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Loida Elena Bonney, *Emory University*
Hannah Cooper, *Emory University*
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Josalin Hunter-Jones, *Emory University*
Deanne F. Swan, *Emory University*
Richard B Rothenberg, *Emory University*
Benjamin G Druss, *Emory University*

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Access to health services and sexually transmitted infections in a cohort of relocating African American public housing residents: An association between travel time and infection

Loida E Bonney, MD, MPH[1,2,3], **Hannah LF Cooper, ScD**[2,3], **Angela M. Caliendo, MD, PhD**[3,4], **Carlos del Rio, MD**[1,3,5], **Josalin Hunter-Jones, MSW, MPH**[2], **Deanne F. Swan, PhD**[2,3], **Richard Rothenberg, MD, MPH**[6,7], and **Benjamin Druss, MD, MPH**[8]

[1]Department of Medicine, Emory University School of Medicine

[2]Department of Behavioral Science and Health Education, Emory University Rollins School of Public Health

[3]Center for AIDS Research, Emory University

[4]Department of Pathology and Laboratory Medicine, Emory University School of Medicine

[5]Department of Global Health, Emory University, Emory Rollins School of Public Health

[6]Institute of Public Health, Georgia State University

[7]Department of Epidemiology, Emory Rollins School of Public Health

[8]Department of Health Policy and Management, Emory Rollins School of Public Health

Abstract

Background—High incidence and prevalence of sexually transmitted infection (STI) in African Americans have been attributed to multiple factors. However, few articles have discussed spatial access to healthcare as a driver of disparities. The objective of this analysis was to evaluate the relationship between travel time to a healthcare provider and the likelihood of testing positive for one of three STIs in a sample of adults living in public housing.

Methods—One hundred and eight African-American adults in Atlanta, Georgia from November 2008 – June 2009, completed a survey that queried sexual behavior and healthcare utilization and had urine tested for, *C. trachomatis, N. gonorrhoeae, and T. vaginalis* by molecular methods. Travel time was a continuous variable capturing the number of minutes it took to reach the place where participants received most of their care. Multivariate analyses tested the hypothesis that individuals reporting longer travel times would be more likely to test positive for an STI. Travel time was squared to linearize its relationship to the outcome.

Results—Thirty six residents (37.5%) tested positive for ≥1 STI. A curvilinear relationship existed between travel time and STI status. When travel time was <48 minutes, a positive relationship existed between travel time and the odds of testing positive for an STI. An inverse relationship existed when travel time was ≥48 minutes.

Corresponding Author: Loida E. Bonney, MD, MPH, Department of Medicine, Emory University School of Medicine and Center for AIDS Research, Emory University, 49 Jessie Hill Junior Drive SE, Atlanta, GA 30303, Phone: 404-778-1620, Fax: 404-778-1601, lbonney@emory.edu.

Conflicts of Interest: None.

Conclusion—Residents of impoverished communities experience a curvilinear relationship between travel time and STI status. We discuss possible factors that might have created this curvilinear relationship including voluntary social isolation.

Keywords

health disparities; access to care; sexually transmitted infections

Introduction

Sexually Transmitted Infections (STIs) are a significant problem among poor African Americans.[1, 2] Centers for Disease Control and Prevention (CDC) surveillance data shows that disparities exist between STI rates in African Americans and whites. For example, in 2007, 48% of incident cases of *Chlamydia trachomatis* infection were reported in African Americans, and the rate was eight times greater than the rate in whites. Seventy percent of the cases of *Neisseria gonorrhoeae* were among African Americans that year, and the rate was 19 times greater than the rate in whites.[1] *Trichomonas vaginalis* prevalence ranges from 1.5 to 10 fold greater in African American women than women of other racial/ethnic groups.[3] Multiple factors have been implicated as contributors to this phenomenon.

Factors associated with these disparities include both proximate and distal social determinants, which are directly and indirectly associated.[4] Proximate determinants are well-studied and are individual sexual behaviors such as unprotected intercourse and multiple partners.[5] More distal factors include sexual networks, marriage rates, incarceration rates,[6-8] and neighborhood factors, such as neighborhood physical conditions and neighborhood composition.[6, 9] African Americans have high risk networks,[10] low marriage rates, and high incarceration rates are all of which are associated with increased rates of STIs.[6-8] They are also more likely than whites to live in poor neighborhoods.

Also implicated in the disparate STI rates experienced by African Americans is access to care issues.[11, 12] African-Americans tend to have worse access to care, which is associated with higher rates of several adverse health outcomes. Extended travel time to one's healthcare provider is a component of the concept of geographic healthcare accessibility.[13] Limited ability to reach care providers may increase the duration of infection, which increases the time during which they are able to transmit infection to others.

Several articles in the literature conclude that STIs abound in areas where there is limited access to STI treatment, and found that when care is more convenient to access, care seeking delays are shorter.[14, 15] However, other literature concludes that greater travel time is *not* linked to care delay or to STI diagnosis.[16] Greater travel time has even been linked with decreased STI diagnosis.[17] More research is needed to clarify the relationship between travel time and STI infection status in light of these conflicting results.

We hypothesized that length of travel time would be positively related to the likelihood of testing positive for an STI in a sample of African American public housing residents scheduled for relocation. African American public housing residents are at high risk for STI,[18-20] however the role of travel time is not well understood in this population, or in other populations. As housing authorities in cities throughout the United States are participating in the Housing Opportunities for People Everywhere (HOPE VI), an initiative to move residents, the majority of whom are African Americans, from areas of concentrated poverty to scattered site housing, now is an opportune time to understand the role of travel time in shaping STI risk. Additional understanding of risk in this group might optimize health outcomes in residents of new environments where travel time to healthcare may or

may not change. Ultimately, understanding better if there is a relationship of travel time to STI may help decrease STI health disparities.

Materials and Methods

Sample and recruitment

We recruited a sample of sexually active African-American adults from November 2008 through June 2009 who were living in one of five Atlanta Housing Authority (AHA) communities in Atlanta, Georgia, USA scheduled for emptying though the HOPE VI initiative. Inclusion criteria were: African American, resident of public housing complex scheduled for emptying, over 17 years of age, sexually active within the past year, and not living with an individual who was already enrolled in the study. We over-sampled alcohol and other drug abusers (AOD abusers). AOD abusers were defined as individuals who had engaged in binge drinking during the reporting period, or used illegal drugs during the reporting period.

Participants were recruited through a variety of methods, including staff outreach at each community; flyers posted inside each community and in local community-based organizations and health clinics; and word of mouth. Collectively, these methods produced a convenience sample of 108 residents of five AHA communities. Data were collected in places that permitted privacy; these places included rooms at community organizations, faith-based organizations, and Emory University.

The study was approved by the Emory University institutional review board (Approval number: IRB00008710). Before data collection, participants gave informed consent. Afterward, participants received a $25 cash incentive for their time.

Measures

The dependent variable was testing positive for at least one of three STIs: *N. gonorrhoeae*, *C. trachomatis*, or *T. vaginalis*. Participants were given a urine collection cup and instructed to provide a sample of first stream urine. The presence of *N. gonorrhoeae* and *C. trachomatis* in clinical specimens was determined by using the Becton Dickinson Probe Tec ET Amplified DNA Assay (Sparks MD). The sensitivity/specificity of the CT assay is 92% / 96.6%.; and the sensitivity/specificity of the GC assay is 95.2%/98.8% (package insert). The presence of *T. vaginalis* in clinical specimens was determined by using Taq Man PCR. The sensitivity/specificity of the TV assay is 100% and 99.6%.[21, 22]

All other variables were ascertained via survey. Participants completed an interviewer-administered Computer Assisted Personal Interview (CAPI) with audio components. Questions about drug use and sexual activity were queried using Audio Computer Assisted Self Interview (ACASI) to improve the validity of responses.[23] The main predictor variable was travel time to the place “where you get most of your care.” We queried several demographic characteristics and sexual behaviors including gender, income, employment, education, condom use, partner concurrency, and sex work. Questions, unless otherwise stated, pertained to the 6 month period prior to relocation of the first 50% of housing community residents because communities were changing rapidly as more and more residents moved away, and researchers wanted to capture data to reflect a time when the communities were mostly intact.

Analyses

Descriptive statistics were performed to capture the distribution of each variable. Analyses were run using generalized estimating equations that address clustering within public

housing communities. We used the Box-Tidwell method to learn whether a non-linear relationship between travel time and STI status existed.[24] Based on our findings, we squared the travel time variable to linearize its relationship to the outcome. To ensure the relationship between travel time and STI status was robust, we included many covariates in the final model that are known to predict STI status. The final multivariate model controlled for participant sociodemographic characteristics, risky sexual behaviors, prior STI history, condom use, and partnership characteristics. We could not include both household income and educational attainment in the model because of the association between these two variables, and so included only educational attainment. Analyses were conducted in SAS version 9.2.

Results

Thirty-four percent of the sample of 108 participants was men (Table 1). Ages ranged from 18 – 59 years and the median household income was $7500. About one half of the sample completed high school or earned a General Equivalency diploma (GED), and less than 1 in 5 was married.

Over 37% of the sample was found to be positive for at least one of three STIs. Percent positive for at least one STI ranged from 26 – 53% across public housing communities and there was variation in travel time across and within communities (Table 2). Thirty six residents tested positive for one or more STI. In the bivariate analysis, gender (being a woman) and age (being younger) were associated with testing positive for at least one STI (Table 3). In this sample of deeply impoverished African-American women and men, there was no relationship between alcohol or other drug dependence and STI status.

Median travel time to the place where participants get most of their care was 30 minutes and there was variation in travel time across and within communities (Table 2). Women with infection had a pattern of longer travel times compared to women without infection (Figure 1a). A similar pattern was suggested for men, but was not definitive because of the small number of positive men (Figure 1b).

The multivariate analysis indicated that there was a curvilinear relationship between travel time and STI status (Table 3, Figure 2). Specifically, when travel times was <48 minutes, higher travel times were associated with a greater likelihood of testing positive for one or more STIs; when participants reported travel times ≥ 48 minutes, higher travel times were associated with a *lower* likelihood of testing positive for one or more STIs. Statistically significant relationships between travel time to health care provider and STI in a sample of public housing residents remained when we control for covariates including sociodemographic characteristics, risky sexual behaviors and partnership characteristics, and a prior history of an STI. Age, thinking partner has multiple partners, believing partner has an STI, and always using condoms were found to have a statistically significant associations with STI when we controlled for other variables.

Discussion

In this sample of poor African American public housing residents with a high prevalence of STIs, we found a curvilinear relationship between travel time and likelihood of testing positive for an STI. We hypothesized that there would be a positive relationship on the basis that STI prevalence would be higher in a sample with poorer access to treatment, and that people with longer travel times have poorer access to care than people with shorter travel times. The data supported our hypothesis in the subset of the sample with travel times <48 minutes. However, when travel times were ≥48 minutes the relationship was inverted.

Findings in prior studies are conflicting, however they do not show the curvilinear relationship found here. In a qualitative study, Goldenberg found that participants reported that geographic isolation and rigorous work schedules limited access to testing and treatment.[15] In contrast, a study of STI clinics across England found that longer travel times were not associated with delays in seeking care for STI, and travel time was not associated with an STI diagnosis.[16] In addition, a medical record review of Hepatitis C status in France showed that greater travel time or distance to provider was associated with decreased detection of Hepatitis C.[17] However, the latter finding may be a product of decreased access to screening and not necessarily decreased prevalence. The current study better ascertained STI status because it tested subjects instead of reviewing medical records. In the Hepatitis C study, a negative result may signify that people were not tested, but in the current study a negative result is more precise in stating that participants lacked infection.

Regarding the proposed mechanism of the longer travel time association with more STI, the first half of the curve (Figure 1), Mercer et al. in a cross-sectional survey of over 3000 patients at 4 STI clinics found there was decreased delay in seeking care when patients were able to have walk-in appointments, suggesting that a form of convenience lends itself to more timely utilization.[14] Their study did not look at travel time specifically. The current study is limited in that it does not ask if travel time contributes to a delay in seeking care, or if the STI-positive participants were more likely to delay care. We conducted post-hoc analyses to understand whether poor access to transportation could help explain the relationship between travel time and STI positivity, and found that while travel time was associated with using public transportation to reach the usual source of care, public transportation use was not associated with STI status. Additional research is needed to clarify the pathway of association.

Given the documented associations between usual source of care and health insurance status to health and healthcare use,[25-27] we included these two variables in the model. Including these two variables in the model did not alter the magnitude of the relationship between travel time and STI.

Another possibility is that the negative slope portion of the curvilinear relationship between travel time and STI status was produced by voluntary social isolation. Voluntary social isolation may be adopted by some residents of impoverished high-crime communities as a way of coping with the threat of violence.[28-30] A subset of the current study sample was interviewed qualitatively and revealed that voluntary social withdrawal is practiced by members of the cohort to minimize exposure to local violence (Wolfgang, 2010). Participants who use this strategy may have chosen to get care farther from home as a part of their social isolation. Voluntary social withdrawal may also translate into less sexual activity – a behavior that would protect against STIs. The current analysis cannot explore this possibility because we it did not query voluntary social isolation on the quantitative survey.

Our study has several limitations. Unlike STI status, the travel time variable was gathered by self-report, which is subject to recall bias. Participants may over- or underestimate the amount of time it takes to reach their source of health care. Another limitation is that we examine prevalence of STI at one specific point in time. A more robust result would have come if the study were longitudinal and had tested for STIs at several time points to create a composite score. Furthermore, while STI test results reflect the time of the interview, travel time answers to questions referred to an earlier time. It is not expected that participants would have changed their location of health care before changing residences, but this is a possibility and if they had, then travel times at the time of interview may have been different. We do not know if the usual source of care reported by our participants is their source of STI-related care or reproductive health care nor do we know the number of

healthcare visits per year. There was no relationship between travel time and having received primary care in the past 6 or 12 months. Our sample is a convenience sample and may not be representative of housing authority populations in Atlanta, Georgia. However, a comparison of our sample's sociodemographic characteristics with those of the underlying population of residents of the five AHA communities indicates that the sample is similar to the underlying resident population on all dimensions for which data are available (i.e., age, gender, and income) from the US Department of Housing and Urban Development.

Results of this analysis raise the question of whether or not people should be encouraged to get care from providers who require the least travel time. Olonilua found that only 7.5% of new GUM clinic attendees attended their nearest clinic.[16] People chose to travel further to get care. On the other hand, Andersen et al. found, in a sample of low income persons, that those living in areas where there were more federally funded health centers were more likely to get medical care than those residents of areas with fewer federally funded health centers.[31] It will be important to do qualitative research to see if public housing residents who get their care from providers who are farther away differ systematically from those who get their care from nearby clinics. For example, are the longer travel time participants less socially connected to their neighbors? Do they separate themselves from local sexual networks that may have high background STI prevalence and form partnerships with individuals living in neighborhoods where STIs are not so highly prevalent?

STIs are health problems plaguing poor African American disparately. Residents of impoverished communities experience improved sexual health if they access services that require less travel time to reach. However at longer travel times, the relationship is inverted and this overall curvilinear relationship has not been reported in previous literature. Qualitative studies are important to help reveal the possible causes of this phenomenon. In the meantime, STI testing and treatment facilities ought to be accessible especially to vulnerable groups in an effort to decrease health disparities.

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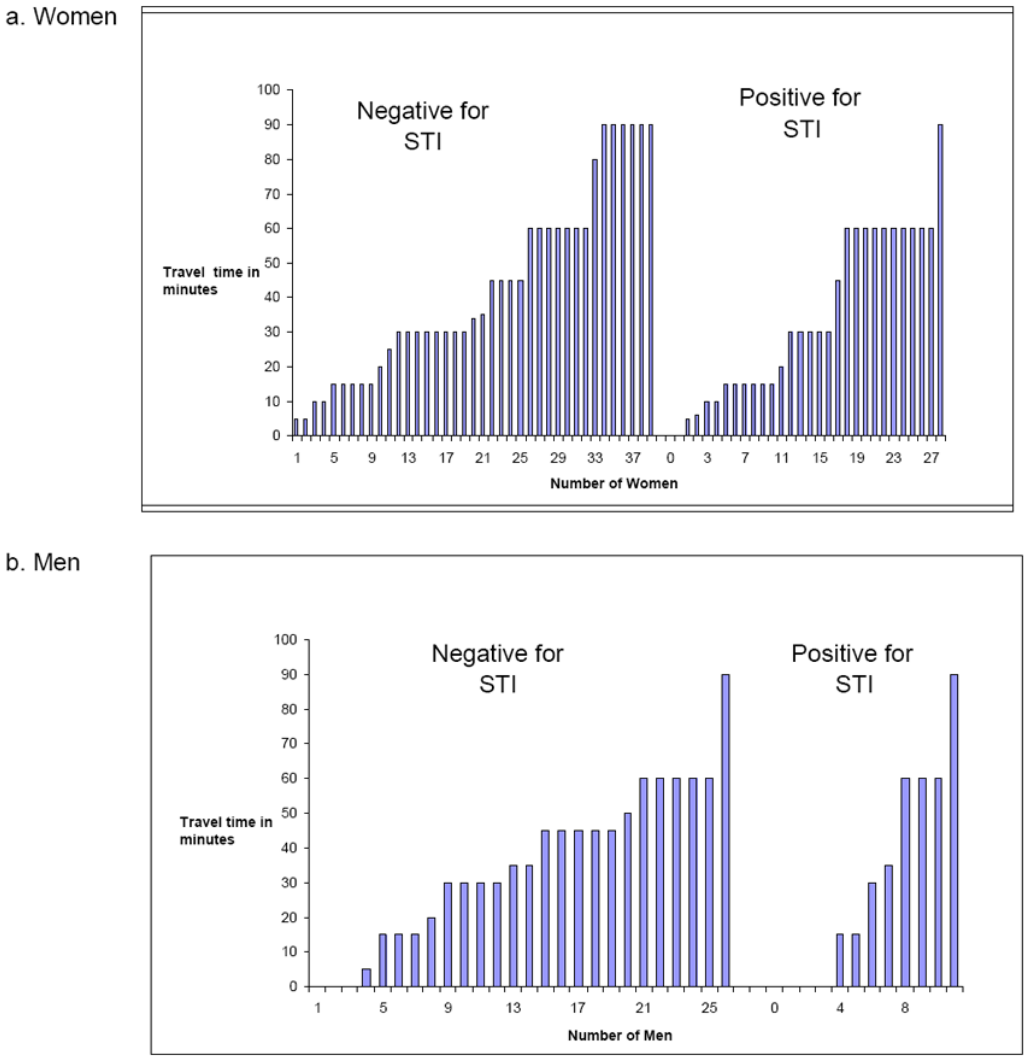

Figure 1.
Distribution of travel times for STI negative and positive women and men

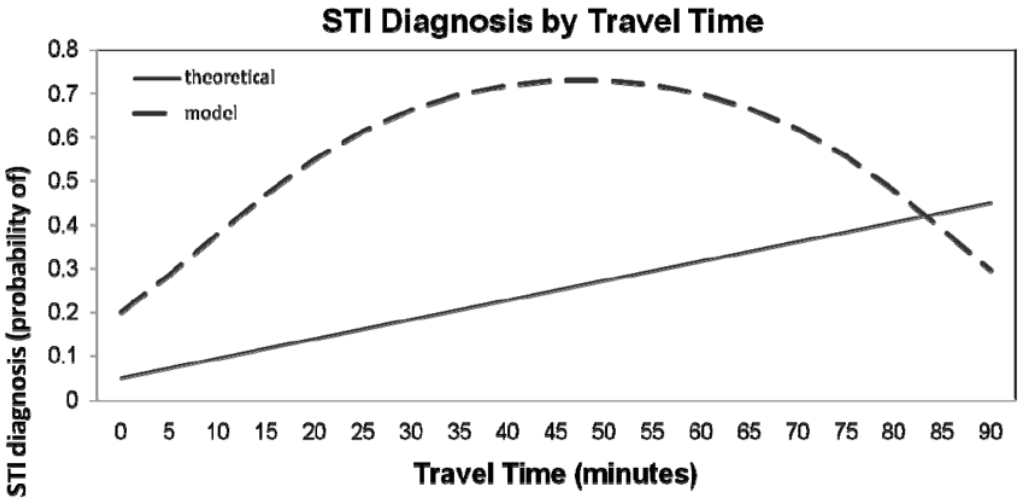

Figure 2.

Hypothesized and Model-estimated relationship between travel time and odds of testing positive for *C. trachomatis, N. gonorrhoeae*, or *T. vaginalis* in a sample of 108 African-American residents of five Atlanta Public Housing Authority communities

Table 1

Characteristics of a sample of African American Public Housing Residents

Variable[1]		Frequency (%), or median (range)
Urine tested positive for any STI (GC, CT, or TV)		36 (37.5%)
Urine positive for GC		3 (3.1%)
Men		0
Women		3 (100%)
Age	18-25	3 (100%)
	26-35	0
	36-45	0
Urine positive for CT		11 (11.5%)
Men		5 (45.5%)
Women		6 (54.6%)
Age	18-25	8 (72.7%)
	26-35	1 (9.1%)
	36-45	2 (18.2%)
Urine positive for TV		29 (30.2%)
Men		1 (3.5%)
Women		28 (96.6%)
Age	18-25	5 (17.2%)
	26-35	10 (34.5%)
	36-45	9 (31.0%)
	>45	5 (17.2%)
Percent with co-infection		5 (5.2%)
Men		1 (20.0%)
Women		4 (80.0%)
Age	18-25	3 (60.0%)
	26-35	1 (20.0%)
	36-45	1 (20.0%)
	>45	
Travel time to place where you get most of your care, in minutes		30 (0-90)
Male Gender (ref = women)		37 (34.3%)
Age		36.5 (18-59)
Household income		$7500 ($2500-$52500)
GED or high-school diploma		56 (51.9%)
Unemployed		87 (82.1%)
Car access		38 (35.2%)

Variable[1]	Frequency (%), or median (range)
Married or living as married	14 (12.96%)
Has primary or main partner	91 (85.8%)
Participant had a casual partner	37 (34.9%)
More than one sex partner	35(35.7%)
Think partner has multiple partners	40(38.5%)
Engaged in sex work in past 6 months	11(10.4%)
Uses condom always	22 (20.6%)
STI history (Ever been told by a doctor any STI)	37 (34.3%)
Believed partner had an STI or HIV	17(16.8%)
Overall health rating	
Excellent	16 (14.9%)
Very good	30 (28%)
Good	38 (35.5%)
Fair	23 (21.5%)
Meets screening criteria for alcohol or other drug dependence	22 (20.7%)

[1]Refers to six month period ending just prior to the date when >50% of residents had relocated from the public housing complex unless otherwise specified.

GC= *N. gonorrhoeae*; CT=*C. trachomatis*; TV=*T. vaginalis*

Table 2

Percent positive for STI and mean travel time by housing community

Housing community	% positive for an STI	Travel time Mean (SD)
A	31.82%	3.12 (18.52)
B	40%	45.5 (25.64)
C	53.3%	51.4 (20.14))
D	26.09%	44.10 (31.70)
E	30.43%	29.27 (21.88)

Table 3

Logistic regression of association between STI positivity and travel time to healthcare provider, adjusting for other influences

Variable[b]	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Travel time to place where you get most of your care, in minutes	1.01 (1.00-1.03)	1.11 (1.03-1.18)
Travel time to place where you get most of your care, in minutes squared	1.00 (1.00-1.00)	1.00 (1.00-1.00)
Male Gender (ref = women)	0.24 (0.11 – 0.54)	0.29 (0.04-2.22)
Age	0.95 (0.91-0.99)	0.89 (0.81-0.99)
Household income	1.0 (1.0-1.0)	
GED or high-school diploma	0.53 (0.17-1.64)	0.29 (0.06-1.39)
Unemployed	1.09 (0.39-3.07)	2.72 (0.32-22.87)
Car access	0.73 (0.16-3.39)	3.85 (0.31-47.18)
Married or living as married	0.48 (0.13-1.72)	0.70 (0.14-3.56)
Has primary or main partner	1.34 (0.24-7.39)	2.40(0.27-21.39)
Participant had a casual partner	1.94 (1.05-3.61)	2.77(0.47-16.37)
More than one sex partner	1.88 (0.74-4.82)	0.49(0.05-4.68)
Think partner has multiple partners	1.69 (0.75-3.81)	2.13 (1.07-4.26)
Engaged in sex work in past 6 months	1.55 (0.15-16.01)	7.90(0.64-97.23)
Uses Condom always	0.29 (0.07-1.23)	0.04 (0.00-0.54)
STI history (Ever been told by a doctor any STI)	1.42 (0.71-2.86)	0.63 (0.08-5.20)
Believed partner had an STI or HIV	0.99 (0.28-3.53)	0.13 (0.02-0.78)
Overall health rating (ref: excellent)		0.80 (0.26-2.43)
Meets screening criteria for alcohol or other drug dependence	0.64 (0.18-2.32)	0.56 (0.02-13.87)

[b] Refers to six month period ending just prior to the date when >50% of residents had relocated from the public housing complex unless otherwise specified.