



Review

The Effect of Housing Instability on Risky Sexual Behavior and HIV and STIs for a Sample of African American Sero-Discordant Couples

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Abstract

Background: Housing conditions are known as descriptive factors along with a housing instability continuum and have long been associated with physical and psychological health outcomes. Unstably housed persons are known to demonstrate high-risk HIV behaviors. Even as HIV/STI incidence and infectious disease morbidity and mortality go hand in hand with housing instability, it has not been thoroughly acknowledged or addressed along a housing instability continuum for Sero-Discordant Couples.

Purpose: The purpose of this study is to identify how various levels of housing instability influence HIV risk in a sample of African-American heterosexual Sero-Discordant Couples, after controlling for HIV risk factors and socio-demographic variables across different housing status categories using secondary data from the EBAN study.

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Methods: Multivariate logistic regression models were used to analyze the association between housing instability on: HIV infection; STI status and partner concurrency.

Results: After controlling for covariates, adjusted odds ratios for primary outcomes revealed persons living with family members had a 48% decrease in likelihood of being HIV+ when compared to stably housed participants, yet they were 2.4 times more likely to be HIV+ than those who were living with a partner. Individuals living with a partner had a 78% decrease in likelihood of HIV+ status compared to stably housed participants.

Conclusion: Our findings suggest that housing instability occurs along a continuum that increases or decreases sexual risk. As persons live in situations that seem more vulnerable, their level of risk may increase; housing instability and subsequent risk outcomes require further study.

Keywords: HIV; Homelessness; Housing instability; STIs

Introduction

Homelessness is a major public health problem in the United States and it has largely been associated with an increase in the cost of housing [1], however, the causes of homelessness include housing conditions, welfare program administration, employment status, as well as individual predictors such as childhood exposures to physical, sexual, or substance abuse; childhood neglect; domestic violence; mental illness; sexual orientation, death of a family members and others [2-4]. Recent estimates from the National Alliance to End Homelessness suggest a national rate of homelessness of 17.7 homeless people/10,000 people in the general population [5].

Housing conditions including where, how, and with whom persons live are known as descriptive factors along with a housing instability continuum and have long been associated with physical and psychological health outcomes. Homelessness refers to not having a place to reside and can be defined as the housing deprivation in its most severe form [6], and on the other hand, unstably housed are those that may have a place to live but might be in an economically or socially insecure situation that put them at risk of not having a secure place to live. Those suffering from unstable housing can either be associated with shelters; living "doubled up"; exchanging sex for shelter, or residing in single room units or transitional housing [4]. Unsheltered living (emergency shelters or street living), renders persons the most vulnerable. Housing instability (being unstably housed) may lead to homelessness. For the purpose of this study, unstably housed/or housing instability continuum includes the homeless populations.

Evidence suggest that those who are unstably housed have riskier sexual behaviors associated with high-risk of Human Immunodeficiency Virus (HIV) such as, injection drug use, greater number of sex partners and unprotected vaginal and anal sex-at a rate of four to six times higher than that of their housed peers [7-9]. Clinical studies suggest a relation between homelessness and unstably housed people having lower odds of Viral Load (VL) non-detectability after adjusting to age, ethnicity and drug use [9]. More specifically, those

experiencing unstable housing and who are sexually active report close to seventy five percent having unprotected sex, and among those persons who were HIV positive, and 57.1% reported less than 100% Antiretroviral (ARV) adherence [10,11]. Gender differences regarding high sexual risk practices exist. Unstably housed men report having earlier onset of sexual debut, greater partner concurrency, and engaging in more survival sex relative to women. Conversely, females report less condom use and more sexual transmitted infections associated with substance abuse and low social support [12,13].

Even as HIV incidence and other sexual transmitted diseases (STDs) morbidity and mortality go hand in hand with housing instability it has not thoroughly acknowledged or addressed in a housing instability continuum for Sero-Discordant Couples [14]. Sero-Discordant Couples are couples with one person who is HIV-positive and one who is HIV-negative. Studies in HIV Sero-Discordant Couples provide crucial evidence on the role of antiretroviral therapy and viral load suppression to reduce the risk of HIV transmission, however they are scarce. For example, an HIV-positive partner might focus on not infecting their partner by adhering to treatment, while the HIV-negative partner may concentrate on taking care of the other person. Some evidence on the viral loads and HIV transmission risk in HIV Sero-Discordant Couples suggest that having a drug addiction and living with nonfamily members are the most significant predictors to explaining sexual risk among newly homeless or unstably housed youth [15]. Viral load on HIV transmission risk in HIV-Sero-Discordant male homosexual couples suggest, however that HIV transmission in the context of viral suppression is very low in an international sample [16], while in the US evidence suggest a strong inverse association between housing instability and viral suppression across a spectrum of unstable housing arrangements [17].

The purpose of this study is to identify how various levels of housing instability influence HIV risk in a sample of African American heterosexual Sero-Discordant Couples, after controlling for HIV risk factors and socio demographic variables across different housing status categories using secondary data.

Materials and Methods

Parent project: Data source and study population

The parent project is the Risk Reduction Intervention for HIV-Sero-Discordant African American couples' study- (EBAN). EBAN is

a randomized control trial that tested the efficacy of a contextually appropriate behavioral intervention on HIV and sexual risk behaviors in a sample of African American HIV Sero-Discordant Heterosexual Couples [18]. The project recruited African-American HIV-Sero-Discordant Couples in four sites (Atlanta, GA; New York, NY; Los Angeles, CA; Philadelphia, PA) from November 2003 to June 2007. It allocated randomly participants to 1 of 2 interventions: (1) the EBAN HIV/STD risk reduction group or (2) the health promotion comparison. Recruitment occurred at HIV clinics, AIDS service and community-based organizations, word of mouth, referrals, targeted street outreaches, and a media campaign-including radio appearances, commercials, and newspaper advertisements, following a common recruitment protocol.

Data collection, including ACASI and biological specimen collection, occurred at four-time points-baseline, immediately post intervention (approximately 8-10 weeks post enrollment), and 6- and 12-months post intervention. Each individual participant was compensated for time and travel for each visit. More detail on the study can be found elsewhere [19] and in the table 1.

Current study

The purpose of this study is to identify how various levels of housing instability influence HIV and sexual risk factors in a sample of African American Sero-Discordant Heterosexual Couples, after controlling for known HIV risk factors across different housing status categories, and socio demographic and income descriptors. EBAN did not explore the relation between housing instability and HIV/STD risk factors. This is the first study to explore these relations using the EBAN dataset.

For this study, the outcome variable was divided into four dichotomous outcomes: (1) HIV status (negative/positive); (2) STI status (negative/positive); (3) unprotected sex acts (none/ ≥ 1 in bivariate analysis; continuous in multivariate analysis), and (4) partner concurrency (no/yes). The main independent variables were categorized in four different levels of housing instability groups: 1) stably housed (own or rent your own home); 2) living with family members; 3) living with sexual partner(s), or 4) living transitionally in sheltered (group arrangements) or unsheltered situations with other persons who are not related.

Site	Total participants No (%)	Total No. Cohort Group (%)	Total No. Couples (RR-HP)* No (%)	HIV-Positive Partner No (%)*	
					Female
All Sites	1070 (100)	110 (147)	535 (260-275)	212 (40)	323 (60)
New York, NY	442 (41.31)	40 (58)	221 (104-117)	79 (36)	124 (64)
Atlanta, GA	234 (21.87)	27 (33)	117 (57-60)	49 (42)	68 (58)
Los Angeles, CA	200 (18.69)	24 (30)	100 (52-48)	42 (42)	58 (58)
Philadelphia, PA	194 (18.13)	19 (26)	97 (47-50)	42 (43)	55 (57)

Table 1: Project EBAN recruitment and clinical sites description.

From: [19]

*Randomized controlled Trial (RCT) cluster of African American HIV- Sero-Discordant recruited allocated to the EBAN HIV/STD Risk Reduction or the Health Promotion (RR-HP) comparison group.

*Distribution by gender of the HIV positive diagnoses of the Sero-Discordant Couples recruited in the RR-HP.

The covariates selected have consistently shown to relate to HIV and STI infections and housing instability. The following covariates were included:

- Gender, males were coded as one and females as zero
- Age, continuous
- Education, categorical from High School diploma to some college
- Income, dichotomous > \$850 per month/ < \$851 per month)
- Employed, dichotomous code yes as one and no as zero
- Health insurance dichotomous code yes as one and no as zero
- Married dichotomous code yes as one and no as zero
- Dependents, dichotomous code yes as one and no as zero
- Previous or recent incarcerations, dichotomous code yes as one and no as zero
- Recent inpatient drug treatment, dichotomous code yes as one and no as zero
- Time involved with study partner, numerical/continuous
- HIV seropositive persons, numerical/continuous
- Years known HIV+, numerical/continuous

Multivariate logistic regression models were used to analyze the association between housing instability on: HIV infection; STI status and partner concurrency. Exploratory data analysis identified 25% of the observations had zeros as the outcome for unprotected sex. Following best practices to model likelihood ratios, we performed a negative binomial regression modeling to best fit the data. All p values were based on 2-tailed tests and statistical significance was set at 0.05. In addition, logistic and negative binomial regression analyses were performed for sexual behavior variables in adjusted and unadjusted models between the outcome variables; independent variables and the study's covariates. Statistical analyses were completed using Stata version 12.1 (Stata Corp, College Station, Texas).

Results

This study specifically hypothesizes: 1) housing instability has an effect on sexual risk after controlling for HIV risk covariates; and 2) along a continuum, those with increased housing instability exhibit the most sexual behavior risk. In addition, tested for gender differences, and if additional housing members affected HIV risk behaviors.

The sample used in the analyses was of 1063 people. Of the 1070 sample of the parent study, 7 participants did not respond to the housing questions, and therefore were excluded from the data analysis.

Of 1063 participants, 605 (57%) were stably housed and 458 (43%) were unstably housed. Of 458 unstably housed participants, 104 (23%) lived with a family member, 189 (41%) lived with his/her sexual partner, and 165 (36%) lived in a rooming house, single room, group living arrangement, welfare-type living, or were unsheltered ("other living arrangement"). Baseline characteristics between participants in varying housing groups were dissimilar and, subsequently, statistically significant in more women (57%) were stably housed than men (43%), ($\chi^2=49.15$, $p=0.000$); the greatest within-group disparity among women's and men's housing groups were those who were stably housed (women: 65%, men 49%) and those living with a sexual partner (women: 10%, men: 26%).

As shown in table 2, bivariate analysis showed there were statistically significant differences in sexual risk behaviors based upon housing status. Specifically, dichotomized and grouped housing variables show there is significant at $p < 0.05$ difference between the expected and observed result for HIV and STI status. After controlling for covariates, adjusted odds ratios for primary outcomes revealed persons living with family members had a 48% decrease in likelihood of being HIV+ when compared to stably housed participants, yet they were 2.4 times more likely to be HIV+ than those who were living with a partner. Individuals living with a partner had a 78% decrease in likelihood of HIV+ status compared to stably housed participants. Persons living in group or unsheltered accommodations had a 44% decrease in likelihood of being HIV+ when compared to stably housed, yet they were 2.6 times more likely to be HIV+ than those who were living with a partner and 1.08 times more likely to be HIV+ than those who were living with family members. Similarly, persons living with family members had a 15% decrease in likelihood of being STI+ when compared to stably housed participants, though this result did not reach statistical significance?

Individuals living with a partner were nearly 3 times more likely to be STI+ compared to stably housed participants (AOR=2.687, $p=0.007$) table 3. Participants living with partners were 1.28 times more likely to be STI+ compared to persons in group or unsheltered living arrangements and 2.7 times more likely to have an STI compared to those living with family members. Persons living in group or unsheltered accommodations were 2 times more likely to be positive for an STI compared to stably housed participants and were 2 times more likely to have an STI compared to persons living with family members.

Discussion

The results of this study revealed that housing instability has a statistically significant association with HIV status and sexual risk behavior. For each sexual risk outcome, housing instability (solely or when combined with an interaction term) was statistically significant as an exposure attributing to additional risk behaviors. These findings are consistent with epidemiological data showing an association between HIV status outcomes with housing instability. This study's sample had a sixty eight percent of HIV- seropositives owned or rented their own homes. Equally, HIV-positive persons within this analysis were more likely to be older; being in a relationship with his or her partner for a longer time and were more likely to have known their status for nearly 1.5 years longer than unstably housed persons. Conversely, unstably housed groups were more at risk for positive STI status, partner concurrency, and number of unprotected sex acts. This merely confirms, along with previous literature, that after controlling for HIV risk covariates, housing instability hails as a statistically significant exposure variable for HIV and sexual risk behaviors.

The bivariate and multivariate analysis suggests that housing instability led to a significant decrease in HIV+ serostatus. This result is contrary to previous literature which documents housing instability should have a positive association with HIV status and, thus, risk for HIV-positive serostatus should increase as housing instability increases. These results may be explained as the study sample had more HIV+ women who were stable housed, while their male partners reported being unstably housed and were HIV-. Gender differences regarding high-risk sexual practices and factors that contribute to such risk are clearly demonstrated in the literature. Unstably housed men

report having earlier onset of sexual debut, greater partner concurrency, and engaging in more survival sex relative to women. Conversely, females report less condom use and more STIs associated with substance abuse and low social support [20,21].

Our findings suggest that housing instability has a continuum that increases or decreases sexual risk. We proposed that housing instability and subsequent risk outcomes occur along a continuum. As persons live in situations that seem more vulnerable, their level of risk would

increase. This work purported housing stability and risk along this continuum (from least risk to most risk): 1) stably housed, 2) living with family members, 3) living with partner, and 4) living in group or unsheltered accommodations. Our findings support that a continuum exists; however, it fails to establish groups that place participants at most or least risk consistently across outcomes. A potential limitation is that different behavioral, social, and structural factors impact behaviors—for instance, factors that place a person at risk for partner concurrency may be different than those that lead to unprotected sex.

	Full Sample	Stably Housed	Unstably Housed			P Value
			Living w/family	Living w/partner	Living w/other	
Group totals (n)	1063 (100)	605 (57)	104 (10)	189 (18)	165 (15)	-
Dependent Variables (n, %)						
HIV +	532 (50)	364 (68.5)	48 (9)	40 (21)	80 (15)	0
		364 (68.5)		167 (31)		0.000^*
STI +	148 (14)	72 (49)	13 (9)	32 (22)	31 (21)	0.061
		72(49)		76 (51)		0.026^*
Concurrent partners	195 (18)	72 (49)	24 (12)	33 (17)	34 (17)	0.455
Times unprotected sex (mean, SD)	-	15 (27)		14 (26)~		0.964^
Independent variables (n, %)						
Persons living with you						
Alone	341 (32)	212 (62)	4 (1)	77 (23)	48 (14)	0
Spouse	337 (31)	220 (65)	26 (8)	55 (16)	36 (11)	0
Your own children	348 (33)	227 (65)	38 (11)	66 (19)	17 (5)	0
One or both parents	66 (6)	13 (20)	43 (65)	8 (12)	2 (3)	0
One or more siblings	39 (3)	12 (31)	21 (54)	5 (13)	1 (2)	0
Other relative (s)	63 (5)	20 (32)	27 (43)	7 (11)	9 (14)	0
Roommate(s) non-related	60 (4)	14 (23)	2 (3)	3 (5)	41 (68)	0
Non-spouse sex partner	75 (7)	48 (64)	4 (5)	15 (20)	8 (11)	0
Supervised living arrangement	22 (2)	2 (9)	1 (5)	1 (5)	18 (82)	0
Other (i.e. institutionalized)	21 (2)	3 (14)	1 (5)	2 (10)	15 (71)	0
Covariates (n, %)						
Gender						
Female	532 (50)	346 (65)	53 (10)	53 (10)	80 (15)	0
Age (mean, SD)	-	44 (8)	43(8)			0.012^
Marital status						
Married to study partner	345 (32.5)	235 (68)	30 (9)	40 (12)	40 (12)	0
Educational status						
No formal schooling	763 (72)	410 (55)	84 (11)	147 (19)	122 (16)	0.005
Employment						
Unemployed	759 (72)	417 (55)	80 (10)	122 (16)	140 (19)	0
Monthly income						
\$0-850/month	753 (71)	385 (51)	87 (12)	149 (20)	132 (17)	0
Insured (No)	261 (25)	103 (39)	36 (14)	68 (26)	54 (21)	0
Have dependents (Yes)	521 (49)	321 (62)	49 (9)	93 (18)	58 (11)	0
Incarceration previous 3 months (yes)	661 (62)	346 (52)	64 (10)	135 (20)	116 (18)	0
Received HIV medical care 6 months	475 (45)	335 (71)	41 (9)	32 (7)	67 (14)	0.005
Knowledge CD4 count (yes)	365 (34)	254 (70)	32 (9)	25 (7)	54 (15)	0.587
Knowledge viral load (yes)	292 (27)	212 (73)	24 (8)	18 (6)	38 (13)	0.096
Inpatient drug txt 3 months (yes)	554 (52)	311 (56)	49 (9)	88 (16)	106 (19)	0.005

Table 2: Describes the study sample, and distribution in dependent and independent variables.

Numbers rounded

~Missing data on the different categories of unstable housing

^bivariate analysis of dichotomous variables t-test

*Statistically significant p < 0.005

Risk	AOR ^a	95% CI ^b	
HIV Seropositive			
Living with family	0.5163*	0.2782	0.9583
Living with partner	0.2159**	0.1247	0.3738
Living with other	0.5604*	0.317	0.9905
STI Positive			
Living with family	0.9985	0.4205	2.37
Living with partner	2.687**	1.317	5.482
Living with other	2.088*	1.001	4.358
Partner Concurency			
Living with family	1.118	0.5053	2.477
Living with partner	0.7762	0.3921	1.536
Living with other	0.5949	0.2754	1.285
Unprotected Sex			
Living with family	2.506d	0.9826	6.393
Living with partner	0.2865**d	0.1107	0.7413
Living with other	2.336*d	1.006	5.422

Table 3: Adjusted ratios for outcomes variables.

Overall, our findings suggest that a better understanding is needed of what are the different permutations and granularity of unstable housing and how it relates with HIV risk. The over simplification of living arrangements may mislead findings on the risk factors for HIV and may misrepresent a vulnerable group in great need of public health and health services.

Limitations

Due to the cross-sectional study design, it is difficult to estimate causality and to generalize the results across African American generally or to sero discordant heterosexual couples. Equally, co-variation of cause and effect could not be well established as the time when unstable housing began was unknown in relation to HIV onset for the seropositive individuals. Future research would do well to relate the health behavior and biological HIV-related health outcomes with qualitative research to understand the continuum of housing instability, social support, and where and with whom a person lives.

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