2008; Branson et al., 2006).

Rates of HIV testing, however, vary across sociodemographic groups and social contexts. Consistent differences appear in HIV testing rates across sex and racial/ethnic groups (CDC, 2007b). On average, women test more frequently than men; in part, this sex difference may be attributed to women's greater use of medical care services, as women often have a continuous relationship with gynecologists or women's health practitioners during their childbearing years, increasing their likelihood of being offered a test (Arrington-Sanders & Ellen, 2008). Black, non-Hispanic persons are more likely to test than White, non-Hispanic or Hispanic persons (CDC, 2007b). Bond, Lauby, and Batson (2005) attribute this difference to Black/African-Americans having a greater sense of perceived risk of infection. Knowing someone who has tested positive for HIV or viewing HIV as having negatively affected one's community may increase the likelihood that a person will seek out an HIV test. Due to the disproportionately high incidence of HIV in African American communities (CDC, 2008), the effects of HIV may be more personalized to those who identify as part of these communities and thus account for racial differences in testing behaviors.

The context in which an individual lives may have additional effects on their HIV testing behaviors. Individuals residing in economically disadvantaged areas are less likely to test for

HIV/AIDS as they may have less access to health care (Prentice, 2006). Furthermore, individuals living in economically disadvantaged areas are less likely to have a permanent health care provider (Kirby & Kaneda, 2005). They are also less likely to have recently been tested than individuals who report having a regular primary care physician (Bond, Lauby, & Batson, 2005). Efforts to design HIV testing interventions for low income communities are underway. The New York City Department of Health and Mental Hygiene (NYCDHMH), for example, is currently implementing a free, door-to-door testing campaign within the entire Bronx borough (NYCDHMH, 2008). Similarly, individuals who reside in communities with populations more directly affected by HIV (i.e., a large number of unmarried singles, an above-average prevalence of AIDS cases) may be more likely to seek an HIV test, thus elevating HIV testing rates in these high risk geographic areas (Taylor, Leibowitz, Simon, & Grusky, 2006). Taylor and colleagues (2006) found individuals were more likely to test for HIV if they lived in Los Angeles zip codes with a greater prevalence of HIV/AIDS cases. At present, however, it is unclear whether these relationships occur within other regions of the country. Furthermore, Taylor et al. (2006) only accounted for a composite measure of sexual risk behavior in their analyses (e.g., not always wearing a condom and having more than one partner in the last year). In order to examine the effects of contextual factors on HIV testing, we include additional sexual risk correlates (e.g., sexual intercourse frequency, pregnancy concerns, history of STIs, sex partner age differences) in our analyses. Given the importance of HIV testing in slowing the progression of the virus, we seek to expand on the current research by evaluating the role of contextual factors in predicting HIV testing rates. Using a multilevel approach, we evaluate the role of neighborhood disadvantage on individual testing behavior in a sample of African-American youth living in a Midwestern city.

Our study had two objectives. First, we identified the association between HIV testing and sociodemographic characteristics (i.e., sex, high school degree, and SES) and sexual risk correlates (i.e., frequency of sexual intercourse, condom use, age difference between youth and their sexual partners, pregnancy concerns, and history of STIs), respectively. Consistent with previous literature, we anticipated seeing higher reported rates of testing among women, but lower rates of testing among those with markers of social disadvantage (i.e. lower socioeconomic status, lack of high school degree, and a history of STIs). We also hypothesized that youth reporting greater sexual risk correlates would be more likely to report higher rates of testing. Second, we assessed the influence of neighborhood disadvantage and HIV prevalence on HIV testing and its sociodemographic and sexual risk correlates. We predicted that individuals who live in economically disadvantaged communities would report less testing than their counterparts in higher SES areas. We also expected that neighborhoods with a high HIV prevalence would have higher testing rates than areas with lower rates as found in previous research.

Methods

Sample

This study is based on an eight-year longitudinal study of youth followed from adolescence into young adulthood. Participants in this study were recruited based on their risk for school dropout. To be eligible, participants had a grade point of 3.0 or lower at the end of the eighth grade, were not diagnosed by the school as having emotional or developmental impairments, and identified as African American, White, or Bi-racial (African American and White). Data were collected from 850 adolescents beginning their ninth grade (Wave 1: 1994) in four public high schools in a Midwestern city. Waves 1 through 4 correspond to the participants' high school years. Waves 5 through 8 correspond to the second, third, fourth, and fifth years post-high school.

Fifty percent of the original sample was female. Adolescents self-reporting as African American constituted 80% percent of the sample in Wave 1 ($N = 679$); 17% were White ($N = 145$); and, three percent were biracial ($N = 26$). The mean age at Wave 1 for participants was 14.55 years ($SD = .66$). For the purposes of this study, we focus our attention on the African American sample that had complete data on Wave 8 ($N = 396$). Attrition analyses, however, suggest that this subsample was similar to our original sample (see Results section).

Procedures

Structured face-to-face interviews were conducted with students in school or in a community setting if the participants could not be found in school. Waves 5 through 8 interviews were mostly conducted in a community setting. On average, each interview lasted 50–60 minutes. After the interview portion of the protocol, participants completed a self-administered paper and pencil questionnaire about alcohol and substance use, sexual behavior and other sensitive information. The study had a 90% response rate by Wave 4 and a 68% response rate by Wave 8. Our Institutional Review Board approved the study design and procedures (UM-IRB#H03-0001309).

Measures

Individual-Level Characteristics

HIV Testing: Participants answered the question “Have you ever been tested for HIV, the AIDS virus?” across the young adulthood years (Waves 5–8). We created a dummy variable where participants received a value of 1 if they reported testing one or more times in any of the young adulthood years and a 0 if they were never tested.

Demographic characteristics: Demographic characteristics were collected from participants at Wave 1. Participants were asked to report their birth month and year and sex.

Socioeconomic Status: Participants reported the occupations of both parents. Occupations were assigned a prestige score using Nakao and Treas’ (1994) classification and rating scheme. The highest occupational group received a score of 64.38 (professional), and the lowest group received a score of 27.84 (private household worker). If scores were available for both parents, the higher prestige score was used for analysis. Parents of youth were mostly blue-collar workers from local factories in the area. The mean prestige score was 39.4 ($SD = 10.19$).

Educational Attainment: We computed highest educational attainment by Wave 8 to determine who dropped out of high school. We created a dummy variable to identify those without a high school degree by combining the “GED or high school diploma”, “associate degree”, “technical degree”, or “some college” categories into 0= Completed High School category ($N = 358$; 90.4%) or 1 = No High School Degree category ($N = 38$; 9.6%).

History of STIs in Adolescence: At each wave, we asked participants “Have you ever had a sexually transmitted disease such as syphilis or gonorrhea?” We created a dichotomous variable where participants received a value of 0 if they answered “no” throughout the adolescent years (waves 1–4), or received a value of 1 if they answered “yes” at least once during the period.

Frequency of Sexual Intercourse: Participants self-reported their frequency of sexual intercourse in the past year at Wave 8 (“How many times have you had sex in the last year?”). Response categories included 0 = None, 1 = 1 or 2 times, 2 = 3 to 5 times, 3 = 6 to 8 times, 4 = 9 to 11 times, and 5 = 12 or more times.

Partner Age Difference: Participants were asked to report the age of their last sexual partner at Wave 8. This number was subtracted from the reported participant age to create the age difference variable. Negative scores indicated the partner was older than the respondent; higher scores indicated the partner was younger than the respondent. Non-sexually active participants were assigned a missing value.

Pregnancy Concerns: Participants indicated where they (or their partner) were concerned about getting pregnant at Wave 8 by answering the question, “How concerned or worried are you about getting pregnant or getting your girlfriend pregnant?” Response categories were offered on a Likert-type scale ranging from 1 (Not at all concerned) to 5 (Very concerned).

Condom Use: Participants self-reported their condom use over the past year at Wave 8 by answering the question, “How often have you used a condom when having sex in the last year?” Participants could respond with one of the following categories: 1 = Almost never, 2 = Not very often, 3 = Half of the time, 4 = Most of the time, and 5 = Always. Non-sexually active participants were assigned a missing value.

Area-Level Characteristics

Economic Disadvantage: In line with previous research investigating neighborhood disadvantage, we created a standardized neighborhood disadvantage score (Cronbach’s $\alpha = .85$) based on an oblique factor analysis of the 2000 census data (Sampson, Raudenbush, & Earls, 1997; Xue, Zimmerman, & Caldwell, 2007). The factor analysis resulted in a single factor solution (Eigenvalue = 3.14; 62.87% of variance), which included: the proportion of poverty (i.e., income < \$15,000), percentage of families on public aid, percent households with a single parent and child(ren) under 18, percent of the civilian workforce unemployed, and percentage of residents 25+ without a high school diploma. We defined neighborhood as a census block group. We present descriptive statistics on these variables in Table 1.

HIV Prevalence: HIV prevalence data were obtained for each zip code in the study from the Michigan Department of Community Health. We then assigned participants their zip code score. Given the non-normal, bimodal distribution of this variable, we created a dummy variable where a value of 0 referred to zip codes with 50 or fewer reported HIV cases (i.e., “Low Prevalence”; 22%) and a value of 1 referred to zip codes with 51 or more reported HIV cases (i.e., “High Prevalence”; 88%). To parallel the economic disadvantage measure, we then aggregated the zip code data by census block.

Data Analytic Strategy

We first examined our sample characteristics using descriptive statistics. Using Wave 1 sociodemographic data, we then conducted attrition analyses across all study measures by comparing participants included in the analyses (i.e., participated in Wave 8) to those cases with missing data (i.e., did not participate in Wave 8). This analysis was useful to test whether excluded and non-excluded participants had comparable means across study variables and whether we could generalize our findings to the entire sample.

In order to carry out our multivariate analyses, we used the HLM2 command in HLM (v. 6; SSI, 2009) to design a multilevel logistic regression model. This approach allowed us to estimate robust estimates by partitioning the outcome’s variance (i.e., odds of testing for HIV during young adulthood) by its individual (Level One) and area (Level Two) components concurrently (Raudenbush & Bryk, 2002). We first added the individual-level predictors into our model (Model 1; Table 3). This model was similar to running a logistic regression in that we were attempting to examine the relationships between youth’s

likelihood of having tested for HIV during young adulthood and their sociodemographic characteristics and HIV risk correlates, respectively.

We then proceeded to add level-2 variables to our model. Adding the area-level predictors into our model allowed us to assess whether these area predictors were associated with the sample's intercept (direct effect), or moderated the associations between youth's likelihood of testing for HIV during young adulthood and their sociodemographic characteristics and sex risk behaviors (moderating effect). Given that past research has suggested a correlation between areas of economic disadvantage and HIV prevalence (Hogben & Leichter, 2008), we were concerned that there would be multicollinearity between these two area-level predictors. Although we found no support for multicollinearity between these predictors ($r = .10$; $p < .05$), we entered these two area predictors in a stepwise fashion in order to examine how the model changed as each area-level predictor was added to the model. We first entered economic disadvantage into the logistic regression (Model 2; Table 3), followed by HIV prevalence (Model 3; Table 3). As we found no support for random effects in the observed relationships, we treated all variables as fixed covariates. We report our findings as fixed-effect models (i.e., population-average model). To maximize statistical power in our analyses, we dropped predictors found to be non-significant from the level-1 and level-2 models.

Results

Sample Description and Attrition Analysis

The final sample of African American young adults ($N=396$) was equally split by sex (males, 49%; females, 51%), and the majority had at least a high school education (High School Degree or higher, 90.4%). Twelve percent reported at least one STI diagnosis (i.e., gonorrhea or syphilis) during adolescence, (87.9% reported no STIs, 9.8% reported 1, 1.5% reported 2, and .8% reported 3). Among these participants, approximately three quarters (76.8%) reported having received an HIV test at least once during their transition to adulthood (23.2% reported never having been tested, 24.0% reported receiving 1 HIV test, 23.0% reported receiving 2, 17.2% reported having received 3, and 12.6% reported having received 4). Overall, participants had an average frequency of intercourse score of 3.59 (i.e. between 6 to 11 times in the past year), an average a pregnancy concern score of 1.92 (i.e., less concerned about pregnancy), and an average condom use score of 3.46 (i.e. indicating condom usage either half or most of the time). On average, females reported having older sexual partners than males (Females: $M = -1.89$, $SD = 4.09$, Males: $M = 0.26$, $SD = 2.81$; $t = 6.14$, $p \leq .001$). For more detailed descriptive statistics broken down by sex, refer to Table 2.

We then compared our analytic sample (i.e., completed Wave 8; $N=396$) to those who were missing (i.e., did not complete Wave 8; $N=122$). Neighborhood HIV prevalence rates for the attrition group (those who were not included in the study) were lower ($M=25.13$, $SD=10.42$) than the rates for those in the study sample ($M=54.62$, $SD=27.39$; $t = 17.30$, $p \leq .001$). Those participants lost through attrition did not differ from the final sample in their HIV testing behaviors, sex, education level, socioeconomic status, or neighborhood disadvantage. Furthermore, the two groups did not report significant differences in their sexual behaviors (i.e., STI diagnoses during adolescence, sexual frequency, condom use, pregnancy concerns, or age difference between participant and last sexual partner).

Predictors of HIV Testing

Model 1- Individual Characteristics—We found the sociodemographic predictors were associated with HIV testing. Females were more likely than males to have received an HIV test during the emerging adulthood years ($OR=1.61$, 95% $CI=[1.31, 1.97]$, $p \leq .001$).

Participants with lower SES (OR=1.01, 95% CI=[1.00, 1.02], $p \leq .01$) and who did not complete high school (OR=2.53, 95% CI=[1.46, 3.32], $p \leq .001$) were more likely to have tested than youth with higher SES or a high school degree, respectively. Additionally, having had one or more diagnosed STIs during the adolescent years increased the odds of receiving an HIV test during young adulthood (OR=1.61, 95% CI=[1.21, 2.15], $p \leq .01$). We found no association between youth's sex attitudes and behaviors (i.e., frequency of intercourse, age of partner, condom use, pregnancy concerns) and their likelihood of HIV testing during young adulthood (data not shown).

Model 2- Individual Characteristics and Neighborhood Disadvantage—In the multilevel logistic regression, we found females continued to test more than males (OR=1.78, 95% CI=[1.44, 2.19], $p \leq .001$), with likelihood of testing increasing if females lived in more disadvantaged neighborhoods (OR=1.67, 95% CI=[1.29, 2.15], $p \leq .001$). Once economic disadvantage was included in the model, individual SES became non-significant (see Table 3); however, we found neighborhood disadvantage was associated with HIV testing (OR=1.02, 95% CI=[1.01, 1.04], $p \leq .01$). In other words, youth living in more disadvantaged areas were more likely to test during young adulthood regardless of their socioeconomic background.

Participants without a high school degree tested more often than those with a high school degree (OR=2.32, 95% CI=[1.49, 3.62], $p \leq .001$); however, if youth had not completed high school and lived in areas with greater disadvantage, the likelihood for having tested HIV decreased (OR=0.33, 95% CI=[0.18, 0.60], $p \leq .001$). Participants who reported one or more STIs during adolescence were more likely to have tested for HIV than those who never reported an STI diagnosis (OR=1.87, 95% CI=[1.37, 2.55], $p \leq .001$). If these youth lived in areas of greater disadvantage, however, their likelihood of testing for HIV during young adulthood decreased (OR=0.59, 95% CI=[0.42, 0.83], $p \leq .01$). We found no economic disadvantage effect on the associations between youth's sex risk behaviors and their likelihood of HIV testing during young adulthood (data not shown).

Model 3- Individual Characteristics, Neighborhood Disadvantage, and HIV Prevalence—As a final step, we examined whether the HIV prevalence in an area was associated to youth testing behavior. Consistent with Model 2, female youth were more likely to have tested (OR=4.44, 95% CI=[2.80, 7.04], $p \leq .001$), particularly if they lived in areas of greater disadvantage (OR=1.86, 95% CI=[1.43, 2.43], $p \leq .001$). After adjusting for economic disadvantage, however, we found females who resided in higher HIV prevalent areas were less likely to have tested during young adulthood (OR=0.32, 95% CI=[0.19, 0.53], $p \leq .001$). While youth from higher SES backgrounds were less likely to have had a HIV test (OR=0.97, 95% CI=[0.95, 0.99], $p \leq .01$); we found HIV testing increased if these participants lived in areas of greater disadvantage (OR= 1.02, 95% CI=[1.00, 1.03], $p \leq .05$) and HIV prevalence (OR=1.03, 95% CI=[1.01, 1.06], $p \leq .01$).

On average, youth who did not complete high school were more likely to report receiving an HIV test (OR=6.91, 95% CI=[2.66, 17.96], $p \leq .001$); however, their likelihood of testing decreased if they lived in areas of greater economic disadvantage (OR=0.34, 95% CI=[0.18, 0.64], $p \leq .001$) and HIV prevalence (OR=0.26, 95% CI=[0.09, 0.73], $p \leq .05$). HIV prevalence was not associated with respondents' likelihood to have tested for HIV during young adulthood, after accounting for all other covariates in the model. We found no effects for area HIV prevalence on the associations between youth's sex risk behaviors and their likelihood of HIV testing during young adulthood (data not shown).

Discussion

Racial and ethnic minorities continue to have a heightened risk of HIV infection, particularly during the adolescent and young adulthood years (CDC, 2007a; Lane et al., 2004). These disparities have been attributed to differences in access to medical care across socioeconomic groups, as well as to variations in community perceptions of their risk of HIV infection (Taylor et al., 2007). Few researchers, however, have examined the interplay between individuals' sociodemographic characteristics and their social environments. In this study, we examined whether testing behavior was associated with individual and area-level characteristics in a sample of African American young adults. We found that those that were female, without a high school degree, from a lower SES background, and with a history of STIs were more likely to have tested during their young adulthood years; however, the strength of these associations changed when accounting for neighborhood disadvantage and community HIV prevalence.

Our finding that females were more likely to test than their male counterparts is consistent with our hypothesis for individual correlates. This may be due to sex differences in medical care utilization. Specifically, researchers repeatedly find that women are more likely than men to access medical services due to continuing reproductive care through their child-bearing years as well as their lower perceived health status (Arrington-Sanders & Ellen, 2008; Bertakis, Azari, Helms, Callahan, & Robbins, 2000). Increased contact with medical providers may provide women with more opportunity to be asked about and offered an HIV test. Contrary to what has been found in other studies, however, we found that youth who reported a lower socioeconomic position (i.e., low SES or not completing high school) or who had a history of STIs across adolescence were more likely to test for HIV in young adulthood. These findings support the premise that youth who are commonly identified as at-risk may be aware of their heightened risk of becoming infected (i.e., have greater perceived risk), and take steps to mitigate that risk (i.e. using condoms or getting an HIV test) (DiClemente et al., 1996). Furthermore, these findings demonstrate that focused health education and community HIV prevention programs for higher risk youth, including greater emphasis on HIV testing, may be achieving success.

Prior to HIV testing being incorporated into routine medical care, HIV testing interventions were based on a risk-based algorithm where an individual's risk (i.e. intravenous drug use, sex behaviors) was estimated and tests offered according to the approximated risk of the patient (Branson et al., 2006). We found some support for this algorithm's successful use as youth with a history of STI in our study were more likely to test for HIV; however, the absence of an association between sex risk behaviors and the likelihood of HIV testing suggests that this individualized at-risk algorithm may not fully account for or inform youth's decisions to get tested. Rather, our findings suggest that youth's testing behaviors may also be informed by their social contexts. This finding is consistent with past research suggesting that individuals living in predominantly racial or ethnic minority communities or HIV prevalent areas may have a greater perceived risk and seek strategies to offset their risks (i.e., get tested) (Taylor et al., 2006).

Building on research on the neighborhood effects on HIV testing (Taylor et al., 2006), we examined whether the association between youth's demographic characteristics and their likelihood to test for HIV varied across social contexts. Contrary to our second hypothesis, we found that females reported increased HIV testing in areas of greater economic disadvantage, but decreasing levels of HIV testing in areas of greater HIV prevalence. The high rate of testing in disadvantaged areas may be attributable to public health campaigns designed for low income communities, especially those composed of racial or ethnic minorities who are disproportionately affected by HIV. When a demographic group has been

identified as high risk for HIV (as would be the case for young, African American women in low-income communities), neighborhoods and places of business with higher densities of those deemed high risk often become the epicenter of education and public health campaigns (Taylor et al. 2006). This strategy may in turn increase the perceived risk among residents in these communities and boost HIV testing rates (Taylor et al, 2006).

Wingood and DiClemente's (2002) Theory of Gender and Power may be useful in understanding the reduced testing behavior among women living in high HIV prevalent zip codes. They postulate that the increased risk of HIV infection for females is due to an imbalance of social and economic power between women and men. The societal role played by men is afforded an elevated value, and so women may come to rely on male partners for financial security and social mobility. These dynamics may therefore inhibit a woman's ability to negotiate sexual safety (i.e., require partners to wear condoms, request a monogamous relationship), thus heightening her vulnerability to HIV. In geographical areas with higher rates of HIV (i.e., the high prevalence zones in this study), gender power inequalities may be particularly heightened specifically due to stigma and social discrimination experienced by women perceived or diagnosed as HIV-positive (Bunting, 1996). In these geographic areas, women may readily witness enacted stigma, and fearful of experiencing similar consequences, opt against an HIV test. Future research that specifically focuses on women's attitudes of stigmatization and relationships with their male partners would be useful in elucidating this phenomenon.

With the exception of participant sex, we found support for our secondary hypothesis that neighborhood disadvantage would further reduce testing behavior beyond individual level factors. Informed by Social Disorganization Theory (Kawachi & Berkman, 2003), we expected neighborhood disadvantage to create a context detrimental to the individual's health and thus decrease HIV testing rates. Consistent with this expectation, the positive association between our markers of risk (i.e., low SES, no high school diploma, history of STIs) was tempered in the presence of neighborhood disadvantage, and in the case of having a low SES or being without a high school degree, was further reduced by residence in a community with a high prevalence of HIV. These results suggest that while HIV testing campaigns may have initial success in identifying and educating at risk populations, they fall short of offering solutions to physical barriers to access that may be found in high risk community context. Research reveals that access to preventive care is compromised by residence within low-income neighborhood settings (Prentice, 2006)—a structural barrier that may not adequately be acknowledged or negotiated by current pushes to increase HIV testing rates in economically disadvantaged areas.

Strengths and Limitations

Several limitations of the current study should be noted. First, we did not have data on access to health care services within our sample's neighborhoods. Although this would allow us to eliminate access as an alternative explanation of our results, other researchers have found that the availability of health care services is not related to HIV testing behaviors (Taylor et al., 2006). Furthermore, access to care may be accounted for within our neighborhood disadvantage variable in that more disadvantaged areas have less access to medical resources than advantaged areas (Kirby & Kaneda, 2005). Second, half of our sample had been tested for HIV once by wave 5. Given this fact, we created a composite score to account for the likelihood of testing in any young adulthood year. Thus, this composite score was not sensitive to specific social contexts of the testing decision. We could not, for example, determine if testing resulted from concern of having engaged in a specific risky encounter (e.g., having had sex without a condom). Controlling for HIV testing reasons would strengthen our conclusions by eliminating this as an explanation; however, we did control for some individual level factors which might be associated with

HIV testing (i.e., frequency of intercourse, age of partner, condom use, pregnancy concerns), and they did not eliminate the neighborhood effects in predicting testing behavior. Nevertheless, future research that examines time to testing (e.g., survival analysis methods) would help reduce the effects of specific social factors.

In addition, our sample may not be generalizable to all African-American youth as each community may have a unique social and economic composition and history of HIV. Other social processes may operate within neighborhoods in different regions of the country. The neighborhood context in our study, for example, was not located in an epicenter of HIV. It is possible that there is a tipping point for which neighborhood prevalence of HIV becomes more influential for testing behavior as more cases become known in the community. Although we measured HIV prevalence based on the total number of HIV cases in the area, we may have decreased the precision of our associations by not accounting for the population density within each area; thus, adjusting for the population size in large urban areas may be warranted when measuring HIV prevalence. Furthermore, the size of a neighborhood may also influence sexual networks within the community and may increase perceived risk and communication of a positive HIV-test and overall testing behavior. Furthermore, research examining how economic disadvantage and HIV prevalence relate to these social processes would be useful to clarify our findings and refine existing HIV education initiatives. Finally, as Wave 8 of the current study ended in 2002, our study may not reflect the most recent cultural climate around HIV testing in the United States. We recommend continuing this line of research into the future in order to understand the ways in which neighborhood conditions may shape HIV prevention behaviors today.

Despite these challenges, our study possesses several notable strengths. First, our study follows a sample of urban, African-American youth who were at risk of dropping out of high school at wave 1. Consequently, our analyses focus on a group at heightened risk of HIV infection. Second, our study is one of the first to examine the effects of neighborhood disadvantage and HIV prevalence concurrently on HIV testing behaviors. Although both economic disadvantage and high HIV prevalence often occur simultaneously, as we found, they may affect HIV testing behaviors independently. This recognition is a critical contribution to the understanding of how social context may affect HIV prevention efforts. Our study suggests that future research that examines how neighborhood contextual factors may influence testing behaviors will provide beneficial insights for HIV prevention by focusing limited resources.

Prevention Implications

Taken together, our results highlight the role that community characteristics play in shaping HIV testing behaviors. Our findings suggest that the effects of neighborhood disadvantage and HIV prevalence vary across individual contexts, as we saw with the differing influences of these factors on testing rates by sex, SES, and educational status. While our findings support the value of conducting area-wide neighborhood initiatives (e.g., the Bronx project) that seek to overcome community barriers to accessing health care, they suggest that these efforts could be strengthened by further tailoring health education messages. Most importantly, these results highlight the critical role that an ecological analysis can play in determining how resources may be used to obtain the greatest benefit for HIV prevention. When designing community interventions around HIV prevention and testing, a focus on individual risk factors alone may not be adequate. Efforts to increase testing may also need to consider neighborhood context in order to use resources most wisely.

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Table 1

Mean and standard deviation scores of neighborhood disadvantage variables by block group and sample participants.

	Block Mean (SD)	Participant Mean (SD)
Proportion of households on public assistance	.12 (.08)	.15 (.08)
Proportion of adults 25+ without a high school degree	.27 (.12)	.28 (.11)
Proportion of households headed by single parent with children <18	.22 (.14)	.28 (.11)
Proportion of households living under the poverty level (<\$15,000)	.29 (.15)	.31 (.14)
Proportion of civilian workforce unemployed	.14 (.10)	.17 (.08)

Table 2

Descriptive Statistics for Study Variables by Sex

	Females (N=202)	Males (N=194)	Total (N=396)	X ² /t
HIV Testing				4.52*
Yes	164 (81.2%)	140 (72.2%)	304 (76.8%)	
No	38 (18.8%)	54 (27.8%)	92 (23.2%)	
High School Dropout				1.33
Yes	16 (7.9%)	22 (11.3%)	38 (9.6%)	
No	186 (92.1%)	172 (88.7%)	358 (90.4%)	
History of STIs				1.17
Yes	28 (13.9%)	20 (10.3%)	48 (12.1%)	
No	174 (86.1%)	174 (89.7%)	348 (87.9%)	
HIV Prevalence				0.02
High	157 (77.7%)	152 (78.4%)	309 (78.0%)	
Low	45 (22.3%)	42 (21.6%)	87 (22.0%)	
Neighborhood Disadvantage	0.33 (0.80)	0.21(0.81)	0.27(0.81)	-1.46
Socioeconomic Status	37.83 (8.77)	41.01(11.27)	39.40(10.19)	3.18**
Frequency of Intercourse	3.57 (1.88)	3.63 (1.94)	3.59 (1.90)	0.28
Partner Age Difference	-1.89 (4.09)	0.26 (2.81)	-0.84 (3.68)	6.14***
Pregnancy Concerns	1.92 (0.27)	1.91 (0.29)	1.92 (0.28)	-0.44
Condom Use	3.27 (1.68)	3.66 (1.56)	3.46 (1.63)	1.93

* $p \leq .05$;** $p \leq .01$;*** $p \leq .001$

Table 3

Multilevel regression model examining the role of individual-level and area-level characteristics on HIV testing behavior across young adulthood (n = 396).

	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Mean Testing Score at Wave 8, b_0	2.53***	(2.20, 2.91)	2.63***	(2.29, 3.04)	1.20	(0.89, 1.60)
Disadvantage, b_{01}			1.11	(0.94, 1.32)	0.99	(0.84, 1.18)
HIV Prevalence, b_{02}					2.70***	(1.94, 3.79)
Sex ^a , b_1	1.61***	(1.31, 1.97)	1.78***	(1.44, 2.19)	4.44***	(2.80, 7.04)
Disadvantage, b_{11}			1.67***	(1.29, 2.15)	1.86***	(1.43, 2.43)
HIV Prevalence, b_{12}					0.32***	(0.19, 0.53)
Socioeconomic Status, b_2	.99**	(0.98, 1.00)	1.00	(0.99, 1.01)	0.97**	(0.95, 0.99)
Disadvantage, b_{21}			1.02**	(1.01, 1.04)	1.02*	(1.00, 1.03)
HIV Prevalence, b_{22}					1.03**	(1.01, 1.06)
No HS Degree ^b , b_3	2.20***	(1.46, 3.32)	2.32***	(1.49, 3.62)	6.91	(2.66, 17.96)
Disadvantage, b_{31}			0.33***	(0.18, 0.60)	0.34***	(0.18, 0.64)
HIV Prevalence, b_{32}					0.26*	(0.09, 0.73)
History of STIs, b_4	1.61***	(1.21, 2.15)	1.87***	(1.37, 2.55)	1.44	(0.75, 2.80)
Disadvantage, b_{41}			0.59**	(0.42, 0.83)	0.59**	(0.42, 0.84)
HIV Prevalence, b_{42}					1.30	(0.62, 2.72)

* $p \leq .05$;

** $p \leq .01$;

*** $p \leq .001$

^a Males serve as the referent group.

^b Participants who completed high school serve as the referent group.

Note: Sexual risk correlates (i.e. partner age differences, frequency of intercourse, pregnancy concerns and condom use) were non-significant in exploratory models and omitted from our final analysis.