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Prevalence and correlates of HIV risk among adolescents and young adults reporting drug use: Data from an urban Emergency Department in the U.S

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Abstract

Adolescents and young adults who use substances are at particularly high risk for contracting Human Immunodeficiency Virus (HIV). The Emergency Department (ED) is a critical location for HIV prevention for at-risk youth. To inform future interventions in the ED, this study identifies correlates of HIV risk behaviors among substance using youth seeking ED care. Among 600 14-24-year-olds with past 6-month drug use, bivariate correlates of HIV risk included: older age, female gender, depressive symptoms, alcohol use, marijuana use, other drug use, and dating, peer, and community violence. Regression analyses indicated that older age, marijuana use, and dating violence were positively related to HIV risk. Results suggest HIV prevention efforts for youth in the urban ED should address marijuana use and dating violence as well as sexual risk behaviors.

Introduction

The Centers for Disease Control and Prevention (CDC) estimates that 1.2 million people in the U.S. are infected with the Human Immunodeficiency Virus (HIV) and approximately 50,000 new infections develop each year (CDC, 2012a). Significant disparities in infection rates exist. Young people make up about 21% of the population, but comprised 39% of new HIV infections in 2009 (CDC, 2011a). African Americans constitute about 14% of the population, but accounted for 46% of all new infections (46%) in 2009 (CDC, 2012a). Males have higher infection rates than females (CDC, 2011b) and HIV tends to be concentrated in urban areas (CDC, 2012b).

HIV is most commonly transmitted through sexual contact and injection drug use (IDU) (CDC, 2008). Even though fewer than 1% of young people have injected drugs (Johnston, O'Malley, Bachman, & Schulenberg, 2011), 13% of HIV/AIDS cases can be attributed to IDU (CDC, 2008) and research with young injecting drug users (IDUs) suggests that most engage in risky behaviors like needle sharing (Kipke, Unger, Palmer, & Edgington, 1996). In contrast, sexual risk behaviors are more common among young people and therefore are of high concern in terms of HIV transmission. One-third (34%) of high school students are currently sexually active, and 39% reported not using condoms during their most recent intercourse (CDC, 2010). Among young adults, national data showed that 29% reported condom use "none of the time," 31% reported it "some of the time," and 40% reported it "most/all of the time" in the past year (Gillmore, Chen, Haas, Kopak, & Robillard, 2011).

It is also important to consider socio-demographic factors, such as race, gender, and sexual orientation when examining sexual risk behaviors among youth. For example, 69% of new HIV infections among 13-29 year-olds in 2009 (CDC, 2011a) occurred among young men who have sex with men and HIV intervention content may vary based on gender of sexual partners. Furthermore, on average, a larger proportion of African American young people are sexually active, and they initiate sex at an earlier age than European Americans (Eaton et al., 2011; Nkansah-Amankra, Diedhiou, Agabanu, Harrod, & Dhawan, 2011; Rothman et al., 2009). However, it is important to clarify that while African Americans are disproportionately affected by HIV, findings regarding racial differences likely reflect the influence of socio-ecological factors (e.g., poverty, racism, social discrimination) and/or genetic factors on HIV incidence (He, et al., 2008; DiClemente et al., 2005; Voisin, Jenkins, & Takahashi, 2011).

Theoretical approaches to understanding HIV risk behaviors

Scholars propose several conceptual models for understanding risk factors for HIV among young people. DiClemente and colleagues (2005) suggest using a socio-ecological framework, taking into account individual (e.g., cognitive factors, impulsivity, depressed mood), family (e.g., parental influence, monitoring), relationship (e.g., partner type, same/opposite gender sex, dating violence), peer (e.g., peer pressure, condom use norms, peer/gang violence), community (e.g., community violence, school environment, HIV/STI incidence), and societal (e.g., poverty, racism, sexism) spheres of influence. Specifically, family and relationship level influences are thought to most strongly influence individual risk behavior, whereas community and societal spheres provide a broader context which also

affects behavior. DiClemente et al. (2005) posit that these spheres of influence interact synergistically, and thus should be accounted for in research, intervention, and policy.

In particular, in a similar socio-ecological model, Voisin, Jenkins, and Takahashi (2011) suggest community violence exposure is an important community level factor to consider in relation to HIV risk behaviors. Specifically, they posit that structural/societal level factors (e.g., poverty, neighborhood social capital, access to healthcare) are precursors to community violence exposure which influences HIV risk behaviors through multiple pathways (e.g., peer behavior/influence, psychological factors, school performance) occurring at different socio-ecological levels. Both of these models account for the influence of factors at multiple levels in determining HIV risk behaviors among young people, and therefore were used as a guide in selecting factors to include in our investigation, which focuses on the role of substance use, depression, and violence (i.e., community violence exposure, partner violence, and non-partner/peer violence).

Substance use, depression, violence and HIV risk behaviors among young people

Few adolescents are at risk for HIV via IDU; however, notably larger proportions use alcohol and drugs via other routes (Johnston, O'Malley, Bachman, & Schulenberg, 2011). Specifically, among adolescents, alcohol and marijuana use prior to sex is related to a decreased likelihood of condom use (Bryan, Ray, & Cooper, 2007; Bryan, Schmiege, & Magnan, 2012), potentially increasing the risk of HIV transmission. Much of the research regarding sexual risk behaviors in youth has focused on heterosexual samples, or has not distinguished risk behaviors based on sexual orientation. However, across samples of adolescents and young adults, including young men who have sex with men, patterns of alcohol and drug use are related to increased sexual risk behaviors, including lack of condom use, multiple partners, and alcohol consumption prior to intercourse (Ellickson, Collins, Bogart, Klein, & Taylor, 2005; Nkansah-Amankra et al., 2011; Steuve et al., 2002). In addition to cross-sectional research, event-level data indicate that alcohol use prior to intercourse is associated with a higher likelihood of unprotected sex with casual/non-steady partners (Brown & Vanable, 2007; Kiene, Barta, Tennen, & Armeli, 2009) and marijuana use before sex is related to lack of condom use (Hendershot, Magnan, & Bryan, 2010).

Among adolescents and young adults, depressive symptoms have been associated with IDU (Havens, Sherman, Sapun, & Strathdee, 2006) and sexual risk behaviors, such as inconsistent condom use, and multiple partners in young men who have sex with men (Brown, et al., 2006; DiClemente et al., 2001; AUTHOR, 2010; Perdue, Hagan, Thiede, & Valleroy, 2003). Depressed mood may affect HIV risk behaviors through several mechanisms. For example, in addition to relationships between depression and substance use, low self-esteem or self-efficacy could affect condom use or safer drug use (Brown, Danovsky, Lourie, DiClemente, & Ponton, 1997). From an ecological perspective, depressed youth may be at higher risk for community level influences on HIV risk behaviors (Brown et al., 1997).

Consistent with proposed theories of HIV risk, violence has also been related to both IDU and sexual risk behaviors among young people. With regard to IDU, research more often involves adults (Braitstein, et al., 2003; Marshall, Fairbairn, Li, Wood, & Kerr, 2008;

Wagner et al., 2009) but one study of 15-30-year-olds found that IDUs reported more physical victimization than non-IDUs (Fuller et al., 2002). This relationship may be accounted for by an association between drug use and criminal involvement (Bennett, Holloway, & Farrington, 2008), which may include physical violence, and/or disputes with IDU partners over division of drugs or money (Bourgois, Prince, & Moss, 2004; Epele, 2002). Although IDUs are more likely to reside in rural than urban areas (Novak & Kral, 2011), those residing in urban areas may be involved in violence as result of the high crime levels in such communities (Rand & Catalano, 2007).

Prior research also demonstrates relationships between dating (i.e., partner) violence, peer violence (i.e., violence among non-dating partners), and community violence exposure (e.g., experiencing or witnessing crimes, hearing gun shots, etc.) with sexual risk behaviors among young people. Among urban African American female youth, sexual risk behaviors were related to dating, peer, and community violence exposure, and reporting more than one type of violence was related to higher levels of sexual risk behaviors (Wilson, Woods, Emerson, & Donenberg, 2012). Studies conducted by Voisin (2003; 2005) also pinpoint community violence exposure as a strong correlate of sexual risk behaviors among young people. In addition, among lesbian, gay, and bisexual youth, school-based peer victimization has been associated with increased sexual risk behaviors (Bontempo & D'Augelli, 2002).

Several studies have shown that dating violence among young people is related to sexual risk behaviors such as unprotected sex, multiple partners, having an STI/HIV, inconsistent condom use, and substance use at last intercourse, although most work has focused on female samples without consideration of sexual orientation. For example, among African American 14-18 year-old females, those with recent dating violence were more likely to have had an STI, and less likely to use condoms consistently than those without recent dating violence (Wingood, DiClemente, McCree, Harrington, & Davies, 2001). Furthermore, Decker and colleagues (2001) reported that half of the female adolescents in their sample who had HIV or another STI were involved in dating violence. In addition, work with African American and Hispanic adolescent females has shown that frequency of relationship abuse (including physical, verbal/emotional, and threatening behavior) was associated with inconsistent condom use (Teitelman, Ratcliffe, Morales-Aleman, & Sullivan, 2008). Similarly, among young adult women in the National Survey on Drug Use and Health, past-year physical/verbal relationship abuse was linked to inconsistent condom use (Teitelman, Ratcliffe, Dichter, & Sullivan, 2008). Alleyne and colleagues (2011), examined predictors of sexual risk behaviors (e.g., multiple partners, condom use at last intercourse, substance use at last intercourse) separately based on ethnicity of high school students in their sample (African American, Latino, and White). This study found positive relationships between dating violence victimization and alcohol use at last intercourse for Latinos only and dating violence victimization was negatively related to condom use at last sex for Whites only; however dating violence was positively related to number of partners for all three groups (Alleyne, et al., 2011). Similar to these other studies, partner violence has also been associated with unprotected anal sex and HIV infection among young men who have sex with men (Mustanski, Garofalo, Herrick, & Donenberg, 2007)

These studies provide important information regarding HIV risk factors among adolescents and young adults; however, they have limitations which can be addressed by further research. For example, most investigations do not measure both sexual and IDU risk behaviors (e.g., Alleyne et al., 2011; Fuller et al., 2002; etc.). Others focus only on samples of a single gender or race (e.g., DiClemente et al., 2001; Teitelman et al., 2008; etc.). Furthermore, some studies do not account for multiple substances when evaluating substance use and HIV risk (e.g., Brown & Venable, 2007; Kiene et al., 2009; etc.).

Accessing At-risk Youth in the Emergency Department

Universal prevention programs based in schools and targeted prevention for high-risk youth in specialty settings (e.g., substance use and STI clinics) are important to public health efforts toward HIV prevention, yet these settings may not capture the range of at-risk youth who are not in school or seeking specialty care. The hospital Emergency Department (ED) visit provides an opportunity to intervene with at-risk youth because youth can be screened at triage. Further, studies (Rothman et al., 2009; AUTHOR et al., 2011) have identified significant rates of sexual risk behaviors among youth in urban EDs. Among 14-to-21-year olds, Rothman et al. (2009) reported lifetime rates of sex without a condom or birth control ranging from 33% to 50% of males and 20% to 40% of females across racial/ethnic groups. Among 1,500 14 to 18 year-olds, 60% reported ever having sex (AUTHOR et al., 2011), a rate higher than what was reported in a national youth survey (CDC, 2010); furthermore, only 45% reported always using condoms.

HIV risk interventions for young people in the ED are lacking, but researchers have begun to identify correlates of HIV risk behaviors that could inform intervention development. AUTHOR et al. (2011) found that older age, male gender, visiting the ED for a medical issue (vs. injury), not living with a parent, dating violence involvement, and marijuana use were associated with inconsistent condom use among teenagers in the ED. Moreover, AUTHOR et al. (2011) also found that failing grades, peer violence involvement, and weapon carriage were related to use of substances before sex. However, this study has limitations because it did not assess IDU as an HIV risk behavior and other pertinent correlates of HIV risk (e.g., depression, community violence).

Despite the high rates of HIV risk behaviors among youth, HIV testing rates are low; only 13% of high school students report having been tested for HIV (CDC, 2010). However, the CDC (Branson et al., 2006) recommends HIV testing for patients aged 13-64 in all health care settings. Currently, 82% of EDs offer testing, but only 22% provide systematic testing (Rothman et al., 2011). For HIV/STI testing that does occur, the current standard of care provides no routine prevention intervention at the point of care for youth who tested negative and but are at high risk for future infection. To promote testing and inform interventions, we must further identify correlates of increased HIV risk among youth seeking ED care. ED interventions are essential to HIV reduction given that the ED serves as primary care for many underserved and uninsured Americans, particularly in low-resource communities (Ragin et al., 2005; Richman, Clark, Sullivan, & Camargo, 2007; Rhine, Gittelman, & Timm, 2012; Tang, Stein, Hsia, Maselli, & Gonzales, 2010) and because EDs provide care to many undiagnosed HIV-positive individuals and people at high

risk for HIV (Goggin, Davidson, Cantrill, O'Keefe, & Douglas, 2000; Kelen, Shahan, Quinn, & The Project Educate Workgroup, 1999). This is especially pertinent to youth, because many do not have primary care providers when transitioning from pediatric to adult medicine (Marshall, 2011; McCormick, Kass, Elixhauser, Thompson, & Simpson, 2000) and therefore may seek medical care in the ED instead of a doctor's office.

The Present Study

The present study extends research on HIV risk factors among young people in urban EDs (Rothman et al., 2009; AUTHOR et al., 2011) by examining individual (race, gender, age, depressive symptoms, substance use), relationship (dating violence), peer (peer violence), and community (community violence exposure) variables in relation to an index of IDU and sexual HIV risk behaviors. We hypothesized that depressive symptoms, substance use, and all three forms of violence would be related to HIV risk. Given that these variables have been identified as critical risk factors from research among young people in other settings, data on these factors among youth in the ED is needed to inform the most pertinent content and delivery of HIV prevention efforts for youth in this setting where interventions are time-limited. Furthermore, in order to inform HIV testing practices in ED settings, we also sought to examine the prevalence of past HIV testing among these youth and assessed barriers for testing among those who had never been tested.

Method

Study Design

The current cross-sectional study is a secondary analysis of data collected as part of an ongoing prospective two-year longitudinal study of 14 to 24 year-old youth with recent drug use who sought care in an urban Emergency Department (STUDY NAME REMOVED for blind review). For this manuscript, analyses focus on youth who presented to the ED (either for assault-related injury or other reasons, as described below) and reported past six-month drug use on an initial screening survey. Study procedures were approved and conducted in compliance with the Institutional Review Boards for the [INSTITUTIONAL NAMES REMOVED FOR BLIND REVIEW]. A Certificate of Confidentiality was obtained from the National Institutes of Health.

Study Setting

[STUDY NAME] was conducted at [HOSPITAL NAME], a large urban, academic level-1 trauma center located in [CITY, STATE]. [HOSPITAL NAME] is the only public hospital located in [CITY], where poverty and crime rates are high, and comparable to other urban centers, including Detroit, Michigan; Hartford, Connecticut; Camden, New Jersey; St. Louis, Missouri and Oakland, California (Federal Bureau of Investigation, 2007). This urban hospital, like most EDs nationally does not provide universal HIV testing at the point of care to adults or adolescents.

Study Protocol

Potential participants (ages 14-24) were approached in ED treatment and waiting areas by trained research assistants (RAs). Recruitment occurred from December, 2009-September,

2011, 7 days a week with 24 hour-a-day coverage Thursday through Monday and 21 hours Monday, Tuesday and Wednesday. Exclusion criteria included presenting to the ED for acute sexual assault, child abuse, or suicidal ideation/attempt, altered mental status, unstable vital signs, psychotic symptoms, non-English speaking, or absence of a parent/guardian (if patient was under 18 years old). After RAs obtained written informed consent by the patient and parent/guardian (if under 18 years old), patients self-administered a computerized screening survey (20-40 minutes) on a laptop computer with touch screen and audio capability and received a \$1.00 gift (e.g. pens, notebooks) for participation. All participants who reported past six-month drug use on the screening survey were invited to participate in a baseline survey (70-90 minutes) containing additional measures (\$20 remuneration). Both surveys were privately administered and, to ensure privacy, family or friends accompanying the patient in the ED were not allowed in the same location as the participant during survey administration. The RA paused the computer survey during the patient's medical evaluation or if medical studies (e.g., x-rays) or intervention was required and the survey was resumed after medical care was completed.

It is important to note that this study involved the baseline assessment of a larger 2-year observational study ([STUDY NAME]) which was designed to oversample youth presenting to the ED with assault-related injury given these youth may be at exacerbated risk for HIV. Thus, all youth presenting to the ED for assault-related injury (i.e., violent injury) during the study frame were included. Patients with assault-related injuries who were too medically unstable to recruit in the ED and who were admitted to the hospital were approached in the hospital if they stabilized within 72 hours. Based on the age and gender of youth presenting with assault-related injury who reported past 6 month drug use, a proportionally-selected (on age and gender) comparison group was sampled from those who presented for non-assault-related complaints (e.g., abdominal pain, fever); these youth presenting to the ED for other reasons were screened and completed the baseline assessment as described above. Thus, the sample described in this secondary analysis consisted of 600 youth in the ED reporting recent drug use, of whom 350 presented with assault-related injuries and 250 presented for other reasons.

Measures

Inclusion Criteria for Baseline Sample—On the computerized screening survey, we assessed past six-month drug use with the Alcohol, Smoking and Substance Use Involvement Screening Tests (ASSIST; Humeniuk, et al., 2008 WHO ASSIST Working Group, 2002). Participants indicated if they had used any drugs (marijuana, cocaine, heroin, hallucinogens, methamphetamines, inhalants, and prescription sedative, opiate, or stimulants in a manner other than prescribed) in the past 6 months. All participants included in this secondary analysis sample endorsed past six-month use of at least one illicit drug or nonmedical use of prescription drugs.

HIV Risk—The primary dependent variable for this analysis was an index of past-month HIV risk behaviors as measured by the HIV Risk-taking Behaviour Scale (HRBS; Darke, Hall, Heather, Ward, & Wodak, 1991). The HRBS is a validated questionnaire consisting of six items assessing frequency of IDU, needle sharing and cleaning and five questions asking

about number of sex partners, condom use with regular, casual, and paid partners, and frequency of anal sex. Items were scored on a scale ranging from 0 to 5, with total scale scores ranging from 0 to 55 such that higher scores indicate a higher risk for HIV. Compared to the original scale, response options on the item asking about condom use with paid partners were altered to reflect number of times condoms were used (i.e., None = 5, One time = 4, Two times = 3, 3-5 times = 2, 6-10 times = 1, More than 10 times = 0) such that a higher score indicates fewer occasions of condom use with paid partners. Individuals who did not have paid sex received a score of 0 on this item to reflect no increased risk. Cronbach's α in our sample was .74, which is higher than what was reported among the original measurement development sample ($\alpha = .70$; Darke et al., 1991) and is similar to coefficient reported by Petry (2001) for a past-month version of the HRBS ($\alpha = .77$).

Demographics—Demographic information, including age, sex, race, employment, and receipt of public assistance by the participant or his/her parents (if under 18 years old) was collected using items from the National Longitudinal Study of Adolescent Health and the Drug Abuse Treatment Outcome Study of Adolescents (Bearman & Jones, 1997; Harris & Florey, 2003; Sieving et al., 2001; United States Department of Health and Human Services, 2008).

Alcohol Use—Using Chung et al.'s (2000) version of the Alcohol Use Disorders Identification Test (AUDIT) for adolescents, we used a modification of the AUDIT-Consumption (AUDIT-C; Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998) to assess for alcohol misuse. Three items asked about past six-month frequency of alcohol use, number of drinks consumed on a typical drinking day, and frequency of occasions of drinking five or more drinks. Total scores range from 0 to 12 with higher scores indicating greater consumption.

Drug use—Frequency of past 6-month drug use was measured by the ASSIST question, "How often have you used (drug)?" which included response options: never (0), once or twice (2), monthly (3), weekly (4), or daily or almost daily (6) for all drugs separately (marijuana, cocaine, methamphetamine, hallucinogens, inhalants, and street opiates). For the current analyses frequency of marijuana use was scored using the above response options, but we created a dichotomous variable to indicate use of any other illicit drug because only 66 of 600 (11.0%) participants endorsed any past six-month drug use other than marijuana.

Depressive Symptoms—Six items from the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983; Derogatis & Spencer, 1982) measured past-week depressive symptoms. Using a scale from Not at All (coded 0) to Extremely (coded 4), participants rated how much they were bothered by thoughts of suicide, loneliness, feeling blue, lack of interest, hopelessness, and worthlessness. Responses to each item were summed, and each participant's score could range from 0 to 24 with higher scores indicating higher levels of depressive symptoms.

Violence—Community, peer, and dating violence were assessed with three separate measures. We used a modification of the Things I Have Seen and Heard Survey (Richters & Martinez, 1992; Richters & Saltzman, 1990) to assess *community violence exposure*. We

used the five items assessing how often participants heard gun shots, saw drug deals, had their homes broken into, saw gangs in the neighborhood, and saw someone getting stabbed or shot. Participants rated items on a scale from Never (coded 0) to Many Times (coded 3). Responses were summed (range 0 to 15) so that higher scores indicated more community violence exposure.

Past six-month *dating violence* was assessed with a revised version of items from the Conflict Tactics Scale (CTS; Straus, 1979; 2007; Straus, Hamby, Boney-McCoy, & Sugarman, 1996). Participants completed 26 items in reference to their “dating partner (girlfriend/boyfriend, fiancé, husband/wife).” Respondents rated how often their partner had engaged in 13 violent behaviors (e.g., slapping, punching, kicking, choking) directed toward them, and then they rated how often they had perpetrated the 13 behaviors toward their partner. Response options ranged from Never (coded 0) to 20+ Times (coded 6). Responses on aggression and victimization items were added together to create a summary variable of dating violence involvement (range = 0 to 156); so that higher scores indicated more frequent involvement in dating violence. Similarly, past six-month *peer violence* was assessed using the same 26 items (13 for aggression, 13 for victimization), but participants were asked to provide responses in reference to “friends, neighbors, co-workers, or strangers” only. Participants’ responses were summed, such that higher scores indicated more frequent involvement in peer violence (range = 0 to 156).

Descriptive Information Regarding Sexual Activity, STIs, and HIV Testing—

Items from national surveys and related literature were used to assess sexual activity, STI history, and HIV testing history. Specific items assessed: lifetime sexual activity, number of children, female pregnancy, gender of sexual partners, use of alcohol or drugs before last intercourse, history of forced sexual activity, non-consensual sex due to drinking/drugs, and STI history (AUTHOR, 2003; AUTHOR, 2000; Bearman & Jones, 1997, National Center for Chronic Disease Prevention and Health Promotion, 2009; Parks, Romosz, Bradizza, & Hsieh, 2008). Participants were asked about lifetime HIV testing, and those who were tested reported whether they had ever had a positive test (Bearman & Jones, 1997). Those that had no prior HIV test completed 8 yes/no questions (Peralta, Deeds, Hipszer, & Ghalib, 2007) about beliefs and barriers to testing. At baseline, all participants were offered a saliva-based HIV antibody test (OraQuick Advance Rapid HIV-1/2 Antibody Test, OraSure Technologies, Inc., Bethlehem, PA).

Statistical Analysis

Descriptive statistics, including frequency and percentage for categorical measures and means and standard deviations for continuous measures, were computed for demographics, substance use, depression, sexual activity, and HIV testing. To characterize rates of HIV risk behaviors in this sample, response frequencies were also calculated for each item on the HRBS. Because HRBS total scores were not normally distributed, a negative binomial regression model with simultaneous entry was then used to evaluate the associations between independent variables and the continuous measure of HIV risk behavior. Negative binomial regression analyses provide an Incident Rate Ratio (IRR) for each independent variable such that IRRs greater than 1.0 reflect increased HIV risk and IRRs less than 1.0

reflect decreased HIV risk. Specifically, age, gender, race (African American vs. European American/Other), receipt of public assistance (yes/no), depressive symptoms, alcohol use (AUDIT C score), frequency of marijuana use, other illicit drug use (yes/no), and frequency of dating violence involvement, peer violence involvement, and community violence exposure were entered in the model. Because there was limited variation in the racial composition of our sample (58% African American, 33% European American, 9% other), it was necessary to dichotomize race for the purpose of statistical analyses. Mean scores on the HRBS did not differ based on ED presentation reason (assault-related injury vs. other); therefore, this variable was not included in the regression analyses.

A correlation matrix and variance inflation factors were computed for all independent variables in the regression model, and there was no evidence of multicollinearity. All data were analyzed using SAS 9.2. statistical software (SAS Institute Inc; Cary, NC).

Results

Sample

There were 1399 patients 14-24 years old who presented to the ED for violent injury during the recruitment period; 474 (27.6%) were excluded, most commonly for not having a parent/guardian present (13.7%) or insufficient cognitive orientation (13.9%). Of the remaining 925 potentially eligible participants presenting for violent injury, 849 were approached (91.8%) and 76 (8.2%) were missed. Refusals were received from 131 (15.4%). Of the 718 (84.6%) who completed the screening, 388 (54.0%) reported past six-month drug use and were eligible for the baseline phase of the study. With regard to the proportionally matched group presenting to the ED for reasons other than violent injury, 846 patients were approached, 146 refused participation (13.7%), and 730 (86.3%) completed the screening measures. Of those, 281 (38.5%) were eligible for participation in the baseline phase of the study.

Participants who completed the screening survey were compared to missed patients ($n = 76$) and those who refused ($n = 247$) on the basis of gender, age group (14-17 vs. 18-24), and race (African American vs. European American/Other). Males (17.7%) were more likely to refuse the screening than females (10.9%; $\chi^2 = 16.08, p < .001$), younger participants (18.1%) were more likely to refuse than older participants (13.6%; $\chi^2 = 4.79, p < .05$), and European American/Other (22.0%) were more likely to refuse than African Americans (9.7%; $\chi^2 = 33.00, p < .001$).

Based on screening criteria, 669 participants were eligible for the baseline phase, but 63 refused participation (33 with violent-injury) and six (one with violent injury) were excluded because during the screening process they were determined to be cognitively impaired, precluding completion of surveys. Therefore, 600 participants completed baseline measures and enrolled in the study (350 presenting with violent injury; 250 presenting for other reasons). At baseline, European American/Other individuals (13.5%) were more likely to refuse than African Americans (6.5%; $\chi^2 = 9.33, p < .01$); baseline refusals did not differ by gender or age grouping.

Participants' demographics, depressive symptoms, substance use, and violence involvement

Participants' mean age was 20.1 years ($SD = 2.4$); 41.2% were female, and most were African American (58.2%); 35 (5.8%) reported Hispanic/Latino ethnicity. About half (47.8%) lived with a parent/guardian and 73.0% reported receipt of public assistance. With regard to substance use, the majority (66.5%) consumed alcohol in the past six-months; the average AUDIT-C score was 2.7 ($SD = 3.1$). Among this high-risk sample with past six-month drug use, marijuana use was most common (97.2%) and, on average, participants reported using marijuana on a weekly basis. Descriptive characteristics and participants' means on measures of depressive symptoms and violence are shown in Table 1.

Participants' sexual history, HIV risk behaviors, and HIV testing

Table 1 also displays characteristics of participants' sexual history. Nearly all participants reported lifetime sexual intercourse (95.3%) with 40.3% having children and 28.1% of sexually active females reported current/suspected pregnancy at the time of survey. Most participants reported having only opposite gender sex partners (82.3%), only 2% reported having only same gender sex partners, and 11% had sex partners of both genders. Two-thirds (67.2%) of participants had ever had an HIV test and 30.3% had a prior STI. As shown in Table 2, among the 197 (32.8%) who had never had an HIV test, the most common reasons for not being tested were not feeling "at risk" (55.3%) and never having been offered an HIV test (45.7%). At baseline HIV testing 585 participants tested negative, (97.5%) one test was inconclusive, and 14 participants declined testing; however, 8 participants reported having had a prior positive HIV test (1.3%).

Table 3 displays a summary of responses to each item included on the HRBS. Seventy-eight (13%) participants scored a 0 on the HRBS, indicating no past-month injection drug use, sex, or sexual risk behavior. The remaining 87% were, at some level, involved in HIV risk behaviors. Further, participants reported more frequent sexual HIV risk behaviors than IDU HIV risk behaviors. Although 21 (3.5%) participants reported lifetime IDU, only 8 (1.3%) injected in the past month. Only 15.5% of participants reported having no sexual partner in the past month, whereas 54.3% reported having one partner and 30.2% reported having at least two partners. Over half (54.5%) did not use a condom every time they had sex with a regular partner and 27.3% did not use a condom every time with a casual partner. Eight respondents reported never using condoms with paid sex (1.3%). With regard to anal sex, most participants (82.5%) denied past-month anal sex, however 7.5% reported anal sex with one partner and 10.0% had two or more anal sex partners in the past month.

Analyses examining correlates of HIV risk behaviors

As shown in Table 4, the following variables were significantly positively correlated with HIV risk at the bivariate level: age, female gender, alcohol, marijuana, and other drug use, depressive symptoms, and all three types of violence (community violence exposure, peer, and dating). The negative binomial regression model evaluating correlates of HIV risk was significant [$\chi^2(11) = 20.11, p < .05$] and results are displayed in Table 5. Older age was significantly related to HIV risk (IRR = 1.03), such that a one year increase in age resulted in a 3% increase in HIV risk. Marijuana use frequency (possible range 0 to 6) was also

significant (OR = 1.06), and a one-unit increase in marijuana frequency was associated with a 6% increase in HIV risk. Dating violence was the remaining significant correlate of HIV risk (IRR = 1.01). A one-point increase on the dating violence scale (possible range 0 to 156) was associated with a 1% increase in HIV risk behavior. The remaining variables in this regression model (i.e., gender, race, public assistance, alcohol use, other drug use, depression, community violence, peer violence) were not significantly related to HIV risk score at the multivariate level.

Discussion

The descriptive results provide a wealth of information regarding HIV risk and the sexual history of high-risk young people who use drugs and present to the ED. Although this is a drug-using sample, most participants were not IDUs. Rather, these youth were at risk for HIV through sexual risk behaviors. For example, nearly one-third reported multiple partners and the majority did not use condoms every time they had sex with a regular partner; another quarter reported inconsistent condom use with casual partners. One-third had used alcohol or drugs before their last sexual encounter. These proportions suggest a need for ED-based sexual risk reduction interventions in this population.

Although this sample's rate of HIV testing was much higher than the national average from the Youth Risk Behavior Survey (CDC, 2010), given the rates of sexual risk behaviors in this sample, it is concerning that one-third had never been tested, and that no routine prevention messages were given to high-risk youth at the time of care. Despite CDC recommendations for universal HIV testing for adolescents and adults in healthcare settings, 57% of youth who said they were never offered an HIV test said they had visited an ED in the previous 6 months. This suggests the need for further dissemination of HIV testing and research evaluating strategies to overcome barriers to testing as well as feasible strategies to disseminate prevention interventions to youth seeking ED care who may not be reached in other settings. The CDC estimates (2011a, 2012a) that young people, especially African Americans (who comprise 58% of our sample), are disproportionately affected by HIV. However, the most commonly endorsed reason for lack of testing among our sample was not feeling "at risk" for HIV. Prevention programs might consider this discrepancy in creating interventions targeting reduced risk and increased testing.

While dating violence, marijuana use, and age were the most potent predictors of index HIV risk in multivariate analyses, all independent variables (except race and receipt of public assistance) demonstrated significant bivariate relationships with HIV risk that are consistent with prior research and theory (DiClemente et al., 2001; Jessor, 1982; Voisin, Jenkins, & Takahashi, 2011). As such, all of these factors (e.g., substance use, depression, dating, peer, and community violence) should be considered in assessing and addressing young people's HIV risk in the ED setting. It is also notable that race was not significantly related to HIV risk both bivariately and multivariately, suggesting that these other socio-ecological factors play a more prominent role in the development of HIV risk than an individual's race.

Results from this at-risk sample of drug-using adolescents/young adults presenting to the ED showed significant multivariate relationships between age, marijuana use, and dating

violence with HIV risk behaviors, which is consistent with studies examining these variables among samples from other settings (Alleyne et al., 2011; Decker et al., 2001; Hendershot, Magnan, & Bryan, 2010; Silverman, Raj, & Clements, 2004; Silverman, Raj, Mucci, & Hathway, 2001; Wilson, Woods, Emerson, & Donenberg, 2012; Wingood, DiClemente, McCree, Harrington, & Davies, 2001). The present results were also consistent with a prior ED-based study that examined sexual risk behaviors among 14-18 year-olds (AUTHOR et al., 2011). However, the current study differs by focusing on a high risk sample of substance using youth, the large majority (95%) of whom were sexually active in the past month. The current study also encompassed a wider age range representing the developmental periods of both adolescence and young adulthood, and assessed an index HIV risk that comprised IDU and sexual HIV risk behaviors (including condom use across types of partners, anal sex, and transactional sex).

Although prior event-level research (Hendershot, Magnan, & Bryan, 2010) has shown that marijuana use before sex is associated with lack of condom use, our measure of marijuana use was one of the general pattern of past six-month use and did not take into account contextual factors, such as when the marijuana was consumed in relation to sexual behavior. However, in this sample of primarily marijuana users, it is important to note that increasing marijuana use frequency was associated with increasing HIV risk. Future event-level data could further evaluate these relationships by examining quantity of marijuana consumed in relation to high-risk sexual events. Furthermore, as expected based on prior research (Brown & Venable, 2007; Kiene et al., 2009) alcohol consumption was positively correlated with HIV risk behaviors in bivariate analyses; however, alcohol use was not a significant correlate of HIV risk in our multivariate model when simultaneously accounting for other risk factors. Nevertheless, given the presence of sexual risk behaviors among these drug-using youth, substance abuse treatment programs may also present an opportunity for coordinated prevention and intervention regarding HIV risk, yet few adolescent programs provide on-site HIV testing, and only about half of programs offer HIV risk assessment and prevention programming (Knudsen & Oser, 2009). This highlights the need to reach youth in the settings where they are most often seeking care, such as the ED. For example, on average, youth in this sample sought care in the ED 1.4 times ($SD = 3.1$) in the past 6 months.

Findings regarding the relationships of violence with HIV risk behaviors differ somewhat from prior literature. Like others (e.g., Decker et al., 2001; Teitelman et al., 2008; Wingood et al., 2001) we found a positive relationship between dating violence and HIV risk. Although the IRR for this effect appears relatively small ($IRR = 1.01$), it is important to note that for every one point increase on the index score of dating violence involvement, there is a 1% increase in HIV risk behavior. Thus, for a one standard deviation increase in dating violence, the incident rate ratio for HIV risk behavior would increase by 9% (i.e., $IRR = 1.09$). In our multivariate analyses, we did not find expected relationships between community violence exposure and peer violence with the index of HIV risk. However, given these youth were oversampled to have experienced recent violence there may be restricted variability in our measures of violence which could affect relationships of violence and HIV risk behaviors. There is a large amount of overlap in young people engaging in both dating

violence and peer violence (Foshee et al., 2011; Swahn, et al., 2008), and our analyses did not account for whether individuals were involved in both of these or only one type of violence. Thus, more research is needed to understand these patterns of violence and HIV risk in the adolescent ED population; however it may be that dating violence is a stronger risk factor for sexual HIV risk than involvement in peer violence. Furthermore, multivariate analyses did not reveal a significant relationship of community violence exposure with HIV risk behaviors when accounting for individual experience of violence. Only 3.8% of adolescents in this sample reported no community violence exposure; it may be that among youth from a high-crime community, frequency of community violence exposure is not a strong predictor of overall HIV risk.

Depressive symptoms were not related to HIV risk behaviors in the regression model, though they were correlated with HRBS scores at the bivariate level. It is plausible that this relationship was less powerful than expected because the measure we used asked participants to report on symptoms over the prior week, which may have little relationship to HIV risk behaviors over a six-month time period. Alternatively, depression may be a less robust predictor of sexual HIV risk behaviors than substance use or violence.

This investigation is not without limitations, for example, due to the cross-sectional design, causal relationships cannot be determined. Moreover, our sample was recruited using a non-probabilistic technique and thus our results may not be generalizable to the larger ED population within this setting. Furthermore, given that the majority of youth reported opposite-gender sexual relationships, it is not known whether findings would generalize to youth of other sexual orientations. In addition, the limited variability in racial and ethnic composition of the sample may affect the generalizability of findings. These data may also be subject to the limitations of self-report, although prior research supports the reliability and validity of data reported by youth using computers (Buchan et al., 2002; Brener et al., 2002; 2003; Dennis et al., 2002; Harrison et al., 2007; Thornberry & Krohn, 2000; Turner et al 1998; Webb et al., 1999) and RAs took steps to ensure participants' privacy during survey administration. Furthermore, we could not include measurements of all variables theorized to be related to HIV risk. For example, our findings related to dating violence may have been different if we could account for other relationship influences such as condom use self-efficacy and communication with partners about sexual risks.

Despite the above limitations, our results have implications for intervention and future research, particularly for intervention development in health care settings. Our finding that frequency of marijuana use was related to sexual risk behaviors, suggests future research using event-level methods (e.g., timeline follow back, ecological momentary assessment) is needed to evaluate more clearly the temporal links between quantity, frequency, and timing of marijuana use and sexual risk behaviors. Prior event-level research has demonstrated that acute alcohol use/intoxication is also associated with sexual risk behaviors (Brown & Vanable, 2007; Kiene, Barta, Tennen, & Armeli, 2009), and although alcohol use was not related to HIV risk behaviors at the multivariate level, it is important to consider its role, in addition to marijuana, in future research. Similarly, event-level data may help elucidate causal relationships when dating violence, substance use, and risky sex occur in the same

context or relationship. Lastly, HIV intervention programs should consider integrating dating violence and substance use prevention given the co-occurrence of these behaviors.

That very few participants reported IDU suggests that HIV prevention programs for at-risk youth in ED settings may be most effective if they focus on sexual risk reduction, though the risks of IDU should not be ignored for those engaging in or likely to initiate IDU. Moreover, expanding universal testing of HIV to include youth in the ED who are at highest risk (e.g., presenting for dating violence, having a history of substance use) and moving beyond testing to providing brief counseling while they are present at point of care is the logical next step for ED practitioners in reducing the transmission of HIV. Although evidence-based HIV prevention programs for high-risk youth exist (CDC, 2011c), they typically involve several group-based sessions, which would be impractical to implement in the ED setting. However, studies of brief ED-based interventions (approximately 30 minutes) have reported reductions in other risky behaviors in youth (AUTHOR et al., 2012; Monti et al., 1999; Monti et al., 2007; Spirito et al., 2011; AUTHOR et al., 2010) and future research should evaluate whether such approaches are effective in reducing HIV risk behaviors among adolescents and young adults presenting to the ED. Furthermore, as DiClemente et al. (2005) suggests, prevention may be most effective if efforts are coordinated synergistically across levels of socio-ecological influence. Thus, the ED is one promising venue for the implementation of prevention and intervention. Specifically, youth with high risk for HIV may be amenable to brief interventions in the ED setting, as well as increased information regarding HIV testing services. Currently, there is no standard of care for behavioral interventions in the ED for youth at risk for HIV. In addition, programming may be most effective when offered in coordination with other community and social services and active referral from the ED could aid this linkage.

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Table 1Frequencies of demographics, risk factors, and sexual behavior ($N = 600$)

| | <i>M (SD) or %</i> |
|---|--------------------|
| Demographics | |
| Age | 20.1 (2.4) |
| Female | 41.2% |
| African American | 58.2% |
| Lives with parent/guardian | 47.8% |
| Self or parent receives public assistance | 73.0% |
| HIV risk factors | |
| AUDIT-C ^a | 2.7 (3.1) |
| Frequency of marijuana use | 4.3 (1.8) |
| Any other illicit drug use | 11.0% |
| BSI-Depression ^b | 4.7 (5.3) |
| Frequency of community violence exposure | 6.7 (3.6) |
| Frequency of non-partner/peer violence | 11.0 (15.5) |
| Frequency of partner/dating violence | 12.4 (17.5) |
| Sexual Activity and STD | |
| Sexually active in lifetime | 95.3% |
| Pregnant, or think could be pregnant ^c | 28.1% |
| Has children | 40.3% |
| History of STD | 30.3% |
| Ever been tested for HIV | 67.2% |
| Sexual Partners | |
| None | 4.7% |
| All opposite gender | 82.3% |
| Mostly opposite gender | 6.7% |
| Half same gender, half opposite gender | 3.3% |
| Mostly same gender | 1.0% |
| All same gender | 2.0% |

^a Alcohol Use Disorders Identification Test-Consumption total score.

^b Brief Symptom Inventory (BSI) Depression total score.

^c Pregnancy status of 28% is calculated among 231 sexually active females only.

Table 2Reasons for and barriers to testing among those who have never been tested for HIV ($n=197$)

| | <i>n</i> (%) |
|---|--------------|
| I don't think I could be HIV positive because I don't feel like I am at risk. | 109 (55.3%) |
| I have never been offered an HIV test. | 90 (45.7%) |
| I don't think I could be HIV positive because I don't feel sick. | 34 (17.3%) |
| I don't know where to get tested | 20 (10.2%) |
| I would be too upset about a positive test. | 14 (7.1%) |
| I don't want the test | 9 (4.6%) |
| Other things are more important than getting an HIV test. | 5 (2.5%) |
| I don't want anybody to know if I have HIV. | 4 (2.0%) |

Note. Proportions sum to more than 100% because participants could check all responses that they felt applied to them.

Table 3

Responses to past-month HIV Risk-Taking Behaviour Scale items for total sample

| | <i>n</i> (%) |
|--|--------------|
| Injection drug use items | |
| Injected drugs | 8 (1.3%) |
| Used needle after someone else | 2 (0.3%) |
| Number of people who have used a needle before you | |
| None/does not inject | 597 (99.5%) |
| One | 3 (0.5%) |
| Number of people who used a needle after you | |
| None/does not inject | 595 (99.2%) |
| One or more | 5 (0.83%) |
| Cleans needles before re-using | |
| Does not re-use or does not inject | 593 (98.8%) |
| Cleans every time | 6 (1.0%) |
| Does not clean every time | 1 (0.2%) |
| Uses bleach to clean needles before reusing | |
| Does not re-use or does not inject | 593 (98.8%) |
| Bleaches every time | 4 (0.7%) |
| Does not always bleach | 3 (0.3%) |
| Sexual risk behavior items | |
| Number of regular, casual, or paid sex partners | |
| None | 93 (15.5%) |
| One person | 326 (54.3%) |
| Two or more people | 181 (30.2%) |
| Condom use with regular partners | |
| No regular partner/no sex | 120 (20.0%) |
| Used condom every time | 153 (25.5%) |
| Did not use condom every time | 327 (54.5%) |
| Condom use with casual partners | |
| No casual partner/no sex | 263 (43.8%) |
| Used condom every time | 173 (28.8%) |
| Did not use condom every time | 164 (27.3%) |
| Condom use with paid partners | |
| No paid sex/no sex | 579 (96.5%) |
| Condom use 1 time with paid partner(s) | 4 (0.7%) |
| Condom use more than 1 time with paid partner(s) | 17 (2.8%) |
| Number of times had anal sex | |
| None | 495 (82.5%) |
| One time | 45 (7.5%) |
| More than one time | 60 (10.0%) |

Table 4

Bivariate correlations between independent variables and HIV risk behavior

| Correlates | Correlation with HRBS Total |
|---|-----------------------------|
| Age | .13** |
| Female (ref = male) | .09* |
| African American (ref = European American/Other) | -.04 |
| Receipt of Public Assistance (ref = no public assistance) | .01 |
| AUDIT-C ^a | .16*** |
| Frequency of marijuana use | .15** |
| Other illicit drug use (ref = no other illicit drug use) | .13** |
| BSI ^b Depression | .10* |
| Frequency of community violence exposure ^c | .13** |
| Frequency of peer violence involvement | .14*** |
| Frequency of dating violence involvement | .23*** |

*
 $p < .05$,**
 $p < .01$,***
 $p < .001$ ^a Alcohol Use Disorders Identification Test-Consumption total score.^b Brief Symptom Inventory Depression total score.^c Participants' scores on violence measures were summed such that higher scores = more frequent community violence exposure or dating/peer violence involvement.

Table 5

Negative binomial regression model examining correlates of HIV risk among youth with past 6 month history of drug use

| Correlates | IRR | 95% CI |
|---|-------|-------------|
| Age | 1.03* | (1.00-1.06) |
| Female (ref = male) | 1.11 | (0.97-1.26) |
| African American (ref = European American/Other) | 1.06 | (0.93-1.22) |
| Receipt of Public Assistance (ref = no public assistance) | 1.04 | (0.90-1.21) |
| AUDIT-C ^a | 1.01 | (0.99-1.03) |
| Frequency of marijuana use | 1.06* | (1.02-1.09) |
| Other illicit drug use (ref = no other illicit drug use) | 0.87 | (0.71-1.07) |
| BSI - Depression ^b | 1.00 | (0.98-1.01) |
| Community violence exposure ^c | 1.01 | (0.99-1.03) |
| Peer violence | 1.00 | (1.00-1.01) |
| Dating violence | 1.01* | (1.00-1.01) |

*
 $p < .05$

^a Alcohol Use Disorders Identification Test-Consumption total score.

^b Brief Symptom Inventory Depression total score.

^c Participants' scores on violence measures were summed such that higher scores = more frequent community violence exposure or dating/peer violence involvement.