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Prescription opioid use in a population-based sample of young black men who have sex with men: A longitudinal cohort study

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Abstract

Background: Prescription opioid use (POU) among young adults is increasing. This represents a major public health concern due to the increased risks of opioid use misuse and opioid-related overdose. Limited research has examined the POU among young black men who have sex with men (YBMSM), a diverse group experiencing continued increases in HIV incidence over the past decade.

Objective: The current study aims to examine the prevalence and both the individual and network characteristics of POU among YBMSM.

Methods: Data come from a longitudinal cohort study of 16–29 year old YBMSM (N =514) between 2013 and 2016 in Chicago. Bivariate and multivariable associations were estimated using general estimating equations (GEE).

Results: Approximately 4.2% of YBMSM reported POU in the past 12 months with a cumulative incidence rate of 4.1% over the 18-month follow-up period. YBMSM having criminal justice involvements, experiencing violence, or using any illicit drug other than marijuana in the past 12 months were more likely to report POU in the past 12 months. The presence of a mother figure, however, was associated with a decreased risk of POU in the past 12 months, while engaging in condomless anal sex with their named sexual partners was associated with an increased risk of POU in the past 12 months.

Conclusions: This is one of the first studies to describe POU among a population-based sample of YBMSM. The high incidence rate of POU among YBMSM is alarming, and it underscores the need for further analysis on POU among this key population.

Keywords

prescription opioid use; young men who have sex with men (YMSM); Black; longitudinal analysis

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Disclosure of interest

The authors report no conflicts of interest.

INTRODUCTION

In the United States, prescription opioid-related use among adolescents and young adults is a major and growing public health concern (Martins et al., 2017; McCabe et al., 2017). Between 1997 and 2009, the annual prevalence of prescription opioid use (POU) among 12th graders increased, nearly tripling from 3.3% to 9.5% (Johnston & Bachman, 2018). Among adolescents in the United States, lifetime medical prescription opioid use has been shown to be highly correlated with nonmedical opioid use (McCabe et al., 2017). Moreover, past research has found that the use of prescribed opioids before the 12th grade is independently associated with future opioid misuse (Miech, Johnston, O'Malley, Keyes, & Heard, 2015).

Some studies suggest that when compared to general populations, gay, bisexual, and men who have sex with men (MSM) but do not identify as gay or bisexual may have a higher rate of prescription drug misuse including prescription opioid analgesics (Benotsch, Martin, Koester, Cejka, & Luckman, 2011; Cochran, Ackerman, Mays, & Ross, 2004; Corliss et al., 2010; Kelly & Parsons, 2010; Li & Mustanski, 2018). In a recent study among a convenience sample of young MSM in Chicago, 32.4% had used and 11% had misused prescription opioids at least once over their lifetime (Li & Mustanski, 2018). It has also been found that prescription opioid-using MSM have an escalated HIV risk, which can be attributed to a larger number of sex partners (Benotsch et al., 2011), lower condom use during anal sex (Benotsch et al., 2011; Kecojevic, Silva, Sell, & Lankenau, 2015; Kelly & Parsons, 2013), and greater illicit drug use and drug injection (Benotsch et al., 2011; Buttram, Kurtz, Surratt, & Levi-Minzi, 2014). Furthermore, MSM using prescription opioids have also been associated with stressful life events such as mental health distress (Buttram et al., 2014; Kecojevic, Wong, Corliss, & Lankenau, 2015; Li, Turner, Mustanski, & Phillips II, 2018), childhood abuse (Kecojevic, Wong, et al., 2015), victimization and arrest history (Buttram et al., 2014), and economic hardships (Benotsch et al., 2011). Past studies have indicated racial differences in POU among young MSM (YMSM) (Kecojevic, Wong, et al., 2015). Compared to White YMSM, YMSM who were racial minorities were less likely to use prescription drugs (Kecojevic, Wong, et al., 2015), possibly due to the lack of access to healthcare or a lack of health insurance (Dasgupta, Beletsky, & Ciccarone, 2018; Palamar, Shearston, Dawson, Mateu-Gelabert, & Ompad, 2016). However, according to the National HIV Behavioral Surveillance, there was an increasing trend in opioid use among Black MSM from 2008 to 2014 (Hoots, Broz, Nerlander, & Paz-Bailey, 2017). Young Black MSM (YBMSM) represent one of the only populations where HIV incidence has continued to climb in the past decade (CDC, 2017). As CDC estimated, 1 in 2 YBMSM aged 13–34 are expected to be diagnosed with HIV during their lifetime (CDC, 2016). Thus, this group bears the heaviest burden of HIV in the United States. Given YBMSM already bear a high burden of HIV epidemics, an increase in opioid use may further heighten the risk of exposure to HIV, which could result in cumulative or synergistic effects impacting HIV care continuum outcomes. To date, POU among YBMSM and its associated individual and network factors have rarely been explored using a population-based sample. Additional research is needed to examine POU among YBMSM and to examine what individual vulnerabilities and social contexts, in particular, foster HIV and opiate-related use behaviors.

Sexual and social networks also play important roles in influencing sex and drug-use behaviors among MSM (Amirkhanian, 2014; Schneider, Cornwell, et al., 2017). However, it remains unclear if engaging in specific sexual behaviors (e.g., condomless anal sex, transactional sex) with sexual network members is associated with risks of POU among YBMSM (Benotsch et al., 2011; Kecojevic, Silva, et al., 2015; Kelly & Parsons, 2013). Additionally, it is also unclear whether support from close personal network members (e.g., parental figures) or house and ball communities (social and cultural kinship systems that offer support for the Black gay community) is associated with risks of POU, given that increased network support is associated with reduced stress regarding identity, homophobia, and racism among YBMSM (Schneider, Michaels, & Bouris, 2012; Wohl et al., 2011; Wong, Schrager, Holloway, Meyer, & Kipke, 2014). Furthermore, socioeconomic disadvantage such as poverty and lack of opportunity is also associated with increased POU (Dasgupta et al., 2018). The similarity of network members' socioeconomic status with participants may be important in influencing a person's POU by establishing an immediate social environment with limited resources to access services and support. No research has examined whether the similarity of socioeconomic disadvantage of YBMSM and their network members is associated with POU, especially among YBMSM who generally have insufficient resources due to racism and homophobia (Arnold, Rebchook, & Kegeles, 2014). Understanding the network context for POU among YBMSM can better inform the development of network-based interventions which have been shown to be an effective approach for YBMSM populations (Ferreira, Young, & Schneider, 2018).

The purpose of the current study is to begin filling these gaps by describing the use of any prescription opioids that has been linked to the progressive use of injection drugs and polysubstance use regardless of whether opioids are used medically or nonmedically (Kolodny et al., 2015). We examine the prevalence of POU among YBMSM as well as the individual and network correlates of POU among YBMSM longitudinally.

METHODS

Study design and sample

Participants were recruited from the uConnect longitudinal cohort study. The uConnect study is designed to examine demographic, social, and behavioral factors of HIV-related outcomes from a population-based sample of YBMSM. Study design and sampling strategy have been described elsewhere and are summarized here (Schneider, Cornwell, et al., 2017). Using respondent-driven sampling (RDS), the baseline survey was conducted between June 2013 and July 2014 (n=618). Thereafter, the respondents completed two additional follow-up surveys (there was a gap of 9 months between each survey). Eligibility criteria at baseline for this study included the following: respondents who self-identified as African American or Black, were assigned male at birth, were at an age between 16 and 29 years (both inclusive), reported oral or anal sex with a male during the past 24 months, spent the majority of their time in South Chicago or the adjacent South suburbs, and were willing and able to provide informed consent. The Institutional Review Board approval has been obtained for all study procedures. In the present work, we use data from all three waves of this study.

Study variables

Prescription opioid use outcome—The measure of use of any prescription opioids was a “yes” or “no” question that asked, “Have you used prescription painkillers (oxycodone, vicodin, T3, etc) in the past 12 months?”

Individual characteristics—We included sociodemographic characteristics (i.e., age, sexual orientation, less than high school educational attainment, economic hardship), access to health care (i.e., having a primary care provider and having health insurance), the lifetime number of male and transgender women sexual partners, positive or unknown HIV status (based on the HIV testing that was offered during interview). For situational factors, we included the occurrence of stressful life events (i.e., lifetime involvement with the criminal justice system and the experience of violence in their lifetime) and substance use (i.e., binge drinking, marijuana use, and any illicit drug use other than marijuana). For mental health symptoms, we included depressive, anxiety, somatic, and panic symptoms assessed using the brief symptom inventory-18 (Derogatis, 2001). For support systems, we included having a father/mother figure present and being a member of a house/ball or gay family. Lifetime criminal justice involvement and lifetime number of male and transgender women sexual partners were not normally distributed. Therefore, square root and logarithm transformations were applied, respectively.

Network (dyadic) characteristics—For dyadic sexual network characteristics, we included sexual behavior variables with the named sexual partners (i.e., engaging in sex-drug use, engaging in condomless anal sex, and engaging in transactional sex). To capture the concurrence of demographic characteristics between sexual partners and participants, we assessed whether a sexual partner was 10 years older than the participant, whether the sexual partner and the participant both had less than high school educational attainment, whether they were both unemployed, and whether they were both HIV positive or had unknown status (sexual partner’s HIV status was based on participant’s report, and participant’s HIV status was based on HIV testing during interview).

For dyadic confidant characteristics, we included social support from the named confidant (i.e., the status of as MSM, the disclosure of their status as MSM, and/or the ability of participants to ask for money). We also assessed the concurrence of demographic characteristics between confidants and participants, including educational attainment both less than high school, both unemployed, and both HIV positive or unknown.

Each dyadic network variable was calculated as the proportion of the network characteristics among a participant’s sexual and confidant network (e.g., the proportion of a participant’s confidants that were also MSM) as in previous social network research (Schneider et al., 2013). Both individual and network variables were selected based on our prior work and their relevance to the YBMSM population (Morgan et al., 2016; Schneider, Lancki, & Schumm, 2017; Skaathun, Voisin, Cornwell, Lauderdale, & Schneider, 2018; Young et al., 2017).

Statistical analyses

We excluded participants if they did not participate in the baseline survey and at least one follow-up survey ($n = 71$). We also excluded participants who identified as transgender women since the focus of the current study was MSM ($n = 33$). We calculated RDS weighted and unweighted prevalence. As in our previous work (Khanna et al., 2016), RDS weights were calculated using Gile's Sequential Sampling (SS) estimator (Gile & Handcock, 2010) using the RDS package in the R programming language (Mark S Handcock, Gile, Fellows, & Neely, 2017). Adjusted prevalence and incidence of POU were computed using the SS estimator. We assessed the distribution of individual and network characteristics by POU in the past 12 months at baseline using chi-square and t tests. To examine factors associated with POU in the past 12 months, weighted logistic regressions using generalized estimating equations (GEE) with robust standard errors and exchangeable correlation matrix were implemented because we used a repeated-measures design (i.e., measurements for each participant repeated 3 times). Two-sided p-values and unadjusted and adjusted odds ratios with 95% confidence intervals were computed, and statistical significance was assessed at $p < 0.05$. All statistical analyses were performed using STATA software version 14.2 (StataCorp LP, Texas) and R.

RESULTS

1. Prevalence and baseline characteristics

A total of 514 participants were included in the current analysis at the baseline, 493 at wave 2, and 478 at wave 3. At baseline, 24 participants reported any use of prescription opioids in the past 12 months (the weighted prevalence of POU in the past 12 months was 4.2%; the unweighted prevalence of POU in the past 12 months was 4.7%). Over the 18-month follow-up period, 18 participants reported no use of prescriptive opioids in the past 12 months at baseline but reported past-year use of prescription opioids at wave 3 (the weighted cumulative incidence was 4.1%; the unweighted cumulative incidence was 3.6%).

As shown in Table 1, among YBMSM who used prescription opioids in the past 12 months at baseline, 25.0% reported less than high school educational attainment, 41.7% had experienced economic hardship (i.e., residential transience and insufficient resources), and 87.5% had experienced violence. Each of these characteristics were significantly higher among those who used prescription opioids in the past 12 months than those who had not used prescription opioids in the past 12 months ($p < 0.05$).

For dyadic sexual network characteristics, among YBMSM reporting POU in the past 12 months at baseline, on average 34.5% of a participant's sexual partners had engaged in condomless anal sex with the participant, and 7.1% of a participant's sexual partners had engaged in transactional sex with the participant. All of these dyadic sexual network characteristics were significantly higher among those who reported POU in the past 12 months than those who did not ($p < 0.05$).

For dyadic confidant network characteristics, among YBMSM who used prescription opioids in the past 12 months at baseline, on average 0.9% of a participant's confidant network members had less than high school educational attainment as the participant and

84.1% of a participant's confidant network members were those of whom participants could ask for money. These proportions were significantly higher among those who reported POU in the past 12 months than those did not ($p < 0.05$).

2. Individual and network correlates

Table 2 displays results from bivariate and multivariable GEE analyses that show correlates of prescription opioid use in the past 12 months. After adjusting for individual sociodemographic characteristics and variables that were significant in the bivariate models, the multivariable GEE model demonstrates that YBMSM who were in economic hardship (OR 3.77, 95% CI 1.14–12.42), involved in the criminal justice system (OR 1.63, 95% CI 1.19–2.24), had been an victim of violence (OR 4.36, 95% CI 1.55–12.28), or had used any illicit drug other than marijuana (OR 3.42, 95% CI 1.53–7.68) were more likely to report POU in the past 12 months. In contrast, YBMSM who had a mother figure were significantly less likely to report POU in the past 12 months (OR 0.27, 95% CI 0.10–0.71). Mental health symptoms were significant in bivariate models but were not significantly associated with POU in the multivariable model. In terms of dyadic sexual network characteristics, YBMSM who had engaged in condomless anal sex were more likely to report POU in the past 12 months (OR 4.07, 95% CI 1.35–12.22). None of the dyadic confidant characteristics were found to be significantly associated with POU in the past 12 months.

DISCUSSION

In this cohort of YBMSM aged 16–29 in Chicago, approximately 4.2% reported POU in the past 12 months with a weighted POU incidence rate of 4.1% just over an 18-month follow-up period. We examined both individual and dyadic network correlates of POU in the past 12 months. For individual correlates, we found several risk factors for POU in the past 12 months, including involvement with the criminal justice system, the experience of violence at any point in one's lifetime, and the use of any illicit drug other than marijuana in the past 12 months; we also found the presence of a mother figure for YBMSM is a protective factor from POU in the past 12 months. For dyadic network correlates, we found that engaging in condomless anal sex with named sexual partners was associated with an increased risk of POU in the past 12 months. To our knowledge, this study is among the first to describe POU exclusively among YBMSM and the first to examine the longitudinal relationships between correlates and POU among YBMSM in the US.

The incidence rate of any prescription opioid use found in the current study indicates that there is an increasing trend of POU among YBMSM. Consistent with findings from the National HIV Behavioral Surveillance, which indicated although the overall prevalence of POU among MSM did not significantly increase (7.5% in 2008 to 7.8% in 2014), there is an increase in POU among black MSM (Hoots et al., 2017). The *Monitoring the Future* has also shown an increasing trend of POU among black adolescents in the past decade (around 4% of nonmedical use and 8% of medical use in 2008 to 9% of nonmedical use and 12% of medical use among black adolescents) (McCabe et al., 2017). Given that POU is highly

correlated with continued use of injection drugs and polysubstance use, further work and analysis on POU and HIV prevention among YBMSM is required (Kolodny et al., 2015).

Broadly consistent with past studies, we found that illicit drug use (other than marijuana) is associated with an increased risk of POU (Buttram et al., 2014; Li & Mustanski, 2018; Li et al., 2018). Our data did not allow us to examine whether the illicit drugs were used in combination with prescription opioids or in sequence. While we do not know the temporality of drug use, our results do confirm that illicit drug use is a significant correlate for POU among YBMSM. Prior research has found that the polysubstance use of illicit drugs and prescription opioids among YBMSM reflect a strategy to cope with the everyday stress, such as a lack of opportunity and racial discrimination (Voisin, Hotton, Schneider, & Team, 2017). Consistent with these findings, we observed that being a victim of violence at any point is associated with POU in the past 12 months. Research has shown that traumatizing experience or mental health stressors such as childhood physical abuse is significantly associated with POU in MSM (Kecojevic, Wong, et al., 2015) and Black populations (Nicholson & Ford, 2018). We suggest that POU may be a way to escape from stressful states because of calming and relaxing effects of prescription opioids (Sullivan, Edlund, Zhang, Unützer, & Wells, 2006; Voisin et al., 2017). However, in contrast with past research on Black men (Knighton, Stevens-Watkins, Staton, & Pangburn, 2018), we did not find significant associations between mental health symptoms and POU in our sample in the multivariable model. It is possible that variables included in the multivariable model, such as substance use, may lie in the causal pathway between mental health symptoms and POU (i.e., mediators). Therefore, the significant bivariate relationships between mental health symptoms and POU became non-significant in the multivariable model due to the control of possible mediators. It is also worth noting that we also did not find a significant association between marijuana use and POU. Marijuana is often used to treat chronic pain. The results with regards to the association between marijuana use and POU are unclear. While some studies have indicated the marijuana use is associated with a decrease in the risk of POU among patient with chronic pain (Boehnke, Litinas, & Clauw, 2016), a recent large-scale longitudinal study found that marijuana use actually increases the risk of nonmedical POU within a general population (Olfson, Wall, Liu, & Blanco, 2017). Uncovering the mechanism through which marijuana use influences POU, if at all, requires more rigorous investigation.

We have also found that lifetime criminal justice involvement is associated with an increased POU in the past 12 months. YBMSM involved in the criminal justice system may encounter multiple other risk factors (e.g. poverty, illicit drug use), and therefore have a heightened vulnerability to POU because of the syndemic effect (Knighton et al., 2018; Wilson et al., 2014). Further, we observed a syndemic effect in the relationship between economic hardship and POU in our sample. A recent study conducted among criminal justice-involved black men revealed that over 20% of their sample reported nonmedical opioid use (Knighton et al., 2018). Given the high incarceration rate among black MSM (Brewer et al., 2014), future research is needed to understand POU or nonmedical opioid use among criminal justice involved YBMSM. Our results highlight the needs of providing comprehensive and culturally-specific drug use treatment for YBMSM who have experienced or are experiencing an involvement with the criminal justice system.

A noteworthy finding is that, for YBMSM, having a mother figure present was associated with a lower risk of POU in the past 12 months. Research has shown that parental support and encouragement are protective to nonmedical use of prescription opioid use in a national representative sample of adolescents (Vaughn, Nelson, Salas-Wright, Qian, & Schootman, 2016). Furthermore, our prior work conducted among YBMSM has also shown that the presence of one or more family members in their close personal network is associated with less HIV risk, especially when male family members are present (Schneider et al., 2012). In the current study, however, we did not find a significant protective effect of the presence of a father figure on POU. We also did not find a significant protective effect of confidants' support (e.g., confidants who were likely to loan money or confidants to whom MSM status was disclosed) on POU. More studies on the effects of family support, parental involvement, and support from social networks on POU are warranted (Nargiso, Ballard, & Skeer, 2015).

We find that engaging in condomless anal sex within participants' sexual networks is associated with an increased risk of POU in the past 12 months among YBMSM. Again, this may reflect the synergistic effect of socioeconomic disadvantage and structural barriers to health services on risky behaviors. The majority of the YBMSM in our sample resided in the south side of Chicago, which, despite its diversity and resiliency, has concentrated poverty, unemployment, and long-standing segregation (Skaathun et al., 2018; Young et al., 2017). The concentrated disadvantage may limit YBMSM's ability to access condoms or to negotiate condoms during anal sex (e.g., clients who negotiate a higher pay for condomless anal sex during transactional sex). Similarly, the concentrated disadvantage also increases the risk of POU. A recent review indicates that structural disadvantages such as poverty, lower social class, and lack of opportunity is one of the root causes of the US opioid crisis (Dasgupta et al., 2018). The association between condomless anal sex and POU should be cautiously investigated in this context.

Although the concurrence of unemployment between sexual network members and participants is a significant risk factor for POU in the bivariate model, the effect no longer existed when other network covariates were entered. We found a similar pattern for the concurrence of less than high school educational attainment between confidant network members and participants. Since sexual and confidant network members can establish immediate interpersonal environments that either enable or discourage POU (e.g., access to prescription opioids via friends/family) (Yedinak et al., 2016), future studies are warranted to further investigate the effects of network characteristics on POU, including sociodemographic concurrence, among prescription opioid users.

Limitations

As with any study, our findings are interpreted with regard to key limitations. First, many variables included in the current study were derived from self-reported data, including reports of network members. We did not directly interview network members. Therefore, the absence of network members' characteristics could be a concern; there data, however, are comparable to most other network datasets where elicitation of third parties are conducted (Latkin et al., 2012; Mustanski et al., 2019). Second, we did not collect detailed data on POU, such as medical or nonmedical use or the quantity or severity of POU. Similarly, we

did not collect information on self-reported opioid use disorder or a history of opioid-related overdose, both of which would be clinically relevant to POU. We were also not able to disaggregate illicit drug use into the proportion that is nonmedical opioid. Third, some differences were found between those who were lost to follow-up and those who were retained. For instance, in the current study, a higher proportion of those who were lost to follow-up reporting were unemployed and lacked father figures as compared to those who were retained. However, a sensitivity analysis of the participants showed no significant differences between those lost to follow-up and those included in our models. Finally, the use of RDS requires discussion. An RDS approach has two particular purposes. First, it provides a mechanism to recruit participants who might be otherwise hard to recruit. Second, it provides a schema to generate population estimates from the data. Recent methodological developments have made it possible to both diagnose the quality of the sampling scheme and generate probability estimates (Gile, Johnston, & Salganik, 2015; M. S. Handcock, Gile, & Mar, 2015). Future studies should further assess these RDS methodological challenges to obtain generalizable results. It must be noted that even though we used RDS to generate a population-based sample of YBMSM, the results may not be generalizable to YBMSM in other regions or populations outside than the specific geographical and socioeconomic contexts of the South Side of Chicago.

Conclusions

Notwithstanding these limitations, this is one of the first studies to examine POU among a population-based sample of YBMSM, and also amongst the first to explore relationships between POU and individual and network characteristics. We have identified several individual-level and sexual network level factors that are linked to POU among YBMSM. Life stressors such as victimization and involvement with the criminal justice system are associated with POU. This suggests in addition to reducing opioid over-prescribing, structural and contextual interventions that provide educational training, mental health services, and legal services are needed, especially in the underserved communities where YBMSM reside or socialize. Furthermore, health providers who serve YBMSM should not only screen for sexual risk behaviors but ask routine questions about prescription opioid use and implement a referral strategy to supportive services. Future studies are needed to understand how social and structural environments influences POU, as well as to examine the risk of opioid use disorder, and opioid-related overdose among YBMSM.

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Table 1:

Baseline individual and network characteristics among young black men who have sex with men by prescription opioid use in the past 12 months in Chicago, uConnect, 2013 – 2014 (n = 514)

	Total (n = 514) n (%)	Prescription opioid use in the past 12 months		p value
		No (n = 490) n (%)	Yes (n = 24) n (%)	
Respondent's characteristics				
<i>Sociodemographics</i>				
Age, mean (sd)	22.9 (3.1)	22.9 (3.1)	23.7 (3.6)	0.21
Sexual orientation				
Gay	357 (69.6)	342 (69.9)	15 (62.5)	0.52
Bisexual	139 (27.1)	131 (26.8)	8 (33.3)	
Straight/ other	17 (3.3)	16 (3.3)	1 (4.2)	
Less than high school	26 (5.1)	20 (4.1)	6 (25.0)	<0.001
Economic hardship ^a				
None	166 (32.6)	160 (33.0)	6 (25.0)	0.01
Residential transience or insufficient resources	238 (46.8)	231 (47.6)	7 (29.2)	
Residential transience and insufficient resources	105 (20.6)	94 (19.4)	11 (45.8)	
Had a primary care provider	285 (55.9)	273 (56.2)	12 (50.0)	0.55
Having a health insurance	279 (55.5)	266 (55.4)	13 (56.5)	0.92
<i>Stressful life events</i>				
Criminal justice involvement, mean (sd) ^b	1.5 (3.9)	1.5 (3.9)	2.5 (3.8)	0.20
Experiencing violence ^c	329 (64.9)	308 (63.8)	21 (87.5)	0.02
<i>Substance use</i>				
Binge drinking, past 30 days ^d	233 (45.8)	221 (45.6)	12 (50.0)	0.67
Marijuana use, past 12 months ^e				
Never	138 (26.9)	132 (26.9)	6 (25.0)	0.57
Intermittent use	211 (41.1)	203 (41.4)	8 (33.3)	
Heavy use	165 (32.1)	155 (31.6)	10 (41.7)	
Illicit drug use other than marijuana, past 12 months	96 (18.7)	85 (17.4)	11 (45.8)	<0.001
<i>Mental health</i>				
Depression	52 (10.0)	48 (9.9)	4 (16.7)	0.29
Anxiety	75 (14.7)	69 (14.2)	6 (25.0)	0.15
Somatization	45 (8.9)	39 (8.1)	6 (25.0)	0.004
Panic	44 (8.7)	42 (8.7)	2 (8.3)	1.00
<i>Support System</i>				
Father figure present	327 (63.6)	310 (63.3)	17 (70.8)	0.45
Mother figure present	471 (91.6)	452 (92.2)	19 (79.2)	0.02
House/Ball or gay family membership				
Neither	357 (70.0)	339 (69.8)	18 (75.0)	0.95
Gay family only	82 (16.1)	79 (16.3)	3 (12.5)	

	Total (n = 514)	Prescription opioid use in the past 12 months		p value
	n (%)	No (n = 490) n (%)	Yes (n = 24) n (%)	
House/Ballroom	71 (13.9)	68 (14.0)	3 (12.5)	
Number of lifetime male/transgender partners , mean (sd)	38.4 (102.1)	37.8 (103.2)	51.2 (73.2)	0.55
HIV positive or unknown	278 (54.1)	267 (54.5)	11 (45.8)	0.41
Dyadic sexual network characteristics, mean (sd)				
% Condomless anal sex	34.5 (39.6)	33.5 (39.3)	53.6 (41.1)	0.02
% Transactional sex ^f	7.1 (20.2)	6.6 (19.0)	18.6 (34.2)	0.004
% Both HIV positive or unknown	22.2 (38.1)	22.4 (38.2)	18.3 (35.2)	0.61
% Sexual partner 10 years older	8.0 (20.3)	8.2 (20.7)	3.9 (9.2)	0.31
% Both less than high school	0.4 (3.8)	0.2 (2.5)	3.3 (12.6)	<0.001
% Both unemployed	18.9 (34.4)	18.3 (34.0)	29.9 (40.1)	0.11
Dyadic confidant network characteristics, mean (sd)				
% MSM	50.0 (35.9)	50.2 (35.9)	44.4 (36.8)	0.44
% Disclosed MSM status	95.3 (18.3)	95.8 (20.4)	95.3 (18.2)	0.89
% Could ask for money	84.1 (28.3)	84.7 (27.6)	72.4 (38.9)	0.04
% Both HIV positive or unknown	13.2 (26.9)	13.3 (26.9)	12.2 (26.8)	0.84
% Both less than high school	0.9 (6.9)	0.7 (6.1)	6.1 (15.7)	<0.001
% Both unemployed	19.6 (33.2)	19.2 (32.8)	27.6 (39.9)	0.23

^a Defined as (1) reporting two or more addresses in the previous 12 months or (2) not enough money in the household for rent, food, or utilities in the past 6 months

^b Defined as having ever previously been detained, arrested, or spent time in jail or prison

^c Defined as ever being a victim of violence

^d Defined as drinking 5 or more drinks in one sitting in the past 30 days

^e Intermittent use was defined as up to and including multiple times per week and heavy use was defined as at least once per day

^f Defined as giving or receiving drugs, money, shelter, or other goods in exchange for sex

Longitudinal bivariate and multivariable GEE correlates of prescription opioid use in the past 12 months among young black men who have sex with men in Chicago, uConnect, 2013 – 2016 (n = 514)

Table 2:

Characteristics	Bivariate models		Multivariable model ^d	
	OR (95% CI)	p value	aOR (95% CI)	p value
Respondent's characteristics				
<i>Sociodemographics</i>				
Age	1.00 (0.90, 1.12)	0.95	0.95 (0.83, 1.08)	0.44
Sexual orientation				
Gay	ref		ref	
Bisexual	0.96 (0.42, 2.18)	0.91	1.04 (0.33, 3.24)	0.95
Straight/ other	0.82 (0.24, 2.80)	0.75	0.49 (0.10, 2.39)	0.38
Less than high school	1.65 (0.60, 4.52)	0.34	1.50 (0.22, 10.02)	0.68
Economic hardship				
None	ref		ref	
Residential transience or insufficient resources	1.13 (0.41, 3.09)	0.81	0.98 (0.28, 3.37)	0.97
Residential transience and insufficient resources	2.82 (0.90, 8.91)	0.08	3.77 (1.14, 12.42)	0.03
Had a primary care provider	1.09 (0.49, 2.42)	0.82	0.97 (0.34, 2.75)	0.96
Having a health insurance	0.86 (0.34, 2.15)	0.75	0.91 (0.32, 2.58)	0.86
<i>Stressful life events</i>				
Criminal justice involvement count ^a	1.71 (1.21, 2.43)	0.003	1.63 (1.19, 2.24)	0.003
Experiencing violence	5.37 (2.10, 13.71)	<0.001	4.36 (1.55, 12.28)	0.01
Number of lifetime male/transgender partners ^b	1.23 (0.86, 1.75)	0.26		
HIV positive or unknown	0.92 (0.38, 2.23)	0.85		
<i>Substance use</i>				
Binge drinking	1.97 (0.97, 4.01)	0.06		
Marijuana use				
Never	ref			
Intermittent use	1.18 (0.36, 3.84)	0.78		
Heavy use	1.97 (0.76, 5.08)	0.16		
Illicit drug use other than marijuana	3.21 (1.27, 8.12)	0.01	3.42 (1.53, 7.68)	0.003

Characteristics	Bivariate models		Multivariable model ^d	
	OR (95% CI)	p value	aOR (95% CI)	p value
<i>Mental health</i>				
Depression	2.60 (1.11, 6.11)	0.03	1.42 (0.42, 4.81)	0.57
Anxiety	2.92 (1.30, 6.56)	0.01	0.81 (0.22, 3.03)	0.75
Somatization	3.06 (1.24, 7.54)	0.02	2.00 (0.46, 8.61)	0.35
Panic	0.94 (0.33, 2.67)	0.91		
<i>Support System</i>				
Father figure present	1.17 (0.50, 2.72)	0.71		
Mother figure present	0.29 (0.10, 0.80)	0.02	0.27 (0.10, 0.71)	0.01
House/Ball or gay family membership				
Neither	ref			
Gay family only	1.02 (0.42, 2.46)	0.97		
House/Ballroom	0.43 (0.13, 1.37)	0.15		
Dyadic sexual network characteristics				
% Condomless anal sex	2.38 (1.20, 4.72)	0.01	4.07 (1.35, 12.22)	0.01
% Transactional sex	2.64 (0.76, 9.12)	0.13		
% Both HIV positive or unknown	1.33 (0.58, 3.06)	0.50		
% Sexual partner 10 years older	0.40 (0.06, 2.54)	0.33		
% Both less than high school ^c	109.5 (3.40, 3523.79)	0.01		
% Both unemployed	1.24 (0.52, 2.96)	0.63		
Dyadic confidant network characteristics				
% MSM	0.93 (0.45, 1.91)	0.84		
% Disclosed MSM status	0.84 (0.20, 3.64)	0.82		
% Could ask for money	0.17 (0.06, 0.55)	0.003	0.38 (0.13, 1.15)	0.09
% Both HIV positive or unknown	1.44 (0.36, 5.78)	0.61		
% Both less than high school	11.22 (1.06, 119.01)	0.045	2.00 (0.02, 236.14)	0.77
% Both unemployed	0.99 (0.42, 2.36)	0.98		

^aSquare root transformed

^bLogarithm transformed

^c% of sexual partner and participants were both with less than high school educational attainment was not included in the multivariable model because of the wide confidant interval.