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Structural effects on HIV risk among youth: A multi-level analysis

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Abstract

We proposed a multilevel model of structural influences on HIV-risky sexual partnerships in a diverse sample of 1,793 youth residing in 23 states and the District of Columbia. We examined the influence of concentrated disadvantage, HIV stigma, and sexual and gender minority stigma on engagement in HIV risky sexual partnerships and whether youth's participation in opportunity structures, anticipation of HIV stigma, and perceptions of their community as youth-supportive settings mediated structural effects. After controlling for age, HIV status, and race, we found structural HIV stigma had deleterious indirect effects on youth's participation in HIV-risky sexual partnerships. Concentrated disadvantage and structural sexual and gender minority stigma had direct negative effects on youth's perceptions of their communities as supportive and on their participation in prosocial activity. Support perceptions had direct, protective effects on avoidance of HIV-risky sexual partnerships. Structural stigma undermines youth's belief that their communities invest in their safety and well-being.

Keywords

Structural stigma; concentrated disadvantage; HIV risk behavior; high-risk youth

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Compliance with Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest

The authors declare that they have no conflicts of interest.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

INTRODUCTION

HIV remains a major health threat to urban adolescents and emerging adults (hereinafter referred to as youth). In 2015, youth between the ages of 13 and 24 accounted for greater than 20% of all new HIV diagnoses nationwide [1]. Approximately 80% of these diagnoses occurred among youth between 20 and 24 years of age [1]. Racial and ethnic disparities in rates of HIV infection among youth are substantial [2]. Overall, the rate of infection in Black youth is roughly 20 times the rate for White youth and five times the rate for Latino youth [3]. In 2015, Black males comprised 55% of new HIV infections among all male youth. The rate of new HIV-infections among Black female youth is estimated at nearly four times the rates for White and Hispanic female youth [4]. Stark disparities also exist in new infections between gay/bisexual and heterosexual youth; gay and bisexual youth account for 81% of new infections among young males. Among all Black gay and bisexual men, men aged 24 and younger comprised 38% of diagnoses in 2015. Youth have the highest rate of undiagnosed HIV infection nationally and the lowest rates of engagement in care among all age groups [5,6].

Structural Risk Factors for HIV Exposure

Concentrated disadvantage—As HIV-related research has matured, the number of studies documenting that community features influence HIV-related outcomes and drive disparities in disease prevalence has rapidly grown [7]. A substantial body of evidence now links variations in the structural qualities of communities to levels of adult HIV prevalence and to engagement in behaviors that pose high-risk for viral transmission [8–11]. The research in this area has consistently demonstrated that communities characterized by concentrated poverty and the noxious conditions that commonly co-occur with poverty (e.g., substandard housing stock, high rates of community violence, pervasive unemployment) suffer an excess burden of HIV disease [7,8,12]. The effects of community economic disadvantage on HIV disease acquisition have been documented for diverse at-risk populations including injection drug users [7,13,14,], gay and bisexual men [15], and African American heterosexuals [8, 16].

Despite a burgeoning of structurally- and community-focused HIV-related research, studies of the role of the structural community context in promoting HIV exposure focus principally on high-risk adults. With notable recent exceptions [17–21], youth remain understudied. Yet, compared with adults, youth are typically less geographically mobile [22,23]. Youth spend the bulk of their day in or near their home neighborhood and in the company of co-resident peers, making them uniquely vulnerable to social and behavioral influences conveyed by the structural community context. As citizens who are heavily dependent on their community, youth may be among the most affected by the resources available in their immediate surrounds [24]. Research from the related areas of adolescent reproductive health and adolescent pregnancy supports that concentrated community disadvantage predicts early parenting, early sexual debut and unprotected intercourse among urban youth [25–27]. Yet, some research has found protective effects for community disadvantage on youth HIV-related behaviors, including high rates of condom use [28] and HIV testing [29], perhaps

reflecting youth's awareness of the greater threat of HIV to their health by living in disadvantaged settings.

Structural stigma—A parallel literature examines the effects of structural stigma as a place-based contextual factor promoting disease. Scholars widely accept that stigma operating at the structural level affects access to and use of institutional and social resources at lower levels of analysis, such as neighborhoods [30–33]. According to Hatzenbuehler and Link [34] structural stigma refers to the “conditions, cultural norms, and institutional policies that constrain opportunities, resources, and well-being of the stigmatized” (pp. 2). Structural stigma constrains the opportunities that are available to people who possess stigmatized characteristics to achieve optimum health by allowing overt and legalized discrimination against them, providing the normative basis for their ill treatment, and by fostering their social isolation [33]. Structural stigmas manifest in where people live, how they may be treated when they engage with local institutions, and how they perceive health establishments, providers, diseases, and themselves [35,36]. Hatzenbuehler and colleagues suggest that, like economic disadvantage, structural stigma affects health outcomes by how it shapes individuals' social and material experiences through the regulation and distribution of resources and opportunities [33].

Powerful evidence for the effects of structural stigma comes from recent examinations of sexual minority structural stigma. For instance, Hatzenbuehler and colleagues [37] observed that sexual minority structural stigma predicted all-cause premature mortality among a sample of sexual minority adults, after accounting for multiple individual-level and confounding neighborhood-level factors. On average, sexual minorities living in communities scoring high on a measure of structural stigma experienced a 12-year shortened life expectancy. In testing the effects of structural stigma on mortality, stigma's effects on sexual minorities far exceeded its effects on heterosexuals residing in the same communities. In addition, deaths associated with stress (e.g., suicide, homicide, cardiac failure) occurred at significantly higher rates among sexual minorities living in high-stigma communities compared with those residing in low-stigma communities and to heterosexuals living in either type of community. Additional studies link structural stigma of sexual minorities to individual engagement in unprotected anal intercourse and discomfort interacting with primary care providers around discussions of sex [38]. Factors such as the proportion of Republicans in a state – a proxy for structural stigmatization of sexual and gender minority populations – is associated with reports of being refused health care among transgendered persons [39]. By contrast, affirmative same-sex marriage policies are associated with significant declines in suicide attempts among sexual minority youth [40], suggesting structural enfranchisement may promote sexual minority youth's health. Other forms of structural stigma also produce negative HIV-related health outcomes. Studies link neighborhood poverty to experiences of gay-related discrimination [41] and to HIV vulnerability among Black gay men [42], suggesting the possibility that neighborhood disadvantage coupled with multiple structural stigmas may have compounding ill-effects on health. The combined effect of race and sexual orientation stigma has also been linked to the development of syndemic risk among Black gay and bisexual men [42,43].

For youth, these types of structural stigma have seldom been explored. Most is currently known about the damaging effects of structural HIV stigma on youth populations. However, much of the youth-focused research on HIV stigma occurs outside the United States and primarily among HIV-infected youth who are in HIV treatment. Domestically, research on the influence of HIV stigma on youth principally examines the extent to which they hold prejudicial views of people with HIV and the association of felt or anticipated HIV stigma with outcomes such as HIV knowledge and HIV testing behavior [44,45].

Pathways mediating the influence of concentrated disadvantage and structural stigma on HIV risk—Building on prior theory and empirical evidence,

Bernard and colleagues propose that the mechanism by which communities produce good health is via the opportunity structures they provide to residents [24]. Place-based opportunity structures for health include diverse health-promoting institutions and settings (e.g., clinics, gyms, health centers), as well as prosocial resources (e.g., schools, churches). Community resources such as these confer health by offering residents health-promoting opportunities and by addressing health-related problems. In Bernard's and colleagues' conception, poverty effects opportunity structures by constraining the community's ability to provide the conditions that might assist its residents to thrive. Bernard et al. claim that informal social reciprocity norms regulate access to and participation in a neighborhood's social resources [24]. Reciprocity norms reflect trust in the ideas that residents will look after one another and that a good deed done for the well-being of another might someday be returned.

Hatzenbuehler and colleagues propose a similar mechanism mediates the impact of structural stigma on health outcomes, arguing that stigma isolates people from the supports necessary to participate in opportunity structures. Poverty and structural stigma interrupt these informal social processes of reciprocity and support by limiting the ability of groups who are vulnerable to HIV infection from equal participation in caring interactions [33]. For instance, HIV-related stigmas operating at the structural level are known to interfere with individuals' willingness and ability to access critical HIV-related health resources by leading people to anticipate rejection and poor treatment. Anticipated stigma at the individual level has been cited as a primary impediment to accessing medical care, including HIV testing and treatment [30,35]. These parallel conceptions of context suggest that structural stigmas influence who is well looked after within a community, whereas poverty influences whether community residents are well-looked after generally.

Given the odds that HIV-related risk behaviors are multiply determined, research to elucidate pathways from multiple features of a community's structural context to HIV-risk behaviors among diverse youth is critical. The alarming disparities in infection among youth highlights the need to bring an intersectional perspective [36,46] to examinations of the roots causes of HIV risk among U. S. youth. Cross-level investigations of interacting relationships among societal structures that maintain oppression, such as community disadvantage and forms of structural stigma, may clarify how contextual characteristics shape individual youth's experiences and behaviors, and influence youth's HIV-related outcomes. Identifying the collective and unique effects of community disadvantage and structural stigmas on youths'

risk of HIV exposure might inform the development of novel, promising structural interventions.

Current Study

Informed by Bernard et al.'s conceptual work on community opportunity structures and Hatzenbuehler et al.'s conceptual work on structural stigma, we propose a model of community influences on engagement in HIV-risky sexual partnerships in a diverse sample of 1,793 youth residing in 23 states and the District of Columbia. We examine concentrated community disadvantage and two forms of structural stigma (e.g., HIV, sexual and gender minority) on youth. The primary purposes of our research are to confirm prior associations between community disadvantage and HIV risk and between different forms of structural stigma and HIV risk, and to explore the pathways by which these distinct types of structural stigma uniquely impact on youth's participation in community opportunity structures and on their HIV risk behavior. We hypothesize that participation in and use of community resources predicts youth's avoidance of HIV-risky sexual relationship (see Figure 1). In addition, we propose that youth's perception of their community as one in which youths like themselves are the beneficiaries of community-level social support and their anticipation of HIV stigma will mediate the influence of structural stigma and concentrated neighborhood disadvantage on youth's participation in and use of opportunity structures. We examine the direct and indirect influence of structural stigma related to sexual/gender minority status and to HIV status on youth's participation in community opportunity structures and engagement in high-risk sexual partnerships. We also examine the direct and indirect influence of concentrated disadvantage on these same outcomes.

METHODS

Our research was part of a multi-site study on structural change and HIV risk among high-risk urban youth. Data for the current study are from 2012–2013. Data were collected in 14 U. S. cities. In each city, we recruited a convenience sample of youth to participate in the study from community venues (e.g., parks, malls, clubs) [47]. We selected venues based on their popularity among youth and their location in community areas in each city with high background prevalence of HIV and other sexually transmitted infections among youth. Recruiters approached youth in the venues to obtain verbal consent to be screened for eligibility. If a youth indicated they were between the ages of 12 and 24 and sexually active, verbal consent was obtained for completion of an anonymous automated computer assisted interview (ACASI). Youth were not required to live in the neighborhood, city, or state where they were encountered for recruitment. This made it possible to recruit youth from neighboring communities and nearby states. Eligible youth completed the ACASI in or near the recruitment venue on a laptop computer, after verbally providing their informed consent. Recruitment staff remained nearby in case youth required assistance to complete the ACASI. Youth completed the ACASI in English or Spanish. The ACASI took approximately 60 minutes to complete, on average. A waiver of parental consent was obtained from each sites' human research protections office at all but one study site. To maintain youth's anonymity, this site excluded youth under age 18 from participating in the ACASI. Youth received

between \$20 and \$50 in cash or gift cards, depending on the recruiting site, to thank them for their participation.

Measures

Demographics—Participants were asked to provide their age, race (categorized as Black versus other race for analyses), sexual minority identity (coded as gay/bisexual/lesbian vs. straight-identified for analyses), sex at birth, current gender identity, and ZIP code of residence, from which we ascertained their state of residence. Youth also indicated if they were of Hispanic origin (yes/no). Youth reported their highest level of educational attainment, whether they were currently in school, and lifetime experiences of homelessness. For the purposes of these analyses, we also created a measure to indicate youth identified as sexual minority or transgender (coded as 1) or as cis-gender and heterosexual (coded as 0), given that legal protections of sexual minorities may also reference and pertain to transgender persons.

HIV status—Among those who had ever taken an HIV test, youth self-reported their HIV status. HIV status was coded as HIV positive (1) and HIV negative or unknown (0).

Concentrated community disadvantage—Community disadvantage is a composite measure consisting of widely used indicators in research on neighborhood poverty and place-based disparities in wealth [15,23,25,28,29,41,48]. Data for each indicator were drawn from the American Community Survey 2013 estimates [49]. Data were for the 544 ZIP code tabulation areas in which youth in the sample reside. The variable comprises six indicators. We used measures of the percentage of households in each ZIP code at or below the poverty level, the percentage of single-parent female-headed households, the percentage of adult residents without a high school diploma or equivalency, the percentage of residents over age 16 who are unemployed, the percentage of vacant homes, and the percentage of households that are not affluent (annual income less than \$75,000). We factor analyzed these indicators using Mplus version 8. Consistent with prior research, we obtained a one-factor solution. The factor had a composite reliability of .89, 95% CI [.88, .91]. We created factor-weighted scores for each ZIP code and took an average of all ZIP code scores for each state. Higher scores suggest greater disadvantage.

Structural sexual and gender minority stigma—Following the work of Oldenburg and colleagues [38], structural stigma of sexual and gender minorities is a composite measure made by counting the absence of state laws in six categories pertinent to the protection of people on the basis of their sexual orientation and/or identification as transgender: (1) hate crime legislation; (2) adoption; (3) employment discrimination; (4) marriage discrimination; (5) prohibitions on including normalizing discussions of same-sex attractions and behaviors in youth sexuality education; and (6) requirements that sexuality education promote heterosexual marriage. Information on state laws was obtained from the Sexuality and Information Council of the United States [50] and the International Lesbian and Gay Association Survey of World Laws [51]. Only laws in force prior to 2014 were coded to correspond with the time period when our data were collected. Scores may range from 0 to 6. A score of 6 represents an absence of legal protection of sexual and gender

minorities in all areas. Guttman reproducibility is .96 and the composite reliability of the measure is .84, 95% CI [.65, .93]. A rank ordering of the states included in the sample from least to most protective affirms the measure as face valid: Alabama, Mississippi, and North Carolina are ranked on this measure as least protective of the rights and interests of their sexual and gender minority residents and California, Connecticut, Illinois, Massachusetts, New Jersey, and the District of Columbia as most protective. State laws enacted since the time these data were collected do not substantially alter states' rank order on this measure.

Structural HIV stigma—Following Hatzenbuehler and colleagues [37], we derived a measure of the average perceived community-level stigma of HIV. In the youth ACASI, four items assessed youth's perception of the extent to which their community stigmatizes people with HIV. Sample items are "In my community, people with HIV/AIDS are treated like outcasts" and "In my community, most people with HIV/AIDS are rejected when others find out." In a principal axis factor analysis, these items form a single factor, accounting for 80% of the variance. We created an individual score for each youth. We computed the average of youth's score for each ZIP code and the individual mean score for each state. The composite reliability of the measure is .96, 95% CI [.95, .96].

Community support of youth—Community support was assessed by youth's perceptions of their community as a youth-supportive place. In the ACASI, youth rated each of four items on a Likert-type scale ranging from 0 (very unsatisfied) to 4 (very satisfied). Sample items included "How satisfied are you that people in your community are looking for new ways to support youth like you?" and "How satisfied are you that there are lots of opportunities for you to have good interactions with people of all ages in your community?" We summed their responses to each item. Composite reliability for the measure is .83, 95% CI [.81, .85].

Anticipated HIV stigma—Participants completed an adapted version of the anticipated HIV stigma scale. Previous adaptations of the scale have been used to measure anticipated STD and HIV stigma in adolescent populations [52–54]. The nine-item scale measures the extent to which youth anticipate they might face negative consequences if they were to contract HIV. Sample items include "If you had HIV, people would think you are unclean" and "If you had HIV, people who think you have been hanging around with the wrong crowd"). Youth rated items on a Likert-type scale (1=Strongly Agree to 5=Strongly Disagree). A principal component factor analysis was conducted to examine the underlying factor structure of the nine items (Kaiser-Meyer-Olkin = 0.94). The items form a single factor, accounting for 69.1% of the total variance across the nine items. Items were reverse coded and summed to form an overall anticipated HIV stigma score, with higher values indicating greater anticipated HIV stigma. Composite reliability for the scale is .97, 95% CI [.97, .98].

Neighborhood opportunity structures—We created two measures to operationalize neighborhood opportunity structures. Following the work of Ramirez-Valles and colleagues [55], participation in prosocial activities – activities with a clear positive valence - is a count of whether youth reported engaging in each of ten community activities in the prior year.

These included faith-based activities, school extracurricular activities, community after-school programs, academic support services, job training and placement activities, and youth-focused community programs. Scores on this measure could range from 0 to 10. Our second measure counted use of youth-focused health and wellness resources. These included community health and mental health services, school-based and church-based health services, drug treatment serves, housing services, domestic violence services, STI treatment services, and case management services. We counted the number of types of services that youth reported using in the prior year. Scores on this measure could range from 0 to 11.

HIV-risky sexual relationships—We constructed an index a youth's lifetime engagement in HIV-risky sexual partnerships from the following indicators: ever having sex with someone known to inject drugs, ever having exchanged sex, ever having sex with someone known to have HIV, ever having sex with someone suspected of having HIV, and ever having acquired a sexually transmitted infection. Scores could range from 0 to 5, with 0 indicating no lifetime risk and 5 indicating high lifetime risk.

Analyses

Before testing the hypothesized model, we examined the factor structures by conducting confirmatory factor analyses using Bayesian statistics with Mplus Version 8 [56] (see Table 1). The Bayesian framework is useful for Heywood cases in which the indicator error covariances have not been fixed exactly to zero [57]. In addition, because Bayesian analysis does not require the assumption of normally distributed estimates [57], it is useful for binary and ordinal data. We evaluated the posterior predictive p values, trace plots, and autocorrelation plots for each CFA model. We then calculated the composite reliability of variables [58]. Structural fit is considered strong if posterior predictive p values are close to .5; a value greater than .05 indicates good fit [59,60]. As shown in Table 2, our posterior predictive values are greater than .05, ranging from .078 to .529, indicating our model shows excellent posterior predictive quality [59,60]. Composite reliability scores with 95% confidence intervals were computed in R [61]. All other descriptive analysis and investigation of missing data patterns used STATA, Version 13 or SPSS, Version 24.

Prior to performing analyses, we examined variables for the extent of missing data and to assess the likelihood missing data would introduce bias into model estimates [62–64]. None of our indicators exceeded the standard threshold of 5% missing; missingness ranged from 0% to .06%. Logistic regressions predicting missingness on these indicators found no significant relationships, suggesting missingness in these data occurs completely at random.

We assessed the hypothesized model through structural equation modeling (SEM) in Mplus version 8 [56]. SEM has the advantage of providing precise standard errors to better approximate true population estimates. It accounts for measurement error and reliably detects mediational effects [65]. Our community unit of analysis was the 544 ZIP code tabulation areas in which youth reported they reside. The state unit of analysis was the 23 states and District of Columbia to which these ZIP codes correspond. Between 1 and 102 youth resided in each ZIP code. Between 1 and 266 youth resided in each state. Intra-class correlations (ICCs) for the variables at the ZIP code level were small (range = .0017 to

0.296), with the exception of anticipated HIV stigma. Those at the state level were also small and ranged from 0.006 to 0.098. These small ICCs indicate no need for multilevel modeling [57]. Therefore, instead of a three-level model, we used a complex model to address clustering (e.g., non-independence of observations) at the highest cluster level (e.g., state) [56,66], allowing us to limit the number of cluster variables. To improve the precision of estimates and further address non-normally distributed indicators, we used bootstrapping (10,000 replications) with replicate weights and grand-centered mediators [67]. Scaled factor-weighted scores were used to fit the model [66]. We fit the model as a negative binomial model because we included a mixture of count, categorical, ordinal, and continuous measures and to address overdispersion in our behavioral outcome variable [68]. Full information maximum likelihood estimates were used to handle missing data. We treated age, race, and HIV status as covariates. Gender identity is not included in the model, as it is collinear with sexual orientation; most males recruited were sexual minorities and most females recruited were high-risk heterosexuals. Given one of our structural measures concerns sexual and gender minorities, we include sexual/gender minority status as a predictor in the model. We computed significance of direct and indirect effects, as well as confidence intervals. To obtain indirect effects, we treated variables as continuous.

RESULTS

Demographic characteristics of youth are displayed in Table 3. As we show, our sample of youth is majority Black (70.9%) and contains a relatively balanced proportion of males and females (44.7% vs. 55.3% respectively) and sexual minority and majority youth (50.1% vs. 46.49% respectively). The number of youth identifying as transgender was small (4.2%). The average age of youth in our sample is 20.6 years ($SD=2.5$ years). Nearly a third of youth (32.1%) reported they had ever had a sexually transmitted infection and 5.5% indicated they were HIV infected.

Predictive Relationships among State Structural Factors and HIV-Risky Sexual Partnerships

Correlations among predictor and outcome variables are shown in Table 4. These correlations suggest our constructs are sufficiently distinct. As we show, affording fewer legal protections to sexual and gender minorities was positively correlated with structural stigmatization of HIV status ($r = .488, p < .001$), indicating that states in which sexual minorities and transgender persons are stigmatized also tend to stigmatize HIV status. Concentrated community disadvantage was also positively correlated with structural stigmatization of HIV status ($r = .552, p < .001$), suggesting youth from poorer states perceived their communities as more likely to stigmatize those with HIV disease than those from relatively more advantaged states. Structural HIV stigma was also inversely correlated with youth reporting fewer HIV-risky sexual partnerships ($r = -.102, p < .05$).

A complex structural equation model was tested to examine proposed relationships among measured state-level and individual-level variables, controlling for youth's age, race, and self-reported HIV status. Parameter estimates were tested using bias-corrected bootstrapped standard errors (10,000 replications). Model estimation terminated normally. Chi-square and

related fit statistics are not available when modeling count outcome variables using a negative binomial regression on a mixture of observed and latent outcomes. We therefore compared the log likelihood of two models, nested and non-nested [67]. The log likelihood difference of nested and non-nested models indicates the final structural equation model exhibited adequate fit to the data ($X^2_{(1)} = 206.46, p < .001$). We display the final fitted model in Figure 2. Only significant direct pathways are shown for clarity of presentation.

Accounting for youth's age, race, and self-reported HIV status, we observed that structural HIV stigma at the state level was associated with anticipation of HIV stigma at the individual level, as expected ($b^* = .289, p < .001$), with youth residing in highly HIV-stigmatizing states reporting more anticipated stigma of an HIV-positive serostatus. Structural HIV stigma at the state level also had a direct, positive effect on individual use of community health resources ($b^* = .088, p < .01$) such that higher levels of state structural stigma of HIV status was associated with more individual use of health and wellness resources. Structural HIV stigma had no direct effect on individuals' participation in prosocial activity ($b^* = .067, p = ns$) or their level of perceived community support of youth ($b^* = .043, p = ns$). Concentrated community disadvantage had direct negative effects on individuals' use of community health and wellness resources ($b^* = -.084, p < .01$) and on their perception of community support of youth ($b^* = -.102, p < .001$). Specifically, youth residing in states suffering from greater aggregate community disadvantage reported using fewer health resources and perceived their communities as low in support of young people. Concentrated community disadvantage had no direct effect on youth's participation in prosocial activity ($b^* = .030, p = ns$) or anticipated HIV stigma ($b^* = -.019, p = ns$). The direct effect of residing in a state that failed to confer legal protections to sexual and gender minorities on youth's participation in prosocial activity was negative and significant ($b^* = -.091, p < .001$). No other statistically significant direct effects of structural sexual and gender minority stigma were observed ($p = ns$).

Predictive Relationships among Individual Factors

At the individual level, we found that anticipated HIV stigma predicted low engagement in prosocial activity ($b^* = -.066, p < .01$), lower perceived community support for youth ($b^* = -.158, p < .001$), and higher engagement in use of health and wellness resources ($b^* = .062, p < .01$). Community support of youth had a direct, positive association with participation in prosocial activity ($b^* = .097, p < .001$), such that youth who perceived their community as a supportive place for young people reported participating in more of the prosocial activities available in their community in the prior year. Community support of youth also had a direct inverse association with engagement in HIV-risky sexual partnerships ($b^* = -.295, p < .001$), suggesting a protective relationship of perceived community support of youth. Prosocial participation had a positive direct effect on use of health resources ($b^* = .340, p < .001$), such that those who participated in more prosocial activities also reported using more health resources. Use of health resources had a direct, positive association with engaging in HIV-risky sexual partnerships ($b^* = .232, p < .001$). In assessing these effects, we found several direct effects of sexual minority status. In these data, we observed sexual minority and transgender youth were more likely to engage in HIV-risky sexual partnerships ($b^* = .554, p < .001$) and in prosocial activity ($b^* = .221, p < .001$) than sexual majority and cis-gender

youth, but were less likely to report using health and wellness resources ($b^* = -.069$, $p < .05$) and to perceive their community as supportive of youth like themselves ($b^* = -.069$, $p < .05$).

Indirect Effects of Structural and Individual Factors on HIV-risky Sexual Partnerships

To further understand the relationships among state structural factors, individual perceptions, resource use, and high-risk sexual partnerships, indirect effects were estimated. In this case, we assessed whether perceptions regarding anticipated HIV stigma and community support were mediators of the effects of concentrated community disadvantage, structural HIV stigma, and structural sexual and gender minority stigma at the state level on resource use and HIV-risky sexual partnerships at the individual level. Table 5 shows the standardized total and total indirect effects of state structural variables on HIV-risky sexual behavior. The total effect of structural HIV stigma on HIV-risky sexual partnerships and its total indirect effect on HIV-risky sexual partnerships were each significant ($b^* = .036$, $p < .05$) and in a positive direction, suggesting an association between greater levels of structural HIV stigma at the state level and more HIV-risky sexual partnerships at the individual level, a relationship that is mediated through individuals' resource use and perceptions of community support. The total and total indirect effects of concentrated disadvantage on HIV-risky sexual partnerships were non-significant ($b^* = .009$, $p = ns$). The total and total indirect effect of structural stigma of sexual and gender minorities on HIV-risky sexual partnership was also not significant ($b^* = -.017$, $p = ns$). At the individual level, the total direct effect of community support of youth on HIV-risky sexual partnerships was significant ($b^* = -.295$, $p < .001$) and inverse. The total effect of anticipated HIV stigma was not significant ($b^* = .079$, $p = ns$), but the total indirect effect was significant ($b^* = .039$, $p < .001$) and positive, suggesting the cumulative effect of anticipated HIV stigma elevates youth's risk via its influence on their community support perceptions and use of opportunity structures. The direct effect of participation in prosocial activities on HIV-risky sexual partnerships was not significant ($b^* = .057$, $p = ns$), but the indirect effect ($b^* = .060$, $p < .001$) and total effect ($b^* = .104$, $p < .01$) were significant and positive.

DISCUSSION

Addressing disparities in rates of HIV infection among urban youth requires that interventions target structural and individual factors associated with HIV risk. We sought to contribute to the growing literature on structural factors and individual-level risk by exploring prospective mediators of these structural effects in a sample of high-risk urban youth. Cross-sectional studies such as ours only provide a preliminary means to investigate the potential causal linkages among study variables. However, we believe exploring how structural factors influence youth's perceptions and how these perceptions in turn influence use of community opportunity structures and risky sexual behavior adds useful information to the emergent base of evidence on structural causes of HIV risk among youth.

We found that place matters in the production of HIV risk among youth. In this sample, we observed that multiple pathways existed between structural causes of risk at the state level and engaging in HIV-risky sexual partnerships at the individual level, after accounting for

youth's age, self-reported HIV status, and racial identity. We hypothesized that structural stigma and concentrated disadvantage would influence HIV-risky sexual relationships through their indirect effects on youth's perceptions of HIV disease and on the perceived supportiveness of their community, effects that would in turn influence youth's taking advantage of community opportunity structures (e.g., prosocial activities, health and wellness resources). Our hypotheses were partially supported.

In these data, concentrated community disadvantage was not directly or indirectly associated with youth's HIV risky behavior. Rather, concentrated disadvantage was associated with lower use of health resources and lower perceptions of community supportiveness of youth, as others have observed [69]. These findings appear to contradict Bernard et al.'s suggestion [24] that it is via nonparticipation in or lack of access to local opportunity structures that disadvantage undermines health. However, in Bernard et al.'s place-based explanation for neighborhood differences in health inequity, the opportunities available within a defined geographic boundary are theorized as a function of the level of disadvantage that exists within the identical geographic boundary. Our failure to find support for the link between community disadvantage and HIV-risky sexual partnerships through participation in opportunity structures may simply reflect spatial misclassification. Our measure of opportunity structures (youth's subjective definition of their community) did not correspond precisely with our defined geographic unit for measuring disadvantage (ZIP codes). It is quite likely that youth perceive their neighborhoods and communities possess different boundaries than their ZIP code [10]. Additionally, youth may have reported on accessing opportunity structures located outside their immediate neighborhood and its surrounding community. Without applying identical geographic boundaries for each measure, the mediational effects of opportunity structures may not be easy to detect.

Structural stigma of sexual and gender minorities exhibited a similar pattern in that it had no effect, either directly or indirectly, on sexual partnerships, but did have a direct adverse relationship on participation in prosocial activity. The latter observation provides partial support for Hatzenbuehler's argument that living in an environment characterized by structural stigma may have the material and psychological effect of isolating individuals from caring and supportive local resources [33]. Bauermeister and colleagues report a similar result in their study of young gay and bisexual men in Detroit, finding those who resided in communities that they perceived as accepting of sexual minorities were more likely to have used HIV testing resources than were those who resided in communities perceived as nonaccepting [17]. It is clear, given the direct effects of concentrated community disadvantage on variables that are associated with youth risk and of structural sexual/gender minority stigma on use of opportunity structures, that these factors influence youths' well-being, even if we found no evidence for their effects on engaging in high-risk sexual partnerships. Future work should explore the complex relationships among community disadvantage, sexual and gender minority stigma, and indicators of HIV risk-taking behavior among youth.

In contrast, we found structural HIV stigma had a significant total and indirect effect on HIV-risky sexual partnerships, suggesting structural HIV stigma had deleterious effects on youth's sexual relationships through multiple indirect pathways. Consistent with prior work

demonstrating intolerant communities produce intolerant youth [70], we find youth in communities that stigmatize HIV disease possess negative attitudes about people living with the disease. Especially striking in our data are the direct negative effect of structural HIV stigma on youth's use of health and wellness resources in the prior year and the indirect effect of structural HIV stigma on lowered perceptions of community support of youth through anticipated HIV stigma. The latter effect is especially noteworthy, as perceived community support of youth conferred a direct, positive benefit: Youth who perceived their communities as more supportive places reported fewer HIV-risky sexual partnerships than youth who perceived their communities as less supportive places. This finding is consistent with proposition in the literature that structural stigmas exert their influence on individuals' health behaviors in part by altering the formal and informal supports that are perceived to be available [33,36]. In our data, structural HIV stigma appears to play a distinct role in shaping youths' negative assessments of the extent to which they experience their communities as places that are supportive of youth like themselves and they feel welcome accessing neighborhood resources.

Several hypotheses were unsupported in these data, notably a lack of direct association between participation in prosocial activity and fewer HIV-risky sexual partnerships and the finding of a positive association between use of health and wellness resources and engaging in more HIV-risky sexual partnerships. Finding no link between prosocial engagement and reduced risk behaviors is not an uncommon observation [71]. The lack of an effect may simply reflect the fact that among a sample of sexually active youth, the effects of recent engagement in prosocial activity on lifetime sexual partner choices are limited. As Akers and colleagues note, having some place to go and something to do in the immediate hours after school or work is quite different from having appropriate leisure options for dating and pursuit of romantic partnerships or at late hours [69]. It is also possible that when a sexually active youth engages in multiple non-school-based settings, regardless of their degree of prosocial character, the more numerous and diverse are the prospective sexual partners entering their social network; the benefits of participating in prosocial engagement may be attenuated by increased sexual opportunities. Additionally, not all prosocial settings (e.g., job training vs. faith-based activities vs. academic tutoring) are created equal when it comes to socializing youth on matters of how they select sexual partners or on whether the peers who participate in these activities are positive or problematic influences [72]. In other words, the networks of people within these settings may be more important in their influence and the sexual opportunities they limit or create than are the settings in and of themselves. Research examining the compositional attributes of youth settings might provide insight on which aspects of prosocial settings serve as protective influences on the partnering choices of sexually active youth.

The seemingly paradoxical relationship between greater HIV-risky sexual partnerships and increased use of health and wellness resources may simply reflect the fact that youth who engage in HIV-risky sexual partnerships have greater need for health resources and make more use of them. In other words, the direction of causality might simply run in the alternative direction than we hypothesized. Alternatively, the opposing forces in our model might lead to this paradoxical effect. Structural HIV stigma is related to *lower* resource use and, through anticipated HIV stigma, *lower* perceptions of youth support. Perceived youth

support is related to *higher* resource use, *higher* levels of participation in prosocial activity, and *fewer* HIV-risky partnerships. The relationships among these variables may be non-recursive and opposing. Finally, it is possible that the relationship between health and wellness resource use on HIV risky sexual partnerships is established through another mechanism, one that we did not assess. Longitudinal lagged investigations of these cross-level relationships are necessary to untangle their complexity and determine if use of resources is an outcome of having high-risk partners and harboring concerns about HIV stigma, effects which link back to structural stigma of HIV disease at the community level.

Among the youth in our sample, perceiving their community as a supportive place had a direct protective and unmediated relationship on HIV-risky sexual partnerships. In our sample, sexual minority and transgender youth were less likely to experience their communities as supportive places, suggesting they may not have access to community-level support to the same degree as their heterosexual and cis-gender peers. Interestingly, structural stigma of sexual minority and transgender people is associated with reduced participation in prosocial activity for all youth, after holding constant their age, race, HIV status, and identity as sexual minority or transgender. Consistent with theories and research on spatial stigma's relationships to health [73,74] this finding suggests that a state climate of stigma blemishes everyone. Living in stigmatized space may carry symbolic meaning that residents come to embody. In this case, a state's oppressive climate may inform high-risk youth's subjective perceptions of an unwelcoming community, signaling that it is a reasonable possibility they may experience rejection and maltreatment in activities. Moreover, state-level stigma of HIV and of sexual and gender minorities are associated in these data, suggesting interlinked stigmas may transmit a sense of spoiled identity to all people at high-risk of exposure to HIV, such as the high-risk women in our sample, or that the presence of one confers the effects of the other, creating a broad, deleterious impact on residents. Youth's heightened vulnerability to others' negative impressions and appraisals may also partially explain why youth were adversely impacted by structural stigma, after accounting for their individual characteristics. Future research might focus on understanding how spatial stigma lowers youth's perceptions of support and safety, independent of their personal characteristics, and also in consideration of the intersections of their multiple identities. Given societal prejudices against sexual minority and transgender persons and people living with HIV, uncovering the processes by which stigma undermines community protections for all youth, and those who are most vulnerable, may provide productive points of leverage for social change.

Limitations

Several imitations of our research merit consideration when interpreting our findings. First, our sample of youth is one of convenience rather than a probability sample. For place-based studies such as ours, this sampling strategy limits the extent to which our findings generalize to youth residing in study communities. Our sampling strategy also creates problems with restriction of range in study variables. We recruited youth specifically because we encountered them in a high-risk neighborhood and venue. Second, our sample of youth, while diverse, principally comprises high-risk heterosexual females and gay and bisexual males. The high degree of collinearity between gender and sexual identity in the sample

limits our ability to explore and interpret moderating effects of these important variables. When we compare those in our sample who identify as gay or bisexual to those who identify as heterosexual, we are de facto comparing young men to young women as an artifact of sampling. Third, these data are cross-sectional in nature, which is appropriate given the exploratory nature of our work, but which limits our ability to draw causal inferences. Fourth, our measure of lifetime HIV-risky sexual partnerships does not account for the possibility youth may have consistently engaged in condom-protected sex with these partners. It is possible that our measure overstates the lifetime risk of HIV exposure among youth because we cannot account for their condom use. However, few of the youth in this sample report consistent condom use with their recent main and casual sexual partners (27% and 43% respectively). The low rates of condom use youth report bolster our confidence that the measure provides a reasonable, albeit imperfect, gauge of their lifetime risk. Finally, although we can examine our data at the local level, to reduce cluster complexity in light of our sample size and the small number of youth in some ZIP code tabulation areas, we aggregated our structural variables to the state level, which has the effect of obscuring important differences in structural characteristics at the local level. We believe the tradeoff is reasonable, given the exploratory nature of our analysis and the strong likelihood that misclassification of the effects we observed would result in underestimates of structural influences on youth risk [38].

CONCLUSION

We explored structural effects on HIV risk behavior among a sample of high-risk urban youth using multi-level modeling techniques. We observed that perceiving that a community is supportive of young people served as a protective factor in avoiding high-risk sexual partnerships and in promoting engagement in prosocial community activity. Structural stigma of HIV undermined these positive influences, above and beyond the adverse impacts of concentrated disadvantage and structural stigma of sexual and gender minorities. Although better understanding of the complex pathways between multiple forms of structural stigma (e.g., race, poverty, sexual orientation) and diverse HIV-risk related behaviors are essential to inform the development of interventions, these findings suggest targeted efforts to change the way in which HIV is viewed remains a critical area of focus to prevent HIV among youth. Our findings underscore the importance of countering societal stigma of HIV as a first-line protective intervention strategy for high-risk youth.

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Figure 1.

Figure 2.

Table 1

Factor Loadings and Composite Reliabilities (N=1,793)

	Model Results		
	EAD	SD	95% PPI
Structural HIV Stigma (CR = .96, 95% CI = [.95, .96])			
In my community, people with HIV/AIDS are treated differently than others.	.89***	.01	[.88, .91]
In my community, people with HIV/AIDS are treated like outcasts.	.92***	.01	[.91, .93]
In my community, most people with HIV/AIDS are rejected when others find out.	.96***	.01	[.95, .97]
In my community, people who are suspected of having HIV/AIDS are treated worse than others.	.85***	.01	[.83, .87]
Structural Sexual & Gender Minority Stigma (CR = .84, 95% CI = [.65, .93])			
Prohibitions on including normalizing discussions of same-sex attractions and behaviors in youth sexuality education	.77*	.26	[-.01, .98]
Requirements that sexuality education promote heterosexual marriage	.94***	.11	[.60, .99]
Absence of hate crime legislation	.85***	.15	[.43, .98]
Adoption prohibitions	.85***	.13	[.48, .97]
Absence of prohibition of employment discrimination	.96***	.05	[.81, .99]
Marriage discrimination	.91***	.10	[.63, .98]
Concentrated Community Disadvantage (CR = .89, 95% CI = [.88, .91])			
Percentage of households at or below the poverty level	.91***	.01	[.89, .93]
Percentage of single-parent female-headed households	.72***	.02	[.67, .76]
Percentage of adult residents without a high school diploma or equivalency	.76***	.02	[.72, .80]
Percentage of residents over age 16 who are unemployed	.71***	.02	[.66, .76]
Percentage of vacant homes	.50***	.04	[.43, .57]
Percentage of households that are not affluent	.93***	.01	[.91, .95]
Anticipated HIV Stigma (CR = .97, 95% CI = [0.97, 0.98])			
If you had HIV, people would avoid you.	.78***	.01	[.76, .81]
If you had HIV, people would think you were unclean.	.85***	.01	[.83, .86]
If you had HIV, people would think badly of you.	.90***	.01	[.88, .91]
If you had HIV, people would not want to be friends with you.	.87***	.01	[.85, .89]
If you had HIV, people would be disgusted by you.	.95***	.00	[.94, .95]
If you had HIV, people would be uncomfortable around you.	.95***	.00	[.95, .96]
If you had HIV, people would think you have bad morals.	.89***	.01	[.88, .91]
If you had HIV, people would think you have been hanging around the wrong crowd.	.87***	.01	[.85, .88]
If you had HIV, people would talk about you behind your back.	.82***	.01	[.80, .84]
Community Support of Youth (CR = .83, 95% CI = [.81, .84])			
Understanding and supportive of youth	.47***	.02	[.42, .52]
Understanding and supportive of youth like you	.55***	.02	[.51, .59]
Looking for new ways support youth like you	.86***	.02	[.82, .90]

	Model Results		
	EAD	SD	95% PPI
Opportunities for supportive interaction with people of all ages	.82 ***	.02	[.78, .86]
Participation in Prosocial Activities (CR = .72, 95% = [.68, .75])			
Programs that encourage staying in school	.62 ***	.04	[.55, .69]
Faith-based activities	.43 ***	.04	[.35, .51]
School activities	.64 ***	.04	[.57, .71]
Vocational or job training programs	.41 ***	.04	[.33, .49]
Activities or events that were welcoming to gay, lesbian, bisexual, or transgender youth	.21 ***	.04	[.13, .28]
After-school programs (e.g., YMCA, Boys and Girls Clubs)	.64 ***	.04	[.56, .71]
Academic support services (e.g., tutor, mentor, Sylvan Learning Center)	.52 ***	.06	[.41, .63]
Job training	.38 ***	.05	[.29, .47]
Job placement services	.29 ***	.05	[.19, .39]
Lesbian, gay, bisexual, transgender (LGBT) center or organization	.10 ***	.04	[.02, .19]
Use of Health and Wellness Resources (CR = .85, 95% CI = [.82, .87])			
Community mental health	.68 ***	.04	[.59, .76]
Community health	.68 ***	.04	[.61, .75]
School health	.45 ***	.05	[.35, .54]
Church health	.47 ***	.05	[.36, .56]
Inpatient drug treatment	.68 ***	.07	[.53, .80]
Housing services	.68 ***	.04	[.60, .76]
Domestic violence/abuse services	.68 ***	.07	[.54, .80]
Case management	.60 ***	.04	[.51, .69]
Healthcare provider once per year	.14 ***	.05	[.05, .23]
STI testing	.24 ***	.04	[.16, .32]
Outpatient drug treatment	.70 ***	.06	[.57, .80]
HIV-risky Sexual Partnerships (CR = .81, 95% CI = [.78, .84])			
Sex with someone who injects drugs	.67 ***	.05	[.57, .75]
Exchanged sex for drugs or money	.78 ***	.04	[.69, .87]
Sex with someone you suspect has HIV	.69 ***	.04	[.60, .77]
Sex with someone who has HIV	.72 ***	.05	[.63, .81]
Ever had sexually transmitted disease	.44 ***	.04	[.36, .52]

Note.

p < .001;

**
p < .01;

*
p < .05.

CR = Composite Reliability. CI = Confidence Interval.

Table 2**Bayesian SEM-Based Confirmatory Factor Analyses Fit Statistics**

	No. Par.	95% CI of χ^2	PPP
Structural HIV Stigma	21	[−15.4, 13.9]	0.529
Structural Sexual & Gender Minority Stigma *	12	[−24.0, 22.3]	0.517
Concentrated Community Disadvantage^	23	[−14.8, 24.9]	0.316
Anticipated HIV Stigma	56	[−20.8, 38.4]	0.279
Community Support of Youth	21	[−14.2, 16.7]	0.431
Participation in Prosocial Activity	25	[−09.7, 66.7]	0.078
Use of Health & Wellness Resources	22	[−28.3, 43.8]	0.346
HIV-risky Sexual Partnerships	11	[−17.0, 20.0]	0.445

Note. BSEM=Bayesian structural equation model; CFA=Confirmatory Factor Analysis; No. Par. = Number of free parameters; 95% CI = 95% Confidence Interval; *PPP* = posterior predictive p value;

* State level CFA;

^ ZIP Code level CFA.

Table 3

Demographic Characteristics of Analytic Sample (N=1,793)

Characteristic		
	Mean	SD
Age	20.6	2.5
	n	Valid %
Current Gender Identity		
Male	800	44.7
Female	990	55.3
Transgender Identity		
Yes	75	4.2
No	1,718	95.8
Sexual Identity		
Gay/Lesbian	568	32.1
Bisexual	319	18.0
Heterosexual	821	46.4
Unsure	63	3.6
Hispanic/Latino Ethnicity		
Yes	370	20.7
No	1,423	79.3
Race		
Black	1,271	71.1
White	122	6.9
Mixed Race	235	13.2
Other	159	8.9
HIV Status		
Positive	99	5.5
Negative or unknown	1,694	94.5
Ever Acquired Sexually Transmitted Infection		
Yes	572	32.1
No	1208	67.9
In School		
Yes	1,014	56.6
No	778	43.4
Highest Level of Educational Attainment		
Less than High School Graduate	362	20.2
High School Graduate or GED	782	43.7
Some College or Post-Secondary Education	535	29.9
College Graduate or Greater	111	6.2
Ever Homeless		
Yes	524	29.2
No	1,269	70.8

Table 4

Correlations among Predictor and Outcome Variables (N = 1,793)

Variables	M	SD	1	2	3	4	5	6	7	8
1. Sexual Minority or Transgender Identity	—	—	—							
2. Structural HIV Stigma	14.04	1.18	-.68***	—						
3. Structural Sexual & Gender Minority Stigma	1.79	1.52	-.41	.49***	—					
4. Concentrated Community Disadvantage	2.03	2.04	-.58***	.55***	.16	—				
5. Anticipated HIV Stigma	32.87	9.50	-.26***	.30***	.11	.16	—			
6. Community Support of Youth	11.05	3.35	-.03	-.01	.030	-.07	-.15***	—		
7. Participation in Prosocial Activities	3.18	1.95	.23**	-.09	-.15	-.04	-.09*	.09***	—	
8. Use of Health & Wellness Resources	2.02	1.44	-.001	.04	-.001	-.02	.03	.02	.030***	—
9. HIV-risky Sexual Partnerships	0.86	1.15	.37***	-.10*	-.08	-.12	-.03	-.15***	.07*	.17***

Note.

p<.001;**
p<.01;*
p<.05

Table 5
Decomposition of Standardized Effects of Predictor Variables on HIV-risky Sexual Partnerships

	HIV-risky Sexual Partnerships					
	Direct b^*	p	Indirect b^*	p	Total b^*	p
Sexual Minority or Transgender Identity	0.554	< .001			0.554	< .001
Structural HIV Stigma			0.036	.04	0.036	.04
Structural Sexual & Gender Minority Stigma			-0.017	.10	-0.017	.10
Concentrated Community Disadvantage			0.009	.42	0.009	.42
Anticipated HIV Stigma	0.052	.36	0.039	< .001	0.079	.07
Community Support of Youth	-0.295	< .001	0.009	.14	-0.217	< .001
Participation in Prosocial Activities	0.057	.30	0.060	< .001	0.104	.01
Use of Health & Wellness Resources	0.232	< .001			0.232	< .001