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Abstract

This article examines HIV risks among a sample of 406 women on probation and parole with lifetime histories of victimization who were recruited from an urban community in the southern U.S. Guided by the Comprehensive Health Seeking and Coping Paradigm, we analyze the significance of sociodemographic characteristics, substance use, posttraumatic stress disorder, and social support in relationship to three sexual risks and one drug use risk using multivariable regression. Findings indicate that substance use is a significant correlate of nearly all HIV risks examined, including lifetime sexual partners and sexual partners during the past 12 months. Age, race/ethnicity, homelessness, lifetime traumatic event exposure, regular use of alcohol to intoxication and other drugs, functional social support, and substance use treatment in the past 12 months are associated with specific HIV risks. The findings identify potential targets to address in HIV prevention with women on probation and parole who have experienced victimization.

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CORRELATES OF HIV RISKS AMONG WOMEN ON PROBATION AND PAROLE

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This article examines HIV risks among a sample of 406 women on probation and parole with lifetime histories of victimization who were recruited from an urban community in the southern U.S. Guided by the Comprehensive Health Seeking and Coping Paradigm, we analyze the significance of sociodemographic characteristics, substance use, posttraumatic stress disorder, and social support in relationship to three sexual risks and one drug use risk using multivariable regression. Findings indicate that substance use is a significant correlate of nearly all HIV risks examined, including lifetime sexual partners and sexual partners during the past 12 months. Age, race/ethnicity, homelessness, lifetime traumatic event exposure, regular use of alcohol to intoxication and other drugs, functional social support, and substance use treatment in the past 12 months are associated with specific HIV risks. The findings identify potential targets to address in HIV prevention with women on probation and parole who have experienced victimization.

The elevated prevalence of HIV among people involved in the U.S. criminal justice system is a serious threat to public health in the United States (Kinner & Wang, 2014). It is estimated that 20% to 26% of all people living with HIV in the U.S. pass through correctional facilities each year and that up to 50% do not know they are HIV positive (Coons, 2002; Hammett, Harmon, & Rhodes, 2002; Joint United Nations Programme on HIV/AIDS, 2011; Ordonez & Marconi, 2012). Women involved in the criminal justice system are at particular risk in comparison to men involved in the criminal justice system and to women in the general population. An estimated 1.9% of incarcerated women and 1.5% of incarcerated men are living

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with HIV (Maruschak, 2009). The estimates increase dramatically among women and men on probation and parole, among whom studies have found rates of 14–17% and 12%, respectively (Belenko, Langley, Crimmins, & Chaple, 2004; El-Bassel et al., 2014). HIV prevalence among adolescent/adult women in the U.S. general population is estimated to be approximately .18% (Centers for Disease Control and Prevention, 2015; U.S. Census Bureau, 2014). The disproportionate prevalence of HIV among women involved in the criminal justice system underscores the clear and urgent need for research that examines HIV risks among this population of women.

Adding to this urgency is the trend that women are one of the fastest growing populations involved in the criminal justice system. The number of women on probation in the U.S. in 1990 was approximately 481,000. This number more than doubled to just under 1,000,000 women in 2011 (Ajinkya, 2012). Recent data indicate that 1 in every 89 women in the U.S. is under some form of correctional authority, with approximately 85% assigned to probation or parole (Greenfield & Snell, 2000; Minton, 2013; Pew Center on the States, 2009). Although attention frequently focuses on individuals who are incarcerated, most women involved in the justice system are involved in community corrections.

For women involved in the justice system who are residing in the community, there is greater access to substance use and other HIV risks than is typically present for women who are incarcerated (Oser et al., 2006); however, much of the research related to HIV prevention in criminal justice settings has focused on incarcerated populations (Belenko et al., 2004). Additionally, women involved in the criminal justice system in the community face high risk for homelessness and for housing that is unsafe and/or tenuous, which are associated with multiple HIV risks (Elifson, Sterk, & Theall, 2007; Freudenberg Moseley, Labriola, Daniels, & Murrill, 2007; Golder, Hall, Engstrom, Higgins, & Logan, 2014; Mullings, Marquart, & Brewer, 2000; Wenzel et al., 2004; Williams et al., 2013). Compounding the environmental factors for women involved in the justice system are high rates of victimization and posttraumatic stress disorder, which are also associated with HIV risks among women in clinical and community samples (Arriola, Loudon, Doldren, & Fortenberry, 2005; Bauer et al., 2002; M. Cohen et al., 2000; Engstrom, Shibusawa, El-Bassel, & Gilbert, 2011; Engstrom, Winham, & Gilbert, 2016; Mosack et al., 2010; Plotzker, Metzger, & Holmes, 2007). These associations are particularly relevant for women involved in the criminal justice system, among whom up to 99% report being victimized at some point in their lives (Browne, Miller, & Maguin, 1999; El-Bassel et al., 1996; Greenfield & Snell, 2000; Lynch, DeHart, Belknap, & Green, 2012; McClellan, Farabee, & Crouch, 1997; McDaniels-Wilson & Belknap, 2008; Owen & Bloom, 1995; Reichert, Adams, & Bostwick, 2010). Despite the multidimensional risks they experience, relatively little research has focused on HIV risk factors and HIV prevention among women on probation and parole (Alemagno, Stephens, Stephens, Shaffer-King, & White, 2009; Belenko et al., 2004; El-Bassel et al., 2014; Green et al., 2013; Underhill, Dumont, & Operario, 2014; Weir, Bard, O'Brien, Casciato, & Stark, 2007), limiting the development and provision of effective HIV prevention strategies for this population (Logan, Cole, & Leukefeld, 2002). Given the risks experienced by women on probation and parole and the research gaps in this area, the aim of the present study is to explore factors associated with HIV risks among women on probation and parole with lifetime histories of victimization.

This research is guided by the Comprehensive Health Seeking and Coping Paradigm (CHSCP; Nyamathi, 1989), a framework that has been used to identify HIV risks among women who are experiencing homelessness, substance use problems, and poverty (Nyamathi, 1989; Nyamathi, Flaskerud, & Leake, 1997; Nyamathi, Stein, & Bayley, 2000; Nyamathi, Stein, & Swanson, 2000; Nyamathi et al., 1999, 2012). According to the CHSCP, women's engagement in HIV risk behavior is influenced by several individual and environmental factors that can be classified as sociodemographic (e.g., race/ethnicity, age, and socioeconomic resources), personal (e.g., substance use and posttraumatic stress symptoms) and social (e.g., social support, engagement with service providers, and community cohesion). Based on this framework, the current study sought to identify sociodemographic, personal and social factors associated with HIV risks among women on probation and parole with histories of victimization.

METHODS

PARTICIPANTS

A total of 406 women on probation and/or parole in Jefferson County, Kentucky participated in this study. Jefferson County is a large, urban area that includes Louisville. Recruitment methods included in-person outreach at all probation and parole offices located in the county; direct mailings to women on probation and parole in Jefferson County; advertisements in the local newspaper, the website Craigslist, and public access TV; fliers posted in numerous public locations (e.g., bus stops, convenience stores, apartment complexes), community-based organizations, government agencies, and health care facilities; and community outreach by study personnel.

Women, 18 years and older, were selected for inclusion in the study if they were: (a) currently on state probation and/or parole in Jefferson County, (b) reported that they had sex with either men only or with men and women (women who were recently incarcerated were asked about the year prior to their incarceration), (c) reported any experience of physical or sexual victimization as a child or as an adult, and (d) spoke English at a conversational level. Following provision of written informed consent, the women completed in-person audio computer-assisted self interviews (ACASI; Nova Research Company, 2003) administered by trained female staff. The interviews, lasting approximately 2 hours, took place in public locations between October 2010 and January 2013. Approximately 81% of the women who completed screenings were eligible to participate. Among all of the women who completed screenings, ineligibility was based on all female intimate partners (4.08%), absence of lifetime history of victimization (4.87%), and not being on probation or parole (9.59%). In addition, one woman was experiencing too much distress to complete the screening (.15%). The final study sample represented approximately one-fifth of all women on probation and parole in Jefferson County at the time recruitment was initiated (Kentucky Department of Corrections, Division of Probation and Parole, personal communication, November 5, 2010). Following the interviews, participants completed debriefing and were compensated \$35 for their time. The University of Louisville Institutional Review Board approved the study.

MEASURES

INDEPENDENT VARIABLES

Sociodemographic Factors. Five variables measured sociodemographic factors. Age was measured in years. Race/ethnicity was dichotomously coded as African American/Black or other race/ethnicity and White, Non-Hispanic. Intimate partner status was measured by three categories: single or never married; married or living with a male sexual partner; or separated, divorced, or widowed. Work status included five categories: unemployed; full or part time employment; unemployed due to disability; student; and other. Educational attainment was measured as less than high school diploma, high school graduation or GED, trade or technical training, some college or college diploma, and some graduate school or graduate school diploma. Homelessness was assessed through a single item asking whether the woman considered herself to be homeless (0/No; 1/Yes). In addition, we assessed whether a woman reported being in a controlled environment (e.g., jail/prison, substance use treatment, psychiatric treatment, etc.) during the past 12 months (0/No; 1/Yes) and her correctional status (e.g., on probation, parole, or both).

Personal Factors. Two types of personal factors were assessed among participants: substance use and posttraumatic stress.

Substance Use. Seven items adapted from Coyle's Risk Behavior Assessment (RBA; Coyle, 1993) measured substance use. The total number of drugs a woman reported ever using in her life (possible range, 0–10) was used as an indicator of a woman's lifetime substance use involvement. Women were asked about their use of the following 10 substances for this variable: marijuana, cocaine, crack, heroin, other opioids (e.g., OxyContin; Tylenol 2), hallucinogens, sedatives/tranquilizers/barbiturates, club drugs (e.g., Ketamine/Special K, MDMA/ecstasy), and prescription medications. Six dichotomous variables (0/No; 1/Yes), based on the most commonly used substances among the sample (Golder et al., 2014), assessed lifetime engagement in a year or more of regular substance use (defined as an average of three times per week) of alcohol to intoxication, marijuana, crack/cocaine, heroin and/or other opioids (e.g., Percocet, OxyContin, Tylenol 2), sedatives/tranquilizers/barbiturates (e.g., benzodiazepines, Xanax, Seconal, Valium), and/or other drugs (e.g., nonprescription methadone, inhalants, hallucinogens, amphetamines, or club drugs).

Posttraumatic Stress. The Posttraumatic Stress Diagnostic Scale was used to operationalize four indicators of posttraumatic stress (Foa, Cashman, Jaycox, & Perry, 1997; Sullivan, Cavanaugh, Buckner, & Edmondson, 2009). The first indicator assessed whether any traumatic event(s) occurred according to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (*DSM-IV*) diagnostic criteria (American Psychiatric Association, 2000; Foa, 1996). The second indicator measured the severity of re-experiencing, avoidance/numbing, and arousal symptoms (i.e., sum of the scores of the severity of 17 symptoms; possible range, 0–51; $\alpha = .94$). The third variable reflected the number of life domains where functioning was impacted by symptoms (possible range, 0–8). A final indicator was included to assess whether or not (0/No; 1/Yes) the woman met the diagnostic criteria for posttraumatic stress disorder (PTSD). This final variable was included to provide an understanding of the proportion of respondents meeting the diagnostic criteria for

PTSD to increase the interpretability and utility of the results (Golder, Connell, & Sullivan, 2012).

Social Factors. Five variables were used to assess functional, formal, and community-based social support. The 19-item Medical Outcomes Study (MOS) Social Support Survey was used to measure functional social support (Sherbourne & Stewart, 1991). Participants were asked how often emotional/informational, tangible, affectionate, and positive social interaction supports were available to them, including items such as “someone you can count on to listen to you when you need to talk” and “someone to take you to the doctor if you need it.” Responses ranged from 0 (none of the time) to 4 (all of the time), with a mean composite score range of 0–4 ($\alpha = .96$ with the current sample). Three individual items from the Adapted Treatment Services Review (McLellan, Alterman, Cocciola, & Metzger, 1992) were used to measure formal social support during the past 12 months: number of visits to health care provider (observed range, 0–365); number of 12-step program meetings attended (observed range, 0–365); and whether the participant had participated in treatment related to drug or alcohol use during the past year with 0 being No and 1 being Yes. Finally, community-based social support was measured by 8 items from the Neighborhood Cohesion Scale (Buckner, 1988), which has been used in prior studies to predict engagement in HIV risk behavior (Kerrigan, Witt, Glass, Chung, & Ellen, 2006). Participants indicated their perceptions about their neighborhoods (e.g., I fit in with the people in my neighborhood, and I believe my neighbors would help in an emergency); response options ranged from 1 (not true at all) to 4 (very true). The mean score for the total scale was computed (possible range, 1–4; $\alpha = .85$ with the current sample).

DEPENDENT VARIABLES

Participant risks. Three variables assessing participants’ risks were adapted from the Sexual Risk Behavior Questionnaire (El-Bassel et al., 1998, 2001) and the Risk Behavior Assessment (Coyle, 1993). Respondents were asked to provide their lifetime and past 12-month number of sexual partners (lifetime observed range, 0–300; 12-month observed range, 0–50). They were also asked to indicate whether they had ever injected drugs with 0 being No and 1 being Yes.

Partner Risks. Four dichotomous questions, with 0 being No and 1 being Yes, were summed to create a single composite variable (possible range, 0–4) measuring partner risks. Three of the items focused on any current partner (past 6 months), their use of injection drugs, their lifetime involvement with male partners, and the participants’ engagement in sexual activity with them on the day they met. One item focused on lifetime incarceration history among the participants’ main partner.

DATA ANALYSIS

Four count regression models were estimated for the dependent variables (i.e., number of lifetime sexual partners, number of sexual partners in the past 12 months, lifetime injection drug use, and partner risks). Count regression models, including Poisson regression, negative binomial regression, zero-inflated Poisson regression, and zero-inflated negative binomial regression, are extensions of the generalized lin-

ear model and are able to account for over-dispersion (i.e., greater variability in data than would be expected under the assumed distribution) and inflated zeros (Cameron & Trivedi, 1998; Elhai, Calhoun, & Ford, 2008). Over-dispersion is identified when the variance of a count variable is greater than its mean (Elhai et al., 2008). The selection of a particular count model is based on the distribution of the dependent variable. In the present study, data for lifetime sexual partners were over-dispersed (mean = 28.18; variance = 1147.26), thus, a negative binomial regression model was estimated; sexual partners during the past year was both over-dispersed (mean = 2.25, variance = 15.48) and zero-inflated (number of zeros = 82), as such, a zero-inflated negative binomial regression model was estimated. Similarly, zero-inflated negative binomial regression was employed for lifetime injection drug use (mean = .24, variance = .54, number of zeros = 323). Although the variable reflecting partner risks was not over-dispersed (mean = .73; variance = .66), it was zero-inflated (number of zeros = 193), and zero-inflated negative binomial regression was used. The regression models were analyzed in Stata 14.0 (StataCorp, 2015).

RESULTS

SAMPLE CHARACTERISTICS

Means, percentages, standard deviations, and observed ranges are presented in Table 1. The mean age of women in the sample was approximately 37 years old ($SD = 10.24$). Approximately half of the participants identified as White, and about 44% were single. Almost 40% of the participants were not employed; more than a quarter of the participants reported working at least part-time. Thirty-six percent of the participants had a high school diploma or GED, and over one-third of the participants reported experiencing homelessness (34%). More than half of the women reported spending time in a controlled environment sometime during the past year, and the majority of participants were currently sentenced to probation.

Participants reported regular use (three times per week for a year or more) of an average of four types of substances at some point in their lives (mean = 4.26, $SD = 2.72$). Just over half of the participants (52.2%) reported that they had regularly used alcohol to intoxication for at least one year in their lives; more than two-thirds of the participants (69%) reported that they regularly used marijuana for at least one year in their lives, and more than half of the participants (54.9%) reported that they regularly used crack or cocaine for at least one year in their lives. Lifetime regular use of heroin/opioids, sedatives/tranquilizers/barbiturates, and other drugs were each endorsed by one-third or more of the women. The majority of the women (85.5%) reported experiencing a traumatic event meeting the *DSM-IV* criteria at some point in their lives. Almost half of the participants (48.6%) met *DSM-IV* diagnostic criteria for PTSD, which reflects the high end of estimates (17–48%) among incarcerated women and more than four times the lifetime estimate (10.4%) among women in the general population (Harner, Budescu, Gillihan, Riley, & Foa, 2015; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). On average, the women reported low informal support, with the mean value falling between occasionally and some of the time (mean = 2.60, $SD = .99$). In the past 12 months, women reported approximately seven visits to health care providers (mean = 6.77, $SD = 21.02$) and attendance at an average of thirty-six 12-step meetings (mean = 35.72, $SD = 88.49$). Substance use treatment attendance at some point during the past 12 months was reported by 40% of the participants. Finally, participants indicated a mean level of

TABLE 1. Sociodemographic Characteristics, Substance Use, PTSD, Social Support, and HIV Risks

| | Mean (SD)/Percentage | Range |
|---|----------------------|-------|
| Sociodemographic Characteristics | | |
| Age | 37.2 (10.24) | 19–69 |
| Race/Ethnicity | | |
| African American/Black and other racial/ethnic groups | 49.50% | |
| White, Non-Hispanic | 50.50% | |
| Partner Status | | |
| Single | 43.80% | |
| Married/living with partner of opposite sex | 16.50% | |
| Divorced/separated/widowed | 38.20% | |
| Educational Attainment | | |
| Less than a high school diploma/GED | 27.10% | |
| GED/HS diploma | 36.00% | |
| Trade school | 3.40% | |
| Some college/college degree | 30.00% | |
| Some graduate school/graduate degree | 3.20% | |
| Work Status | | |
| Unemployed | 39.70% | |
| Working | 28.80% | |
| Unemployed due to disability | 20.20% | |
| Student | 3.70% | |
| Other | 6.40% | |
| Homeless | 34% | |
| Controlled Environment in Past 12 Months | 57.40% | |
| Correctional Status | | |
| Probation | 75.60% | |
| Parole | 22.70% | |
| Both | 1.70% | |
| Substance Use | | 0–10 |
| Number of substances used regularly in lifetime | 4.26 (2.72) | |
| Lifetime regular alcohol use to intoxication | 52.20% | |
| Lifetime regular marijuana use | 69% | |
| Lifetime regular cocaine/crack use | 54.90% | |
| Lifetime regular heroin/opioid use | 35% | |
| Lifetime regular sedative use | 33% | |
| Lifetime regular use of other drug | 34.70% | |
| PTSD | | |
| Traumatic event | 85.50% | |
| Symptom severity | 18.12 (14.08) | 0–51 |
| Number of life domains impacted | 3.24 (2.83) | 0–8 |
| PTSD | 48.60% | |
| Social Support | | |
| Functional support | 2.60 (.99) | 0–4 |
| Health care visits | 6.76 (21.02) | 0–365 |
| 12-step meetings | 35.72 (88.49) | 0–365 |

TABLE 1. (continued)

| Sociodemographic Characteristics | Mean (SD)/Percentage | Range |
|--|----------------------|--------|
| Substance use treatment | 40.10% | |
| Neighborhood cohesion | 4.41 (1.46) | 2–9.25 |
| Participant HIV Risks | | |
| Number Lifetime Sexual Partners | 28.18 (33.87) | 0–300 |
| 25th percentile | 8 | |
| 50th percentile | 18.06 | |
| 75th percentile | 35 | |
| Number Sexual Partners, Past 12 Months | 2.25 (3.93) | 0–50 |
| 25th percentile | 1 | |
| 50th percentile | 1 | |
| 75th percentile | 2 | |
| Lifetime Injection Drug Use | 20% | 0–1 |
| Partner HIV Risks | | |
| Partner Risk Factors | .73 (.81) | 0–4 |
| 0 risk factor | 44.10% | |
| 1 risk factors | 43.30% | |
| 2 risk factors | 9.10% | |
| 3 risk factors | 2.20% | |
| 4 risk factors | 1.20% | |

Note. Values reported in this table are predominantly based on fully observed data. Multiple imputation using the EM algorithm in SPSS was conducted with variables where more than 5% of values were missing (lifetime sexual partners, sexual partners past year, and partner HIV risks).

neighborhood cohesion between somewhat true and mostly true (mean = 2.44, $SD = .75$).

Participants had an average of 28 lifetime sexual partners (mean = 28.18, $SD = 33.87$) and two sexual partners during the past 12 months (mean = 2.25, $SD = 3.93$). Twenty percent of the women engaged in injection drug use at some point in their lives. Almost half of the women (44.1%) reported that either they did not currently have a partner or that none of the assessed HIV risk factors applied for their partners. The majority of women (nearly 56%) reported the presence of HIV risk factors among their partner(s); approximately 43% of participants reported that their current partner(s) had one of the four HIV risk factors, 9.1% reported that their partner(s) had two of the four risk factors, 2.2% reported that their partner(s) had three of the four risk factors, and 1.2% reported that their current partner(s) had all four risk factors.

CORRELATES OF HIV RISKS

Table 2 presents the findings for the four count regression models examining correlates of participant and partner HIV risks.

The final model for the number of lifetime sexual partners accounted for 17% ($R^2 = .17$) of the variance; homelessness, functional social support, regular use of opioids, sedatives, and other drugs were retained. The final model for the number of sexual partners in the past 12 months accounted for 14% ($R^2 = .14$) of the variance and retained age, functional social support, experiencing a traumatic event, and lifetime regular use of alcohol to intoxication. The model for lifetime injection drug

use retained age, race/ethnicity, homelessness, controlled environment, PTSD diagnosis, lifetime drug use and lifetime regular alcohol use to intoxication, although controlled environment and PTSD diagnosis did not reach the conventional level of significance; 18% of the variance was accounted for in this model ($R^2 = .18$). The final model examining partner risks accounted for 6% ($R^2 = .06$) of the variance and retained age and substance use treatment within the past 12 months.

Among the sociodemographic variables, homelessness was associated with a small decrease in number of lifetime sexual partners (1%; incident rate ratio [IRR] = .99) and a 50% (IRR = .50) decrease in lifetime injection drug use. Older age was associated with a small decrease in number of sexual partners in the past 12 months (IRR = .98) and a small decrease in partner risks (IRR = 0.98). However, older women were more likely to report lifetime injection drug use (IRR = 1.03). Finally, identifying as White, Non-Hispanic was associated with a 219% increase in lifetime injection drug use in comparison to identifying as African American/Black or another race/ethnicity (IRR = 3.19).

In terms of personal factors, participants' lifetime regular use of sedatives and other drugs was associated with a 35% and 58% increase, respectively, in number of lifetime sexual partners (IRR = 1.35; 1.58, respectively). Women's lifetime regular use of opioids was associated with a 26% decrease in lifetime sexual partners (IRR = .74), and lifetime regular use of alcohol to the point of intoxication was associated with a 25% decrease in number of sexual partners during the past 12 months. Lifetime drug use and regular alcohol use to intoxication were associated with a 19% and 131% increase, respectively, in lifetime injection drug use (IRR = 1.19; 2.31, respectively). Experiencing a traumatic event consistent with *DSM-IV* diagnostic criteria predicted a 93% increase in number of sexual partners in the past 12 months (IRR = 1.93).

Greater functional social support was related to fewer lifetime and 12-month sexual partners; for each additional unit of functional social support, the number of reported sexual partners decreased by 14% and 17%, respectively (IRR = .86; .83, respectively). Being in substance use treatment in the past 12 months was associated with a 21% increase in partner risk factors (IRR = 1.21).

DISCUSSION

Guided by the CHSCP, the present study examines theoretically-informed correlates of HIV risks among women on probation and parole who have experienced victimization (Nyamathi et al., 1997; Nyamathi, Stein, & Swanson, 2000). Statistically significant correlates of HIV risks addressed in this article include sociodemographic (e.g., age, race/ethnicity, homelessness), personal (e.g., substance use and trauma), and social factors (e.g., functional social support and recent substance use treatment). While several of the findings are consistent with prior related research, especially regarding the roles of social support and trauma in HIV risks, some of the findings, particularly those related to age, race/ethnicity, substance use, and recent substance use treatment, highlight complex challenges in understanding and addressing HIV risk factors among women on probation and parole.

In the present study, younger age was associated with a greater number of sexual partners in the past 12 months and more partner risk factors. In contrast, older age was associated with greater likelihood of ever using injection drugs. These findings, together with prior research that has examined intersections between age, substance

TABLE 2. Multivariable Models Predicting Participant and Partner HIV Risks

| DEPENDENT VARIABLE | <i>B</i> | <i>SE B</i> | <i>IRR</i> |
|--|----------|-------------|------------|
| Number of Lifetime Sexual Partners | | | |
| Homelessness | -.28* | .11 | 0.99 |
| Functional social support | -.15** | .01 | 0.86 |
| Lifetime regular use of opioids | -.31* | .15 | 0.74 |
| Lifetime regular use of sedatives | .30** | .11 | 1.35 |
| Lifetime regular use of other drugs | .46** | .12 | 1.58 |
| Constant | 3.45** | | |
| Number of Sexual Partners, Past 12 Months | | | |
| Age | -.02** | .01 | 0.98 |
| Functional social support | -.18** | .06 | 0.83 |
| PTSD event | .66** | .22 | 1.93 |
| Lifetime regular use of alcohol to intoxication | -.28* | .14 | 0.75 |
| Constant | 1.57** | | |
| Lifetime Injection Drug Use | | | |
| Age | .03** | .01 | 1.03 |
| Race/ethnicity | 1.61** | .33 | 3.19 |
| Homelessness | -.70** | .26 | 0.50 |
| Controlled environment | .36 | .26 | 1.44 |
| PTSD diagnosis | .67 | .60 | 1.95 |
| Lifetime drug use | .17** | .05 | 1.19 |
| Lifetime regular alcohol use to intoxication | .84** | .30 | 2.31 |
| Partner Risk Factors | | | |
| Age | -.02** | .01 | 0.98 |
| Substance use treatment past 12 months | .19* | .13 | 1.21 |
| Constant | .38 | | |

Note. IRR = Incident rate ratio; number of lifetime sexual partners estimated via negative binomial regression, number of sexual partners in past 12 months estimated via zero-inflated negative binomial regression, lifetime injection drug use estimated via negative binomial regression (African American/Black and other race/ethnicity coded as 0, White, Non-Hispanic race/ethnicity coded as 1), and partner risk factors estimated by zero-inflated negative binomial regression. All count regression models were analyzed in Stata 14.0 (StataCorp, 2015). * $p < .05$. ** $p < .01$.

use, and HIV risk among women who are incarcerated (Staton, Walker, & Leukefeld, 2003), women in methadone treatment (Engstrom et al., 2011; Grella, Anglin, & Annon, 1996), and men and women who use substances (Carneiro, Fuller, Doherty, & Vlahov, 1999; Kwiatkowski & Booth, 2003), suggest significant complexity in relationships between age and HIV risks among these populations. For example, with some similarity to our findings, Kwiatkowski and Booth (2003) found that among a sample of 3,023 adults (85.9% male) who reported substance use and were not in treatment, adults over age 50 were more likely to report recent injection of any drug and of heroin, but lower frequency of injection and less likelihood of smoking crack or drinking alcohol, than adults under age 50. They also found that younger adults had more sexual partners in the past month, but that older adults had higher rates of never (63.4% vs. 61.9%) and always (16.3% vs. 11.2%) using condoms. Other prior research found no statistically significant age-related differences in substance use patterns in the year prior to incarceration, lifetime or recent sexual partners

prior to incarceration, or recent sexual exchanges prior to incarceration among 60 women with histories of regular substance use who were incarcerated (Staton et al., 2003) or in number of male partners at intake among 158 women in methadone treatment (Grella et al., 1996). However, older age was associated with less condom use at intake and with fewer male partners at 18–24 months follow-up in the study conducted by Grella and colleagues. The complexity of findings in this area suggests that HIV prevention efforts with women on probation and parole would benefit from additional research focused on understanding and addressing age-related differences in multidimensional aspects of HIV risk, including patterns in sexual partnering, condom use, and injection drug use.

This study found that identifying as White, Non-Hispanic was associated with significant increase in reported lifetime injection drug use in comparison to identifying as African American/Black or another race/ethnicity. These findings are consistent with several related prior studies. For example, among a sample of 948 women in a county jail, women who were Non-Hispanic White reported the highest rates of lifetime injection drug use, as well as the highest number of sexual partners in the past year (McClelland, Teplin, Abram, & Jacobs, 2002). Similarly, earlier analyses of this study's data found that participants who identified as White, Non-Hispanic were more likely to report nonmedical prescription opioid use than participants who identified as other racial/ethnic groups (Hall, Golder, Higgins, & Logan, 2016). Relatedly, among a Baltimore-based sample 482 adults using injection and non-injection drugs (41% female), Keen, Khan, Clifford, Harrell, and Latimer (2014) found that study participants who identified as White were more than twice as likely to inject heroin or multiple drugs than participants who identified as Black, and they were more likely to be diagnosed with Hepatitis C. However, participants who identified as Black were more likely to be diagnosed with HIV or both HIV and Hepatitis C, as also found in relation to HIV among women recruited from a prison in North Carolina (Rosen et al., 2009). The current findings add to knowledge regarding race-related differences in drug use risk behavior among women on probation and parole; however, when considered in the context of prior related research, the findings, which also include no race-related variation in other HIV risks we examined, suggest the need to further examine relationships between race, HIV risk behaviors, HIV seropositivity, and multilevel correlates that can inform prevention strategies among this population of women.

It is generally recognized that substance use is associated with increased HIV sexual risks (Booth, Kwiatkowski, & Chitwood, 2000; Engstrom et al., 2016; Logan, Cole, & Leukefeld, 2002; National Institute on Drug Abuse, 2012). Our findings regarding lifetime regular use of sedatives and other drugs and increased number of lifetime sexual partners align with this general understanding. However, we also found that lifetime regular use of opioids was associated with fewer lifetime sexual partners, consistent with prior research that found opioid use to be associated with fewer partners when compared to crack cocaine use among women (Cohen, Navaline, & Metzger, 1994) and that identified both relationship longevity (Kane, 1991) and reduced sexual interest and functioning among people who use opioids (Jemmott & Brown, 2003; Rhodes & Quirk, 1998). Yet, other research has found opioid use disorders, but not days of opioid use, to be associated with more sexual partners among women in methadone treatment and psychosocial outpatient treatment (Tross et al., 2009). Similarly, there are conflicting findings regarding alcohol use and number of sexual partners. Prior research has found alcohol use to be associated with increased number of sexual partners among women (Bogart et al., 2005;

Brooks et al., 2010; Carey, Senn, Walsh, Scott-Sheldon, & Carey, 2016; Grella et al., 1996; Sánchez, Comerford, Chitwood, Fernandez, & McCoy, 2002; Wingood & DiClemente, 1998); however, the current study finds lifetime regular alcohol use to intoxication to be associated with fewer recent sexual partners. Contradictory findings regarding alcohol use and number of sexual partners are also evident in research conducted by Tross et al. (2009). In their study, alcohol use disorders, but not days of alcohol use, were associated with more sexual partners among women in psychosocial outpatient treatment, but not among women in methadone treatment. Further, the current study found lifetime regular alcohol use to intoxication to be associated with increased risk of lifetime injection drug use. Important areas for future research include identifying whether substance use characteristics, including types and patterns of substances used, contexts of use, and relational implications of use, are differentially associated with HIV risks and can be effectively addressed in prevention strategies among women on probation and parole.

The current findings add to the growing body of literature that identifies linkages between trauma and HIV risks among women. In the current study, experiencing a traumatic event consistent with *DSM-IV* diagnostic criteria predicted increased sexual partners in the past 12 months. Prior research indicates that PTSD is associated with injection drug use and number of male partners among women in rural jails in Kentucky (Staton-Tindall et al., 2015); multiple sexual partners, partner at risk for HIV, and sex trading among women in a Bronx emergency department (El-Bassel, Gilbert, Vinocur, Chang, & Wu, 2011); drug and sexual risk behaviors among women participating in needle exchange (Plotzker et al., 2007); and drug use/intoxication during sexual activity among women in methadone treatment (Engstrom et al., 2011). Emerging intervention research with women experiencing trauma, substance use problems, and high levels of HIV sexual risk suggests that integrated treatment that aims to strengthen safe behavior, coping skills, relational boundaries, and communication is associated with greater reductions in unprotected sexual activity than a health education program that includes specific attention to HIV (Hien et al., 2010). These findings are especially salient in the context of women involved in the criminal justice system who are disproportionately affected by problematic substance use, trauma, and risk of HIV and may benefit from integrative approaches that address these complex intersecting concerns.

The findings from the current study are consistent with several prior studies demonstrating benefits of informal social support in relation to HIV risk behaviors among women (El-Bassel & Schilling, 1994; Engstrom et al., 2016; Nyamathi, Stein, & Swanson, 2000; Sobo, 1995). However, our findings also indicate that formal social support reflected in recent substance use treatment is associated with having a partner with increased HIV risk factors. It may be that substance use treatment provides an opportunity for women on probation and parole to meet partners who are also addressing substance use difficulties and experiencing multiple risks for HIV. Additionally, the finding that nearly 56% of the women in this study reported having partners with one or more HIV risks (a potentially conservative estimate in that our partner risk measure focused solely on four factors related to injection drug use, involvement with male intimate partners, incarceration, and timing of initial sexual activity) and connections between reliance on partners for basic needs and substance use resources and risks for HIV among women who use substances (Amaro & Hardy-Fanta, 1995; El-Bassel & Schilling, 1994; Engstrom, El-Bassel, & Gilbert, 2012; Engstrom et al., 2016) further support the value of relationship-oriented HIV prevention strategies. There is evidence that such intervention may be

especially effective at reducing HIV risk behaviors among women with ongoing intimate partners (El-Bassel et al., 2010; Jones, Kashy, Villar-Loubet, Cook, & Weiss, 2013). One intervention, Project Connect, which focuses on heterosexual couples and includes attention to relational processes, communication, problem-solving, and gender roles, has been found to be effective in increasing condom use, even when only the female partner participates in the intervention (El-Bassel et al., 2003, 2005). The prior relationship-oriented HIV prevention studies hold promise for women on probation and parole; however, additional research is needed to better understand intersections between relational processes, HIV risk, and effective prevention strategies among this population of women.

Lastly, women in the criminal justice system experience numerous vulnerabilities, including economic and social marginalization (Freudenberg, Daniels, Crum, Perkins, & Richie, 2005), as underscored in the rates of homelessness (34%), unemployment (40%), and high school/GED or less education (63%) among the participants in this study. Prior research suggests that attending to survival needs often supersedes women's ability to address HIV risks (El-Bassel et al., 1995; Hall, Golder, Conley, & Sawning, 2013; Logan et al., 2002; Logan & Leukefeld, 2000a, 2000b), and that among women involved in the justice system, stable housing, adequate employment, and access to substance use treatment may be key factors in self-care behaviors, including condom use (El-Bassel et al., 1995; Hall et al., 2013). Our findings suggest that homelessness is associated with slightly fewer lifetime sexual partners and significantly less lifetime injection drug use. In combination with prior research, the findings highlight the need for additional research to understand the complexities of meeting one's basic needs and preventing HIV among women on probation and parole. Such research carries additional salience for this population as homelessness, housing instability, and poverty are associated with incarceration risk (Holtfreter, Reisig, & Morash, 2004; Metraux & Culhane, 2004; National Reentry Resource Center, n.d.; Wilkins, 2012). Strategies to ensure that women's basic needs are addressed may support reduced risk of both HIV and incarceration (Hall et al., 2013).

This research has several limitations. The women who participated in this study were not randomly selected. Thus, these data may not be representative of all women on probation and parole. Additionally, due to gender-related differences in dynamics of intimate partner violence and concerns regarding adequate power to conduct sub-group analyses, this study excluded women with all female intimate partners. Examination of screening data indicated that approximately 4% of all women screened were excluded because they reported all female intimate partners. Similarly, only women with histories of victimization were included in this study. Given that approximately 95% of all women screened for this study and that up to 99% of women involved in the criminal justice system report a history of victimization (Commonwealth of Massachusetts Executive Office of Public Safety Department of Correction, 2005; Lynch et al., 2012; Reichert et al., 2010), this sample provides the opportunity to highlight clinically meaningful within-group differences that are necessary to inform interventions for the largest subgroup of women involved in the criminal justice system: women with histories of victimization who are on probation and parole. While this analysis relied on self-report of sensitive information, research on self-report data indicates that the validity and reliability of substance use and risk behavior data are good to excellent (Darke, 1998; Fincham, 1992). In addition, the use of ACASI technology provides increased sense of privacy and has been

shown to improve reporting of sensitive information (Metzger et al., 2000). Finally, these cross-sectional data limit drawing causal conclusions from the findings.

Beyond these limitations, this research makes important contributions to understanding HIV risks among women on probation and parole who have histories of victimization. Guided by the CHSCP conceptual framework, the study finds that several sociodemographic, personal, and social factors are associated with HIV risks, at times, in unexpected and complex ways. In particular, the findings highlight the complexity of intersections between age, race/ethnicity, recent substance use treatment and HIV risks. Further, the findings highlight the potential of interventions that enhance functional social support, address trauma, reduce alcohol and other substance use, and include attention to relational processes in HIV risk reduction among women on probation and parole with histories of victimization. Additional research is critically needed to further understand key risk factors and effective HIV prevention strategies among this population of women.

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