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**Association of Depressive Symptoms and Condomless Anal Sex with Main and Casual Partners among Young, Black Men who have Sex with Men in Atlanta**

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Master of Public Health


Global Epidemiology


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By

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B.A., Yale University, 2014

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# Abstract

Association of Depressive Symptoms and Condomless Anal Sex with Main and Casual Partners among Young, Black Men who have Sex with Men in Atlanta

By Christina Chandra

**Background:** Young, black men who have sex with men (MSM) in the U.S. South experience higher rates of HIV and sexually transmitted infections (STIs) compared to the general population. At the same time, prevalence of depression among black MSM is high. Previous studies have found mixed results on the association between depression and condomless anal sex (CAS), the primary mode of transmission of HIV and STIs among MSM. We assessed the association between depressive symptoms and CAS by partner type – main or casual – among young, black MSM.

**Methods:** We analyzed baseline data from a cohort of young, black HIV-negative MSM in Atlanta, Georgia, who completed computer-assisted self-interviews. The PHQ-8 was used to assess depressive symptoms, and we applied a cutoff of 10 or greater to classify participants with depressive symptoms. We examined two outcomes: any CAS with a main male partner and any CAS with a casual male partner, both in the last 6 months. We used bivariable and multivariable logistic models with predicted margins to estimate the prevalence ratios of CAS with main or casual partners among MSM with depressive symptoms compared to MSM without. We identified potential confounders *a priori* using a directed acyclic graph approach.

**Results:** Among 298 participants, 40 (13.4%) had depressive symptoms. Of 251 participants with data on CAS by partner type, 122 (49.6%) reported any CAS with a main partner and 101 (41.1%) reported any CAS with a casual partner in the past 6 months. After adjusting for age, housing stability, annual household income, substance use in the past 6 months, and everyday discrimination, we found a significantly higher prevalence of CAS with a casual partner among MSM with depressive symptoms compared to those without [adjusted prevalence ratio (aPR)=1.59, 95% confidence interval (CI)=1.15-2.21] and no association between CAS with a main partner and depressive symptoms (aPR=0.90, 95% CI=0.61-1.35).

**Conclusion:** The association between depressive symptoms and CAS varies by partner type among young, black MSM in Atlanta. These findings highlight the importance of studying specific CAS outcomes in studies of sexual risk behaviors in this priority population for HIV and STI prevention.

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**INTRODUCTION**

In 2018, two-thirds of new HIV diagnoses in the United States occurred among men who have sex with men (MSM), more than half of new cases occurred in southern states, and the highest rates of HIV diagnoses were among black Americans.[1] Rates of new HIV diagnoses among adolescents and young adults aged 15 to 34 years old have increased between 2013-2017, as rates decreased for all other age groups.[1] Young MSM are also disproportionately affected by bacterial sexually transmitted infections (STIs), including chlamydia, gonorrhea, and syphilis, rates of which have reached an all-time high according to national surveillance data.[2] Black men also experience higher rates of STIs, and in 2018, there were 952 reported cases of chlamydia and 674 reported cases of gonorrhea per 100,000 black males compared to 140 reported cases of chlamydia and 80 reported cases of gonorrhea per 100,000 white males.[2] These trends are especially evident in the South, where one study of Atlanta MSM found that the prevalence of syphilis, rectal chlamydia, and urethral and rectal gonorrhea were significantly higher among black MSM compared to white MSM.[3] Understanding the risk factors associated with important routes of transmission for HIV and STIs – particularly condomless anal sex (CAS) – will be important in tailoring prevention efforts to reduce the incidence of HIV and STIs among young, black MSM.

Although research suggests that young, black MSM do not demonstrate elevated sexual risk compared to their non-black peers, they may experience different psychosocial factors that impact their likelihood of engaging in risky behaviors.[3,4] The mental health of black MSM is affected by various factors, including experiencing shunning and ostracism from previously supportive relationships when their sexual orientation is revealed; growing up under the pressures of traditional masculinity and sexuality; internalized homophobia; and facing discrimination, harassment, and violence.[5,6] The estimated prevalence of depression among black MSM in the U.S. ranges from 30-33% and is high compared to the depression prevalence of 9% among all non-Hispanic black adults in the U.S.[6–8] Depression is a particular concern among young MSM, given that the prevalence of depression among adolescents and young adults in the U.S. has increased in recent years.[9]

These mental health problems may play a role in sexual risk behaviors. For example, depression might increase risk by reducing an individual's motivation to consistently use condoms, diminishing their confidence in their ability to practice safe sex in specific situations, or increasing the likelihood of alcohol consumption or substance use that may impair decision-making around sex.[10–12] Alternatively, severe depressive symptoms might reduce sexual risk by leading to a weaker desire to engage in sexual activity or avoidance of unprotected sex that could lead to HIV or STI transmission.[13,14] Previously published cross-sectional studies have presented mixed findings on the association of depression or anxiety on sexual risk behavior. In some cross-sectional studies of MSM, researchers found no association between depressive symptoms and any CAS or any receptive CAS with a male partner.[15,16] Other studies have found that depressive symptoms were positively associated with HIV risk factors, including CAS or having an STI.[11,17–19] Another study on more than 1,000 MSM across the U.S. found that while there was no association between depressive symptoms and any CAS in the past 90 days, there was an association between depressive symptoms and receptive CAS and between depressive symptoms and an increasing number of CAS events.[20] This study emphasizes the importance in considering variability in how sexual risk behaviors are studied. These aforementioned studies considered relevant confounding factors including education, age, annual income, study site, type of partner (e.g., casual or main), antidepressant medication use, and substance use in their analyses; however, they did not adjust for other potential confounders including stigma and internalized homophobia.[21,22]

Furthermore, the association between mental health and CAS may differ by type of partner. One study of methamphetamine-using MSM found no association between depression and CAS in the past 30 days with a main partner but a 92% increased rate of CAS in the past 30 days with a casual partner among methamphetamine-using MSM in Los Angeles, California.[23] Meanwhile, condom use does not appear to vary by partner type, with national surveillance data reporting 47% of HIV-negative MSM having had CAS with a main male partner and 47% having had CAS with a casual male partner.[24] However, there is evidence that psychosocial factors, including depression, can affect condom use self-efficacy (or the ability for a partner to negotiate condom use) leading to CAS with casual partners specifically.[25] Given potential nuances in the role that mental health plays within relationship dynamics as it relates to condom

use, it is important to examine the differences in the association between depression and CAS by partner type.

In this study, we conduct a cross-sectional analysis to estimate the association between depressive symptoms and CAS with a main or casual partner among young, black MSM in Atlanta, GA as part of the EleMENt cohort study. Previous analyses on the EleMENt cohort have assessed HIV pre-exposure prophylaxis (PrEP) uptake and adherence, and these studies found that mental health outcomes were not associated with PrEP uptake or discontinuation of PrEP.[26–30] We hypothesize that depressive symptoms are associated with CAS, especially with casual partners.

## METHODS

*Study Design.* EleMENt was a longitudinal study evaluating the relationship between substance use and HIV/STI incidence among young, black MSM in Atlanta, Georgia (NCT02503618). Eligible participants were male sex at birth, currently identify as male, were HIV-negative (by serological confirmation), were between 18-29 years old, were non-Hispanic black, had anal sex with a man in lifetime, reported one or more male sexual partners in the past 3 months, and were currently living or working in the Atlanta Metropolitan Statistical Area. One participant who tested positive for acute HIV but was noted as HIV-negative at baseline was excluded from the analysis. We followed participants prospectively for 6 study visits over 24 months, and we used the baseline visit data for this analysis. At baseline, participants completed a computer-assisted self-interview (CASI) that included questions on demographics, sexual behaviors with main and casual partners, mental health, and substance use. Participants were also offered enrollment in an optional PrEP program, which has been described elsewhere.[26–30] The study was reviewed and approved by the Emory University Institutional Review Board.

*Measures.* To assess the primary exposure of depressive symptoms in participants in the last two weeks, the baseline CASI asked participants to complete the 4-item Patient Health Questionnaire (PHQ-4), a validated questionnaire that asks two questions related to depression and two questions related to anxiety. If a participant answered that they had "little interest or pleasure in doing things" or were "feeling down, depressed, or hopeless" for "more than half the days" or "nearly every day" in the past two weeks, then we further assessed the participants for depressive

symptoms with the 8-item Patient Health Questionnaire (PHQ-8). Otherwise, participants were considered to have no depressive symptoms. The PHQ-8 is a validated depressive symptom severity scale with a range of 0-24 and a recommended cutoff of 10 to indicate symptoms of major depressive disorder.[31] Similar to other studies on MSM or HIV, we classified participants with depressive symptoms if they had a PHQ-8 score of 10 or greater.[32,33]

The two main outcomes were CAS with a main male partner and CAS with a casual male partner in the past 6 months. These two outcomes were not mutually exclusive, so participants may have had CAS with both types of partners. Participants were asked whether or not they had sex with a male, how many men they had anal sex with, whether or not they had used condoms with a male anal sex partner, whether or not they had insertive or receptive CAS with a one-time or multiple-time male sexual partner, whether or not the one-time partners were main partners, and how many main partners they had insertive or receptive CAS with, all within the past 6 months. We used this information to determine whether participants had any CAS with a main or casual partner in the past 6 months. We also reported descriptive information on the number of main and casual partners in the past 12 months and whether the participant had any CAS in the past 12 months regardless of partner type.

Potential covariates included demographic information, including age (18-24 years vs. 25-29 years), highest level of education (high school or less vs. some college or more), annual household income (<$20,000 vs. ≥$20,000), primary health insurance (private vs. public vs. none), and housing stability. Public health insurance was inclusive of Medicaid, Medicare, TRICARE (CHAMPUS), Veterans Administration Coverage, and other non-private insurance. A participant was considered to have unstable housing if he moved more than once in the past 6 months, worried "a lot" about current or future housing, or had been homeless at any time in the past 6 months. We were also interested in substance use in the past 6 months, which we restricted to substances that could be injected: cocaine, methamphetamine, hallucinogens, heroin, opiates, ketamine, and speedballs. Other potential covariates were self-efficacy and everyday experiences of discrimination, measured with the General Self-Efficacy Scale (range: 9-36) [34] and Everyday Discrimination Scale (range: 0-45)[35], respectively. These scales do not have a specific cutoff and commonly vary by population. We used the median score as a cutoff point.

*Statistical Analysis.* We used bivariable and multivariable logistic models with predicted margins[36] to estimate the prevalence ratio of CAS with a main partner in the past 6 months and the prevalence ratio of CAS with a casual partner in the past 6 months, in a separate model, among participants with depressive symptoms at baseline compared to those without. We identified potential confounders *a priori* using a directed acyclic graph approach. These included age, housing stability, annual household income, use of a substance that could be injected in the past 6 months, and experience of everyday discrimination (Supplemental Figure S1). Some potential covariates were considered mediators (e.g., self-efficacy) or sufficiently controlled for with the above covariates (e.g., highest level of education), so we did not adjust for these covariates in the multivariable analysis.

*Sensitivity Analysis.* Participants were able to answer "Do not know" or "Prefer not to answer" for questions on the PHQ-8. For the main analysis, we re-coded these answers to the least extreme answer, "Not at all." To assess the robustness of our results, we conducted one-way sensitivity analyses to compare the results when all "Do not know" and "Prefer not to answer" were coded as missing or the opposite extreme, "Nearly every day" (vs. "Not at all"). We also conducted a sensitivity analysis for missing data on CAS by partner type. We re-coded missing data as either having had CAS with a main or casual partner in the past 6 months or have had no CAS with either type of partner.

**RESULTS**

Of the 298 young, black, and HIV-negative MSM included in this analysis, 40 (13.4%) had depressive symptoms and 250 (83.9%) did not have depressive symptoms. Data on depressive symptoms at baseline were missing for 8 (2.7%) participants. The average age of participants at baseline was 24 years with a standard deviation of 3 years (Table 1). Sixty-five percent of participants were in the younger age group (18-24 years) compared to 50.0% of participants with no depressive symptoms. Three-quarters of participants had attended some college or more, and 4 in 10 participants had an annual household income less than $20,000. About half of the participants had private health insurance, while 35.4% of the participants had no health insurance and 13.3% of the participants had some form of public health insurance. A higher proportion of participants with depressive symptoms had no health insurance compared

with those with no symptoms (44.4% vs. 33.9%). The majority (85.9%) of participants had stable housing, and participants with depressive symptoms experienced higher levels of unstable housing compared to those without symptoms (32.5% vs. 11.2%).

The median score of the General Self-Efficacy Scale was 32, and a higher score indicates higher self-efficacy. A greater proportion of participants with depressive symptoms had a General Self-Efficacy scale score below the median compared to those without depressive symptoms (61.5% vs. 34.2%) (Table 1). The median Everyday Discrimination Scale score was 12; a higher score indicates more frequent experiences of discrimination in a participant's daily life. Participants with depressive symptoms reported more everyday discrimination compared to those without depressive symptoms (76.9% above the median vs. 49.6%). A larger percentage of participants with depressive symptoms also reported use of a substance that could be injected in the past 6 months compared to those without symptoms (27.5% vs. 18.0%).

Overall, 79.6% of participants reported any CAS, 49.6% reported CAS with a main partner, and 41.1% reported CAS with a casual partner, all in the past 6 months (Table 1). Among participants with depressive symptoms, 79.5% had more than one main partner in the past 12 months and 47.2% reported having CAS with a main partner in that past 6 months. Among participants with no depressive symptoms, a similarly high percentage (84.5%) had more than one main partner in the past 12 months and half reported CAS with a main partner in the past 6 months. Although 62.5% of participants with depressive symptoms had two or fewer casual partners in the past 12 months compared to 47.0% of participants with no depressive symptoms, 55.6% of those with depressive symptoms reported CAS with a casual partner in the past 6 months compared with 38.6% of those without depressive symptoms.

We found no association between depressive symptoms and CAS with a main partner in both crude [prevalence ratio (PR) = 0.94, 95% confidence interval = 0.65-1.37] and adjusted [adjusted prevalence ratio (aPR) = 0.90, 95% CI = 0.61-1.35] analyses (Table 2). On the other hand, participants with depressive symptoms had a significantly higher prevalence of CAS with a casual partner in crude analysis (PR = 1.44, 95% CI = 1.02-2.02). After adjusting for age, housing stability, annual household income, substance use in the past 6 months, and everyday discrimination, participants with depressive symptoms reported a 59% higher prevalence of CAS

with a main partner compared to those without depressive symptoms (aPR = 1.59, 95% CI = 1.15-2.21).

One-way sensitivity analyses varying PHQ-8 answers and missing data for CAS with main or casual partners yielded results that were consistent with results from our main analysis. At most, 9 (3%) participants answered either "Prefer not to answer" or "Do not know" for any of the PHQ-8 questions (Supplemental Table S3). To include this data in the calculation of the PHQ-8 score, we coded these answers as "Not at all." Re-coding PHQ-8 answers from "Prefer not to answer" and "Do not know" to "Nearly every day" similarly resulted in no association between depressive symptoms and CAS with a main partner (aPR = 0.87, 95% CI = 0.58-1.30) but a significantly higher prevalence of CAS with a casual partner among those with depressive symptoms compared to those without (aPR = 1.54, 95% CI = 1.11-2.15) (Table 3). Re-coding those answers to missing also resulted in no association between depressive symptoms and CAS with a main partner (aPR = 0.82, 95% CI = 0.54-1.25) and 60% higher prevalence of CAS with a casual partner among participants with depressive symptoms compared to those without depressive symptoms (aPR = 1.60, 95% CI = 1.16-2.21).

Forty-seven (15%) participants had missing information on whether or not they have had CAS with a main or casual partner (Supplemental Table S4). Assuming these participants did not have any CAS with a main or casual partner reinforced our results that depressive symptoms were not associated with CAS with a main partner (aPR = 0.97, 95% CI = 0.63-1.47) but was associated with CAS with a casual partner (aPR = 1.82, 95% CI = 1.30-2.56) (Table 3). Assuming that participants with missing outcomes had CAS with a main or casual partner yielded no significant association between depressive symptoms and CAS with either a main (aPR = 0.76, 95% CI = 0.52-1.12) or casual partner (aPR = 1.28, 95% CI = 0.96-1.71). Forty of 47 participants with missing data on CAS by partner type had no depressive symptoms (Supplemental Table S4).

**DISCUSSION**

In a cohort of young, black, HIV-negative MSM living in Atlanta, GA, we found that having depressive symptoms was associated with higher prevalence of CAS with a casual male partner. We found no evidence that depressive symptoms were associated with CAS with a main

male partner among these MSM. Variations in sexual behaviors – by partner type, for example – may explain the variability of mixed findings on the association between depression and CAS. Differential associations between depression and specific CAS outcomes have been published elsewhere. A study that found that depression was not associated with insertive CAS but was associated with receptive CAS, which suggests that depression might also have differential effects on CAS based on sexual position among MSM.[20] The association between depression and CAS by partner type may have implications for HIV and STI transmission. One modeling study estimated that 68% of HIV infections among MSM were from main sex partners due to higher frequency of sex acts with main partners, more frequent receptive anal sex, and lower rates of condom use during anal sex with main partners.[37] Our findings underscore the importance of understanding these nuances in the relationship between depression and various sexual behavior outcomes, particularly by partner type, in studies on HIV and STI prevention among young, black MSM.

The overall prevalence of depressive symptoms (13.4%) in our sample was lower compared to the estimated 30-33% prevalence of depression among black MSM nationally.[6,7] Prevalence of depressive symptoms in our sample were also lower compared to similar studies that have assessed the association between depression and CAS in MSM, which ranged from 17% to 55%.[11,15–17,19] These studies utilized different depression screening methods, including the 2-item Patient Health Questionnaire (PHQ-2) or the Center for Epidemiologic Studies Depression Scale (CES-D), which may account for the large range in prevalence of depressive symptoms across studies. All but one of these studies, which yielded mixed findings on whether there was or was not an association between depressive symptoms and CAS, did not consider the differences between main or casual partners.[15,17,18] The study that considered partner type examined a categorical outcome called "risky sexual behavior" that combined insertive- or receptive-only CAS with having a "risky" partner defined as multiple, casual, HIV-positive or HIV-unknown partners.[11] This study found an association between having relatively more severe depressive symptoms and any CAS with a "risky" partner compared to no CAS and having no "risky" partner, which loosely aligns with our study results. Another study that found no association between depressive symptoms and either insertive or receptive CAS in the past 6 months controlled for partner type (main vs. casual) in multivariable analysis, potentially masking an association between depressive symptoms and CAS by specific partner type.[16]

Recognizing the importance of studying sexual behaviors by partner type, Pines et al. noted that they were unable to do so because their data source, the Multicenter AIDS Cohort Study, did not collect information on partner type at that time.[19]

Similar to the aforementioned studies on depression and CAS among MSM, our analysis is cross-sectional and utilizes self-reported survey data. More sophisticated models that take into consideration the time-varying nature of mental health conditions, including depressive symptoms, and the additive impact of psychosocial factors may be better equipped to explain the relationship between mental health and CAS among MSM. Longitudinal studies have examined the association of psychosocial factors on condomless anal sex within the context of syndemic theory and the minority stress model.[38,39] These models hypothesize that there are multiple psychosocial factors that are specific to the identities of sexual and racial minorities that work synergistically to impact sexual behavior. These studies have found that as MSM experience more co-occurring syndemics (e.g., childhood sexual abuse, depression, anxiety, polydrug use), they are more likely to engage in CAS.[40,41]

Our study did not explore how protective factors (e.g., resilience, self-efficacy, social support, or spirituality) may mediate the effect of depressive symptoms on sexual risk behavior.[16,42] Studies on the association between positive psychosocial factors and sexual risk is a growing area of research. A recent study found that condom use self-efficacy was associated with decreased CAS among young, black MSM residing in the New York City area.[43] Another study found evidence that the effect of syndemics, including the impact of depression, on CAS with a casual partner may be indirect and mediated by social-cognitive mechanisms like condom use self-efficacy.[25] This may be an important reason why we observed an association between depressive symptoms and CAS with a casual partner but not with a main partner, with whom MSM may have greater condom use self-efficacy.[44] Understanding the pathways through self-efficacy and other potentially protective factors may be an important area of study because these mediators can be important targets for HIV and STI prevention interventions among MSM. Clinic-based or internet-based interventions to promote positive experiences with condom use or increased condom use frequency may improve condom use self-efficacy, and these interventions are already being studied in randomized control trials.[45,46]

There are several limitations to this study. First, clinical diagnoses of depression were not assessed, so we rely only on the PHQ-8 results screening for depressive symptoms. As such, we

refer to our exposure as "depressive symptoms" rather than "depression." Clinical diagnoses would provide a more specific exposure classification. Second, complete case analysis was conducted so participants with missing data on the exposure, outcomes, or covariates were not included in the final multivariable analysis. Data were missing for only 0-6% of participants for depressive symptoms and the covariates; however, data were missing for about 16% of participants for our two main outcomes: CAS with a main partner and CAS with a casual partner (Supplemental Table S4). Sensitivity analyses suggest that our overall results are robust despite the considerable proportion of missing data for the outcomes. Third, the time during which participants experience depressive symptoms may not align with the time that participants participate in CAS. The PHQ-8 asks about depressive symptoms within the last two weeks, while questions on CAS cover the last 6 months. This may affect our results in a number of ways, including reducing the magnitude of the association between depressive symptoms and CAS if a participant did not present with depressive symptoms at baseline but depressive symptoms would have been detected at the time he engaged in CAS in the past 6 months. Finally, results from this population may not be transportable to other populations outside of young, black MSM in Atlanta due to the unique experiences and stressors related to being young, black, and a sexual minority in an urban locale in the South that may influence mental health and social norms around CAS in this group.

In summary, depressive symptoms among a cohort of young, black MSM in Atlanta were associated with CAS with casual male partners but not main male partners. In the United States, where the HIV and STI epidemics are highly concentrated in priority populations like young, black MSM in the South, we will be unable to end these epidemics without addressing the role of depression in HIV and STI risk. As Ending the HIV Epidemic – a federal initiative to end the U.S. HIV epidemic announced in 2019 – distributes funding to Greater Atlanta counties where the HIV burden is high, mental health care should be considered for integration into HIV prevention programs.[47]

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**Table 1.** Baseline Characteristics of EleMENt Cohort Study Participants not Living with HIV by Mental Health Symptoms

| | Total[a] | | Depressive Symptoms[b] | | No Depressive Symptoms | | |
|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | P-value[c] |
| **Total Sample** | 298 | 100.0 | 40 | 100.0 | 250 | 100.0 | |
| **Age (Mean and SD)** | 24.3 | 3.3 | 23.8 | 3.1 | 24.4 | 3.0 | |
| 18 - 24 years | 151 | 52.1 | 26 | 65.0 | 125 | 50.0 | 0.08 |
| 25 - 29 years | 139 | 47.9 | 14 | 35.0 | 125 | 50.0 | |
| **Highest Level of Education Completed** | | | | | | | |
| High school or less | 73 | 25.3 | 14 | 35.0 | 59 | 23.7 | 0.13 |
| Some college or more | 216 | 74.7 | 26 | 65.0 | 190 | 76.3 | |
| **Annual Household Income (USD)** | | | | | | | |
| $0 - $19,999 | 109 | 39.9 | 15 | 41.7 | 94 | 39.7 | 0.82 |
| $20,000 or more | 164 | 60.1 | 21 | 58.3 | 143 | 60.3 | |
| **Primary Health Insurance** | | | | | | | |
| Private | 135 | 51.3 | 17 | 47.2 | 118 | 52.0 | 0.43 |
| Public | 35 | 13.3 | 3 | 8.3 | 32 | 14.1 | |
| None | 93 | 35.4 | 16 | 44.4 | 77 | 33.9 | |
| **Stable housing[c]** | | | | | | | |
| Yes | 249 | 85.9 | 27 | 67.5 | 222 | 88.8 | <0.001 |
| No | 41 | 14.1 | 13 | 32.5 | 28 | 11.2 | |
| **General Self-Efficacy (range: 9-36)** | | | | | | | |
| < 32 (median) | 117 | 41.6 | 24 | 61.5 | 93 | 34.2 | 0.01 |
| ≥ 32 | 164 | 58.4 | 15 | 38.5 | 179 | 65.8 | |
| **Everyday Discrimination (range: 0-45)** | | | | | | | |
| < 12 (median) | 132 | 46.6 | 9 | 23.1 | 123 | 50.4 | 0.002 |
| ≥ 12 | 151 | 53.4 | 30 | 76.9 | 121 | 49.6 | |
| **Substance Use in Past 6 Months[d]** | | | | | | | |
| Yes | 56 | 19.3 | 11 | 27.5 | 45 | 18.0 | 0.16 |
| No | 234 | 80.7 | 29 | 72.5 | 205 | 82.0 | |
| **Number of Main Partners (Past 12 Months)** | | | | | | | |
| ≤ 1 | 46 | 16.2 | 8 | 20.5 | 38 | 15.5 | 0.43 |
| > 1 | 238 | 83.8 | 31 | 79.5 | 207 | 84.5 | |
| **Number of Casual Partners (Past 12 Months)** | | | | | | | |
| ≤ 2 | 142 | 49.1 | 25 | 62.5 | 117 | 47.0 | 0.07 |
| > 2 | 147 | 50.9 | 15 | 37.5 | 132 | 53.0 | |
| **Any CAS (Past 6 Months)** | | | | | | | |
| Yes | 227 | 79.6 | 35 | 87.5 | 192 | 78.4 | 0.21 |
| No | 58 | 20.4 | 5 | 12.5 | 53 | 21.6 | |
| **CAS with a Main Partner (Past 6 Months)** | | | | | | | |
| Yes | 122 | 49.6 | 17 | 47.2 | 105 | 50.0 | 0.76 |
| No | 124 | 50.4 | 19 | 52.8 | 105 | 50.0 | |
| **CAS with a Casual Partner (Past 6 Months)** | | | | | | | |
| Yes | 101 | 41.1 | 20 | 55.6 | 81 | 38.6 | 0.06 |
| No | 145 | 58.9 | 16 | 44.4 | 129 | 61.4 | |

Abbreviations: CAS, condomless anal sex; GED, general education development; SD, standard deviation

[a] Frequencies may not add up to total sample due to missing data

[b] PHQ-8 ≥ 10

[c] P-values derived from Chi-square or Fisher's exact tests

[c] Unstable housing defined as having been homeless in the past 6 months, moving more than 3 times in the past 6 months, and feeling "a lot" worried about their current housing situation

[d] Substances include: cocaine, methamphetamines, hallucinogens, heroin, opiates, ketamine, speedballs

**Table 2.** Bivariable and Multivariable Associations of Condomless Anal Sex with a Main or Casual Partner with Depressive Symptoms Among EleMENt Cohort Study Participants

| | Condomless Anal Sex with a Main Partner | | | | Condomless Anal Sex with a Casual Partner | | | |
|---|---|---|---|---|---|---|---|---|
| | Unadjusted[a] | | Adjusted[a] | | Unadjusted | | Adjusted[a] | |
| | PR | 95% CI | PR | 95% CI | PR | 95% CI | PR | 95% CI |
| **Depressive Symptoms** | | | | | | | | |
| No | *Ref* | | *Ref* | | *Ref* | | *Ref* | |
| Yes | 0.94 | (0.65, 1.37) | 0.90 | (0.61, 1.35) | 1.44 | (1.02, 2.02) | 1.59 | (1.15, 2.21) |

[a] Adjusted for age, housing stability, annual household income, substance use in the past 6 months, and everyday discrimination


**Table 3.** One-way Sensitivity Analyses to Understand Changes Related to Coding of PHQ-8 Answers

| | Condomless Anal Sex with a Main Partner | | | | Condomless Anal Sex with a Casual Partner | | | |
|---|---|---|---|---|---|---|---|---|
| | Unadjusted | | Adjusted[a] | | Unadjusted | | Adjusted[a] | |
| | PR | 95% CI | PR | 95% CI | PR | 95% CI | PR | 95% CI |
| **PHQ-8 Re-coding to "Nearly every day"[b]** | | | | | | | | |
| No Depressive Symptoms | *Ref* | | *Ref* | | *Ref* | | *Ref* | |
| Depressive Symptoms | 0.91 | (0.63, 1.33) | 0.87 | (0.58, 1.30) | 1.39 | (0.99, 1.97) | 1.54 | (1.11, 2.15) |
| **PHQ-8 Re-coding to missing[c]** | | | | | | | | |
| No Depressive Symptoms | *Ref* | | *Ref* | | *Ref* | | *Ref* | |
| Depressive Symptoms | 0.88 | (0.60, 1.30) | 0.82 | (0.54, 1.25) | 1.44 | (1.03, 2.01) | 1.60 | (1.16, 2.21) |
| **Missing CAS with main or casual partner re-coding to no CAS[d]** | | | | | | | | |
| No Depressive Sympoms | *Ref* | | *Ref* | | *Ref* | | *Ref* | |
| Depressive Symptoms | 0.98 | (0.65, 1.46) | 0.97 | (0.63, 1.47) | 1.59 | (1.12, 2.27) | 1.82 | (1.30, 2.56) |
| **Missing CAS with main or casual partner re-coding to CAS[e]** | | | | | | | | |
| No Depressive Sympoms | *Ref* | | *Ref* | | *Ref* | | *Ref* | |
| Depressive Symptoms | 0.84 | (0.60, 1.17) | 0.76 | (0.52, 1.12) | 1.22 | (0.91, 1.62) | 1.28 | (0.96, 1.71) |

Abbreviations: CAS, condomless anal sex; PHQ-8, 8-item Patient Health Questionnaire
[a] Adjusted for age, housing stability, annual household income, substance use in the past 6 months, and everyday discrimination
[b] "Prefer not to answer" and "Do not know" re-coded as "Nearly every day" for PHQ-8 answers
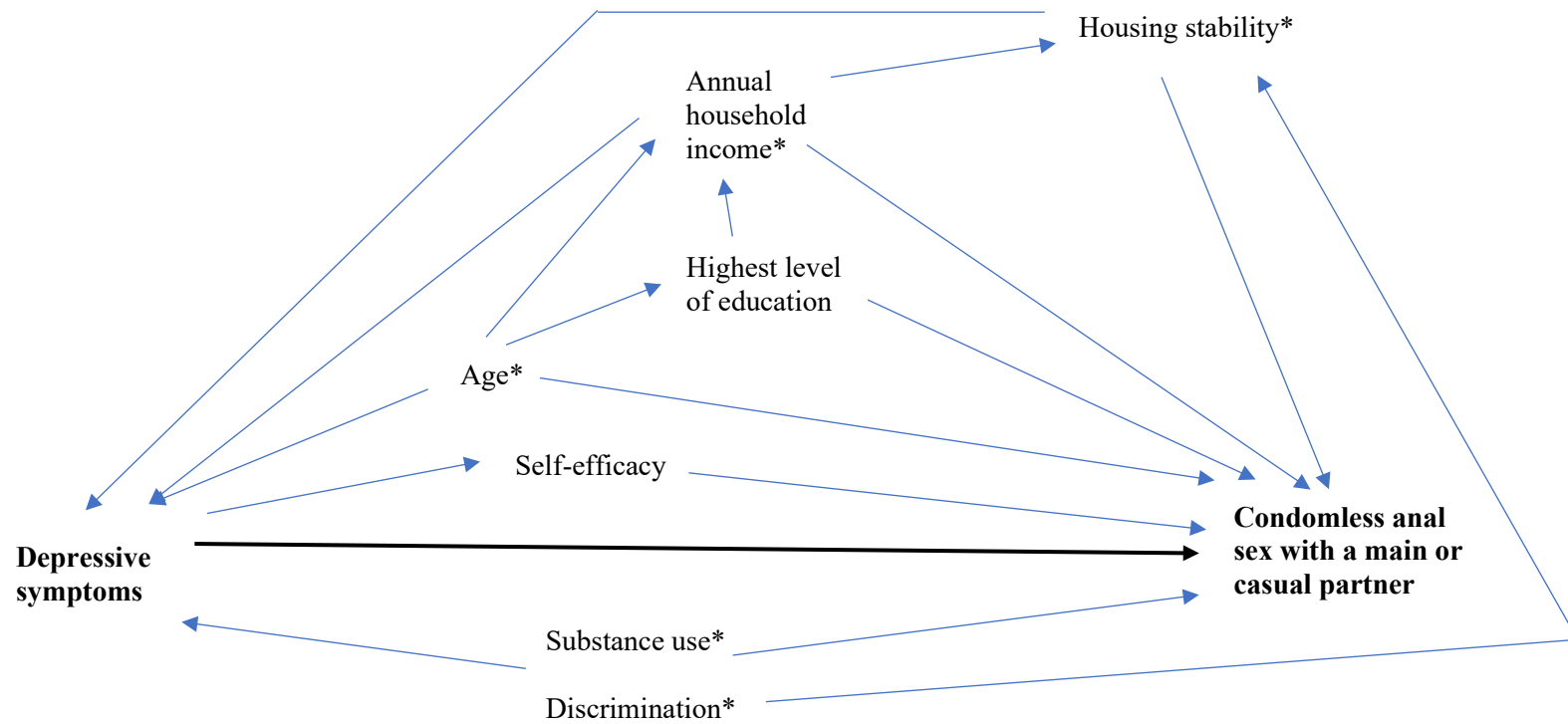[c] "Prefer not to answer" and "Do not know" re-coded as missing for PHQ-8 answers
[d] Missing CAS with a main or casual partner re-coded to no CAS (0)
[e] Missing CAS with a main or casual partner re-coded to CAS (1)

# Appendix. Supplementary Material

**Supplemental Figure S1.** Directed Acyclic Graph (DAG)



*Controlled for in adjusted analyses

**Supplemental Table S2.** Baseline Characteristics of EleMENt Cohort Study Participants not Living with HIV by Condomless Anal Sex in the Past 6 Months

| | Main Partner | | | | Casual Partner | | | |
|---|---|---|---|---|---|---|---|---|
| | Condomless Anal Sex | | No Condomless Anal Sex | | Condomless Anal Sex | | No Condomless Anal Sex | |
| | N | % | N | % | N | % | N | % |
| **Total Sample**[a] | 122 | | 129 | | 101 | | 151 | |
| **Age (Mean and SD)** | 24.2 | 3.1 | 24.5 | 3.1 | 24.9 | 3.1 | 24.0 | 3.1 |
| 18 - 24 years | 68 | 55.7 | 62 | 48.1 | 46 | 45.5 | 84 | 56.0 |
| 25- 29 years | 54 | 44.3 | 67 | 51.9 | 55 | 54.5 | 66 | 44.0 |
| **Highest Level of Education Completed** | | | | | | | | |
| High school or less | 31 | 25.4 | 30 | 23.4 | 25 | 24.8 | 36 | 24.2 |
| Some college or more | 91 | 74.6 | 98 | 76.6 | 76 | 75.2 | 113 | 75.8 |
| **Annual Household Income (USD)** | | | | | | | | |
| $0 - $19,999 | 41 | 35.3 | 59 | 49.6 | 40 | 42.6 | 60 | 42.6 |
| $20,000 or more | 75 | 64.7 | 60 | 50.4 | 54 | 57.4 | 81 | 57.4 |
| **Primary Health Insurance** | | | | | | | | |
| Private | 65 | 57.0 | 52 | 47.3 | 44 | 47.3 | 73 | 55.7 |
| Public | 12 | 10.5 | 18 | 16.4 | 15 | 16.1 | 15 | 11.5 |
| None | 37 | 32.5 | 40 | 36.4 | 34 | 36.6 | 43 | 32.8 |
| **Stable housing**[b] | | | | | | | | |
| Yes | 104 | 85.2 | 106 | 82.8 | 85 | 84.2 | 125 | 83.9 |
| No | 18 | 14.8 | 22 | 17.2 | 16 | 15.8 | 24 | 16.1 |
| **Everyday Discrimination (range: 0-45)** | | | | | | | | |
| < 12 (median) | 58 | 48.3 | 58 | 47.5 | 44 | 44.0 | 72 | 50.7 |
| ≥ 12 | 62 | 51.7 | 64 | 52.5 | 56 | 56.0 | 70 | 49.3 |
| **General Self-Efficacy (range: 9-36)** | | | | | | | | |
| < 32 (median) | 40 | 33.9 | 57 | 47.5 | 42 | 42.4 | 55 | 39.6 |
| ≥ 32 | 78 | 66.1 | 63 | 52.5 | 57 | 57.6 | 84 | 60.4 |
| **Substance Use in Past 6 Months**[c] | | | | | | | | |
| Yes | 21 | 17.2 | 26 | 20.2 | 23 | 22.8 | 24 | 16.0 |
| No | 101 | 82.8 | 103 | 79.8 | 78 | 77.2 | 126 | 84.0 |
| **Depressive Symptoms**[d] | | | | | | | | |
| Yes | 17 | 13.9 | 19 | 15.3 | 20 | 19.8 | 16 | 11.0 |
| No | 105 | 86.1 | 105 | 84.7 | 81 | 80.2 | 129 | 89.0 |

Abbreviations: SD, standard deviation; USD, U.S. Dollars

[a] Frequencies may not add up to total sample due to missing data

[b] Unstable housing defined as having been homeless in the past 6 months, moving more than 3 times in the past 6 months, and feeling "a lot" worried about current or future housing situation

[c] Substances include: cocaine, methamphetamines, hallucinogens, heroin, opiates, ketamine, speedballs

[d] PHQ-8 ≥ 10

**Supplemental Table S3.** Characterizing PHQ-8 answers ("Prefer not to answer" and "Don't know") that are re-coded to 0 ("Not at all")

| PHQ-8 Questions | "Prefer not to answer" | "Don't know" | Total | % of Total Observations (N=298) |
|---|---|---|---|---|
| Little interest or pleasure in doing things? | 2 | 7 | 9 | 3.0 |
| Feeling down, depressed, or hopeless? | 1 | 5 | 6 | 2.0 |
| Trouble falling or staying asleep, or sleeping too much? | 0 | 0 | 0 | 0.0 |
| Feeling tired or having little energy? | 0 | 0 | 0 | 0.0 |
| Poor appetite or overeating? | 0 | 0 | 0 | 0.0 |
| Feeling bad about yourself - or that you are a failure or have let yourself or your family down? | 1 | 0 | 1 | 0.3 |
| Trouble concentrating on things, such as reading the newspaper or watching television? | 0 | 0 | 0 | 0.0 |
| Moving or speaking so slowly that other people could have noticed, or the opposite - being so fidgety or restless that you have been moving around a lot more than usual? | 0 | 2 | 2 | 0.7 |

Abbreviations: PHQ-8, 8-item Patient Health Questionnaire

**Supplemental Table S4.** Total Number of Missing Data for Each Covariate at Baseline

| | No. Missing with Depressive Symptoms | No. Missing with No Depressive Symptoms | No. Missing with Missing Depressive Symptoms | Total Missing | % of Total Observations (N=298) |
|---|---|---|---|---|---|
| Depressive Symptoms | - | - | - | 8 | 2.7 |
| Condomless Anal Sex (CAS) | 5 | 0 | 1 | 6 | 2.0 |
| Income | 13 | 4 | 2 | 19 | 6.4 |
| Housing Stability | 0 | 0 | 1 | 1 | 0.3 |
| Everyday Discrimination | 6 | 1 | 3 | 10 | 3.4 |
| Substance Use | 0 | 0 | 0 | 0 | 0.0 |
| Main Partners | 5 | 1 | 2 | 8 | 2.7 |
| Casual Partners | 1 | 0 | 0 | 1 | 0.3 |
| CAS with Main Partner | 40 | 4 | 3 | 47 | 15.8 |
| CAS with Casual Partner | 40 | 4 | 3 | 47 | 15.8 |