HHS Public Access

Author manuscript

AIDS Behav. Author manuscript; available in PMC 2016 April 01.

Published in final edited form as:

AIDS Behav. 2015 April ; 19(4): 684–693. doi:10.1007/s10461-014-0890-0.

Syndemic vulnerability, sexual and injection risk behaviors, and HIV continuum of care outcomes in HIV-positive injection drug users

Yuko Mizuno[1], **David W. Purcell**[1], **Amy R. Knowlton**[2], **James D. Wilkinson**[3], **Marc N. Gourevitch**[4], and **Kelly R. Knight**[5]

[1]Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention, Atlanta, GA, USA

[2]Johns Hopkins Bloomberg School of Public Health Department of Health, Behavior and Society, Baltimore, MD 21205, USA

[3]Division of Pediatric Clinical Research Leonard M. Miller School of Medicine Batchelor Children's Research Institute, Miami, FL 33101, USA

[4]Department of Population Health, New York University School of Medicine, New York, NY 10016, USA

[5]Department of Anthropology, History, and Social Medicine, University of California-San Francisco, San Francisco, CA 94143, USA

Abstract

Limited investigations have been conducted on syndemics and HIV continuum of care outcomes. Using baseline data from a multi-site, randomized controlled study of HIV-positive injection drug users (n=1052), we examined whether psychosocial factors co-occurred, and whether these factors were additively associated with behavioral and HIV continuum of care outcomes. Experiencing one type of psychosocial problem was significantly ($p<0.05$) associated with an increased odds of experiencing another type of problem. Persons with 3 or more psychosocial problems were significantly more likely to report sexual and injection risk behaviors and were less likely to be adherent to HIV medications. Persons with 4 or more problems were less likely to be virally suppressed. Reporting any problems was associated with not currently taking HIV medications. Our findings highlight the association of syndemics not only with risk behaviors, but also with outcomes related to the continuum of care for HIV-positive persons.

Keywords

Syndemics; HIV-positive injection drug users; HIV risk behaviors; HIV continuum of care

Address for correspondence: Yuko Mizuno, Ph.D., 1600 Clifton Road, NE Mail Stop E37, Atlanta, GA 30333, USA; Phone: +1 (404)639-1925; FAX: +1 (404)639-1950; ymizuno@cdc.gov.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

INTRODUCTION

One of the three goals of the National HIV/AIDS Strategy (NHAS)(1) is to increase access to health care and improve health outcomes for people living with HIV (PLWH). Antiretroviral therapy (ART) not only improves health outcomes for HIV-positive persons, but also provides substantial protection for HIV-negative sexual partners (2). In July 2013, President Obama issued an Executive Order re-emphasizing the importance of addressing the HIV continuum of care for PLWH (3). In the US, it is estimated that 66% of PLWH are linked to care and that the percentages of persons achieving successful outcomes decline as one moves along the continuum of care (i.e., retained in HIV care [37%], prescribed ART [33%] and have suppressed viral load [25%]) (4). Addressing the continuum of care, including identifying undiagnosed HIV-positive persons, increasing linkage and retention to health services, and suppressing viral load is critical for achieving the NHAS goals of improving health outcomes of PLWH, and preventing further HIV transmission (1,5).

In the United States (US), persons who inject illicit drugs (IDUs) accounted for an estimated 11% of diagnosed HIV infections among adults and adolescents in 2011 (5% attributed to males who inject drugs, 3% to men who report male-to-male sexual contact and injection drug use, and 3% to females who inject drugs). Among male adults and adolescents living with diagnosed HIV infection at the end of 2010, 21% of infections were estimated to be attributed to injection drug use (14% to injection drug use and 7% to male-to-male sexual contact and injection drug use). Among females living with diagnosis of HIV infection, 25% were estimated to be attributed to injection drug use (6). Although rates of HIV infection among HIV-positive IDUs have decreased over time, they are of concern because of two potential modes of HIV transmission - sexual behaviors as well as injection behaviors (7–14). Research shows that HIV-positive IDUs are generally socially and economically marginalized and face life circumstances that present significant challenges for HIV prevention efforts including homelessness, violence, addiction, and social exclusion (15–16).

The term syndemics, first applied in the context of HIV/AIDS by Singer (17), describes an interconnected set of problems such as mental health, substance use/abuse, and violence/abuse that additively increase vulnerability to adverse health outcomes (18–19). Further, syndemic theory suggests that these mutually reinforcing health problems are socially produced, pointing to poverty and social inequality as the adverse social conditions through which health problems emerge, concentrate, and interact (17). Increasingly, syndemic theory has been used to explain health disparities among gay, bisexual, and other men who have sex with men (collectively referred to as MSM) and people most at risk for poor health outcomes. Researchers have found that co-occurring and synergistically interacting psychosocial problems are associated with sexual risk behaviors and/or HIV prevalence among various samples of MSM (18, 20–24) and other populations such as transgender women (25), patients attending an urban STD clinic (26), and women (27). To date, there has been limited investigation of syndemics among HIV-positive IDUs and little data reporting the associations between syndemics and behaviors such as injection risk behaviors and outcomes on the continuum of HIV care (e.g., measures of retention in care, treatment uptake, medication adherence, and viral load suppression).

Previous research has typically included psychosocial factors such as poly-drug use, mental health problems, and abuse/violence in the measure of syndemics (18, 20, 21, 23–26, 28–30). Based on the life circumstances of HIV-positive IDUs which could be attributed to their adverse social conditions (15, 16, 31), other relevant problems such as low social support (32–34), homelessness (15, 16, 35), and incarceration (15, 36–40) could also be considered psychosocial factors (41) that define a syndemic. Using baseline data collected from a large sample of HIV-positive IDUs who participated in a randomized controlled behavioral intervention trial to address sexual and injection risk behaviors, utilization of HIV care, and adherence to HIV medications (42, 43), we examined whether certain psychosocial factors were co-occurring, and whether these factors were additively associated with each of the six negative behaviors or outcomes such as sexual and injection HIV transmission risk behaviors, not being retained in HIV care, not taking HIV medications, not adhering to HIV medication regimens, and having detectable viral load. By focusing on syndemics, we move away from individual-level determinants of health (15) to a more holistic approach that considers broader social and structural-level determinants in understanding risk and health behaviors of HIV-positive IDUs.

METHODS

Data

We report baseline data collected from participants of the Intervention for Seropositive Injectors – Research and Evaluation (INSPIRE), a randomized controlled trial of an HIV prevention intervention designed for HIV-positive IDUs (42, 43). We included 1052 participants who provided complete responses to questions related to potential syndemic factors. The study was conducted in four cities in the United States (Baltimore, Miami, New York, and San Francisco) from 2001 through 2005. Participants were recruited using active (e.g., street outreach) and passive strategies (e.g., posters and leaflets, word of mouth) in a variety of HIV care and community venues including AIDS service organizations, medical clinics, methadone clinics, as well as street-based settings. Individuals were eligible for the study if they were at least 18 years old, confirmed to be HIV positive by testing of oral specimen, reported injection drug use in the past 12 months, and reported having sex with an opposite sex-partner in the past 3 months.

Using an audio-computer assisted self-interview (A-CASI), participants were asked questions regarding sexual and drug using behaviors, utilization of health care, and adherence to HIV medications. Participants also provided an oral fluid sample for confirmatory HIV-antibody testing (OraSure, OraSure Technologies, Inc., Bethlehem, PA, USA) and a blood specimen for CD4 count and viral load. HIV confirmatory testing was performed at local laboratories, and CD4 count and viral load testing was performed at CDC laboratories. Participants were reimbursed $30 for their time and effort for the baseline appointment. More detailed description of INSPIRE and its methodology has been reported elsewhere (42. 43). Study protocols were approved by institutional review boards of CDC and collaborating study sites.

Measures

Psychosocial problems—We assessed six psychosocial problems as potential syndemic factors. Poly-drug use was assessed by asking the number of different types of illicit drugs participants used in the past 3 months, and then creating a dichotomous variable indicating whether 3 or more drugs were used. Experience of abuse was measured by asking whether participants have ever been sexually abused (i.e., sexually attacked, raped, or sexually abused) or physically abused (i.e., beaten, physically attacked, or physically abused) in adulthood. Psychological distress during the previous week was measured by combining the depression (7 items), anxiety (6 items), and hostility (5 items) subscales of the Brief Symptom Inventory (44) (alpha = 0.95). Each item had five response categories (1=not at all, 2=a little…to 5=extremely). Average scores across the 18 items were dichotomized so that participants whose average scores were higher than 2 (a little distress) were categorized as having psychological distress. Lack of social support was measured by a 5-item scale adapted from the social support scale developed by Barrera (45) (alpha = 0.87). Each item had five response categories (1=definitely not, 2=probably not…to 5=definitely yes). Average score across the 5 items were dichotomized so that participants whose average scores were less than 3 (maybe) were categorized as perceiving low social support. Homelessness was assessed by asking whether participants slept at least one week in a squatting place, abandoned building, car, homeless shelter, park or street in the past 12 months. Incarceration history was assessed by asking whether participants had been in jail, prison, or a correctional facility in the past 6 months.

Behavioral/health outcomes—For sexual transmission risk behavior, we assessed whether participants engaged in any vaginal or anal sex without condoms with HIV-negative or unknown HIV status sex partners in the past 3 months. For injection risk behavior, we assessed whether participants lent a used needle to or shared injection equipment (cooker, cotton, or rinse water) with HIV-negative or unknown HIV status drug use partners in the past 3 months. HIV care visit was used as a measure of retention in HIV care, and for this, we assessed whether participants self-reported having any visits to their HIV health care providers in the past 6 months. HIV medication use was used as a measure of HIV medication uptake, and for this, we assessed whether participants were currently taking any HIV medications. For medication adherence, we assessed prior day adherence to dosage as a continuous rate and dichotomized it into ≥90% adherence (yes/no) (46). Viral load measured from blood specimens were dichotomized into undetectable (<400 copies/mL) versus detectable. For ease of interpretation of results, we coded each of the behavioral and health outcomes so that those coded as 1 represented a negative outcome (i.e., engaging in risky sexual or injection behavior, not having any visits to their HIV health care providers, not taking any HIV medications, not adhering to their HIV medication regimen, or having a detectable viral load).

Socio-demographic variables—Socio-demographic variables examined included age, biological sex at birth (male vs. female), race/ethnicity (Non-Hispanic white, Non-Hispanic black, Hispanic, and other), education (high school or more vs. less than high school), income ($5,000 or more per year vs. less than 5,000 per year, median-split), and city (Baltimore, Miami, New York and San Francisco).

Analytic strategy

First, we examined the extent to which participants reported experiencing each of the psychosocial problems. We used bivariate logistic regression models to assess whether reporting one type of psychosocial problem was associated with reporting of other types of problems, and also whether reporting each of the psychosocial problems was associated with each of the six behavioral and health outcomes. We then examined the extent to which participants reported multiple psychosocial problems by developing a count score of the number of psychosocial problems (from 0 to 6) and assessed its frequency distribution. For ease of further analyses and interpretation and because relatively fewer people reported having five (n=54, 5.1%) or six problems (n=10, 1.0%), we combined cases reporting 4 to 6 problems into one group (n=180, 17.1%). We used the Mantel-Haenszel chi-square to test for linear association between the number of psychosocial problems and the prevalence of each behavioral and health outcome. We then used multivariable logistic regression models to test which numbers of psychosocial problems were associated with each outcome. For these models, we treated the number of problems as a series of binary variables with zero problems as a reference category, and we also controlled for demographic variables such as age, sex, race, income, education, and city.

RESULTS

Sample Characteristics

Table 1 summarizes the characteristics of HIV-positive IDUs in the sample (n=1052). The sample was predominantly male, African American, and of extremely low socioeconomic status. Almost a third of the sample reported engaging in sexual and injection risk behaviors in the past 3 months. One in five reported not having any visits to their HIV health care providers in the past 6 months and 44% reported not currently taking HIV medications. Among those who were taking HIV medications who also provided valid adherence data (n=501), a quarter reported less than 90% adherence to their HIV medications regimens on the previous day. Only one out of five of participants who provided blood samples at baseline had an undetectable viral load.

Co-occurring Psychosocial Problems

Table 1 also shows the percentage of participants who reported experiencing each of the psychosocial problems. Poly-drug use in the past 3 months was reported by almost 60% of the sample. About a half reported experiencing abuse in adulthood. Thirty-seven percent were categorized as having psychological distress. About a third reported experiencing homelessness in the past 12 months. Incarceration in the past 6 months was reported by about a quarter of the sample. Thirteen percent were categorized as perceiving low social support.

Table 2 shows the results of bivariate logistic regression analyses testing the associations among experiences of psychosocial problems. These results indicate that experiencing one type of problem was often significantly ($p<0.05$) associated with an increased odds of experiencing several other types of problem. The association between psychosocial

problems was minimal for incarceration, which was associated only with homelessness. Further, low social support and poly-drug use were not associated.

Table 3 shows the results of bivariate logistic regression analyses testing the association between each of the psychosocial problems and each of the behavioral and health outcomes. With the exception of adulthood abuse, each psychosocial problem was significantly ($p<0.05$) associated with an increased odds of experiencing at least three negative behavioral or health outcomes. Those who had been homeless had increased odds of experiencing all six negative outcomes, and each psychosocial problem was associated with increased odds of reporting sexual risk behavior.

Table 4 shows the frequency distribution of the number of psychosocial problems reported; only about 10% reported 0 problems, 23% reported one type, about a third reported two types, almost 20% reported three types, and 17% reported four to six types of problems.

Association between Number of Psychosocial Problems and Behavioral/Health Outcomes

Table 4 also shows bivariate associations between the number of psychosocial problems and each of the behavioral and health outcomes. For example, 14% of those who reported zero psychosocial problems engaged in sexual risk behavior in the past 3 months. The percentage was 22, 23, 30, and 47% for those who reported one, two, three, or four to six types of problems, respectively. As indicated in the Mantel-Haenszel chi-square test statistics, there was a significant linear association between the number of psychosocial problems and prevalence of the negative behavioral or health outcomes.

Table 5 reports the results of multivariable logistic regression analyses showing the number of psychosocial problems that was associated with the odds of each behavioral/health outcome, controlling for age, sex, race, income, education, and city. For most negative behavioral and health outcomes (except for “not currently taking HIV medications where reporting any problems was each associated with the outcome), no significant differences were observed between those who reported one or two problems and those who reported no problems. For “no HIV care visit in the past 6 months,” no significant differences were observed between those who reported no problems and those who reported any number of problems, although the difference between zero and “four to six problems” approached statistical significance (AOR=2.05, $p=0.052$).

For sexual risk behavior, reporting three problems was associated with a greater than 2-fold increase in the odds of engaging in sexual risk behavior and reporting four to six problems was associated with a greater than 4-fold increase in the odds as compared to reporting no problems. For injection risk behavior, reporting three problems was associated with a greater than 2-fold increase in the odds of engaging in injection risk behavior and reporting four to six problems was associated with almost a 5-fold increase in the odds as compared to reporting no problems. Reporting any number of problems was each associated with a greater than 2-fold increase in the odds of not currently taking HIV medications as compared to reporting no problems. Reporting three or four to six problems was associated with a 2 to 2.5-fold increase in the odds of non-adherence as compared to reporting no

problems. Finally, for detectable viral load, reporting four to six problems was associated with a greater than a 2-fold increase in the odds as compared to reporting no problems.

DISCUSSION

This study is one of the first to quantitatively explore syndemic vulnerability among HIV-positive IDUs, and also one of the first to examine how co-occurring psychosocial problems are additively associated with outcomes related to the HIV continuum of care. In our sample of HIV-positive IDUs which was comprised primarily of African Americans and males, many reported more than one psychosocial problem. We found that generally experiencing one type of psychosocial problem was significantly ($p<0.05$) associated with an increased odds of experiencing another type of problem and also with an increased odds of negative behavioral or health outcomes. The syndemic pattern observed in this sample, i.e., the pattern of co-occurring psychosocial problems creating additive vulnerability for poor health outcomes, was similar to that seen in other populations (23, 24). Furthermore, in our sample, syndemic problems were associated with HIV transmission risk behaviors, HIV care behaviors, and detectable viral load measured from participants' blood specimens. We observed a linear association showing that greater numbers of psychosocial problems were significantly associated with higher prevalence of negative behavioral or health outcomes.

We also found that each negative outcome had what may be termed as a threshold of syndemic vulnerability or a specific number of psychosocial problems significantly associated with it. That is, for sexual and injection risk behaviors and medication adherence, persons who reported three or more psychosocial problems evidenced significantly elevated odds of these outcomes while those who reported one or two did not have significantly elevated odds. For detectable viral load, the threshold was four to six problems, while any number of problems was significantly associated with elevated odds of not currently taking HIV medication. For health care visit, although no specific number of problems was significantly associated with its negative outcome, there was a tendency for persons with four to six problems to be more vulnerable ($p=0.052$). These findings suggest the utility of a syndemic framework in identifying the vulnerability threshold, and experience of three or four of these problems might constitute the threshold for most of the negative behavioral and health outcomes among these HIV-positive IDUs.

Syndemics theory posits that the interaction of health problems emerges because of adverse social conditions such as poverty, stigmatization, and oppressive social relationships (19). Indeed, research on IDUs often points to how their "risk environment" is socially produced. For example, Rhodes and colleagues (47) point to social structural factors such as neighborhood deprivation and disadvantage, social and economic inequities, and social stigma and discrimination as critical in the production of HIV risk among IDUs. Emerging work has included a broader social structural perspective when examining syndemics among MSM. For example, Ferlatte and colleague (48) found that marginalization of gay and bisexual men (e.g., anti-gay experience) was cumulatively associated with psychosocial issues (e.g., emotional distress, social isolation), which, in turn, were additively associated sexual risk behavior. Similarly, research among minority MSM (49, 50) found evidence of a syndemic of adverse social experiences such as racism and homophobia. Future research on

syndemics among IDUs could include variables drawn from a broader social structural framework (e.g., poverty, residential segregation, IDU/HIV stigma, discrimination) and examine how these variables might contribute to the formation of an interconnected set of psychosocial problems experienced among IDUs or how these variables could themselves be additively associated with negative behavioral and health outcomes.

Other future research topics might include the identification of mechanisms through which multiple psychosocial problems are associated with negative outcomes and understanding which problems most often cluster together among persons with multiple psychosocial vulnerabilities. The U.S. Department of Health and Human Services recently released recommendations that all HIV-positive persons be prescribed antiretroviral (ARV) treatment, regardless of CD4 count (51). Thus, syndemic research that includes HIV continuum of care outcomes might include all HIV-positive persons, not just HIV-positive IDUs. With this broader scope, future research can also aim to identify which psychosocial problems are most important for which populations.

Limitations of these analyses are as follows. First, we conducted secondary analysis of data collected from an intervention trial which was not designed to test syndemics and HIV care continuum outcomes. In addition, our sample was a convenience sample; thus results may not be generalizable to all HIV-positive IDUs. In terms of measures, we lacked a measure of childhood sexual abuse which other syndemic research has examined, and abuse in adulthood appears to be a weak measure and is less associated with other syndemic factors and most other outcomes. Our measures of psychological distress were not clinical measures and our measures of the continuum of care were developed before the more recent work defining these outcomes (52). Also, the measures of psychosocial problems used measures that assessed problems in various time points (e.g., polydrug use in the past 3 months, psychosocial distress in the previous week, homelessness in the past 12 months, etc.) This variation may be an issue in exploring syndemic phenomena as experienced at one point in time. It is also important to note that no direction of causality can be implied by our cross-sectional analyses. While the literature tends to frame syndemics as precursors to public health problems, the reverse also could be true or a third variable could affect both sets of constructs. Finally, the data we used here were collected in 2001–2005, before ARV treatments were recommended for all HIV-positive patients. Thus, the data on HIV medication uptake and viral load should be interpreted with caution.

In summary, our analyses expand not only the populations considered in a syndemic framework, but also the outcomes to include HIV continuum of care outcomes such as utilization of HIV care, uptake of HIV medication, and suppressed viral load. Our findings endorse the association of syndemics not only with risk behaviors, but also with behaviors related to the continuum of care for HIV-positive persons. The breadth of HIV risk and care behaviors associated with psychosocial syndemic factors indicates that they are likely important factors for researchers to understand. Addressing these factors in various public health interventions or supporting program collaboration and service integration to provide multiple prevention and health care services at one time or at a single venue (36) could help to change key behaviors linked to both HIV risk and HIV care outcomes.

Acknowledgments

The INSPIRE Team includes the following people: Carl Latkin, Amy Knowlton, and Karin Tobin (Baltimore); Lisa Metsch, Eduardo Valverde, James Wilkinson, and Martina DeVarona (Miami); Mary Latka, Dave Vlahov, Phillip Coffin, Marc Gourevitch, Julia Arnsten, and Robert Gern (New York); Cynthia Gomez, Kelly Knight, Carol Dawson Rose, Starley Shade, and Sonja Mackenzie (San Francisco); David Purcell, Yuko Mizuno, Scott Santibanez, Richard Garfein, and Ann O'Leary (Centers for Disease Control and Prevention [CDC]); Lois Eldred, Kathleen Handley (Health Resources and Services Administration). We would also like to acknowledge the following people for their contributions to this research: Susan Sherman, Roeina Marvin, Joanne Jenkins, Donny Gann, and Tonya Johnson (Baltimore); Clyde McCoy, Rob Malow, Wei Zhao, Lauren Gooden, Sam Comerford, Virginia Locascio, Curtis Delford, Laurel Hall, Henry Boza, Cheryl Riles, Faye Yeomans (Miami); George Fesser, Carol Gerran, Diane Thornton (New York); Caryn Pelegrino, Barbara Garcia, Jeff Moore, Erin Rowley, Debra Allen, Dinah Iglesia-Usog, Gilda Mendez, Paula Lum, and Greg Austin (San Francisco); Gladys Ibanez, Hae-Young Kim, Toni McWhorter, Jan Moore, Lynn Paxton, and John Williamson (CDC); Lee Lam, Jeanne Urban, Stephen Soroka, Zilma Rey, Astrid Ortiz, Sheila Bashirian, Marjorie Hubbard, Karen Tao, Bharat Parekh, Thomas Spira (CDC Laboratory). This study was supported by the Centers for Disease Control and Prevention and the Health Resources and Services Administration.

References

1. The White House Office of National AIDS Policy. National HIV/AIDS strategy for the United States. Washington DC: The White House; Jul. 2010 at www.whitehouse.gov/administration/eop/onap/nhas [Accessed on September 23, 2013]
2. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. New Engl J Med. 2011; 365:493–505. [PubMed: 21767103]
3. The White House. Executive Order: HIV care continuum initiative. Washington DC: The White House; Jul. 2013 at http://www.whitehouse.gov/the-press-office/2013/07/15/executive-order-hiv-care-continuum-initiative [Accessed on September 23, 2013]
4. Hall HI, Frazier EL, Rhodes P, et al. Differences in human immunodeficiency virus care and treatment among subgroups in the United States. JAMA Intern Med. 201310.1001/jamainternmed.2013.6841
5. Cohen SM, Van Handel MM, Branson BM, et al. 2011. Vital Signs: HIV prevention through care and treatment – United States. MMWR. 2011; 60:1618–1623. [PubMed: 22129997]
6. Centers for Disease Control and Prevention. [Accessed on July 22, 2014] HIV Surveillance – Epidemiology of HIV Infection (through 2011). 2013. at http://www.cdc.gov/hiv/library/slideSets/index.html
7. Avants SK, Warburton LA, Hawkins KA, Margolin A. Continuation of high-risk behavior by HIV-positive drug users: Treatment implications. J Subst Abuse Treat. 2000; 19:15–22. [PubMed: 10867296]
8. Kwiatkowski CF, Booth R. HIV-seropositive drug users and unprotected sex. AIDS Behav. 1998; 2:151–160.
9. Knight KR, Shade SB, Purcell DW, et al. Sexual transmission risk behavior reported among behaviorally bisexual HIV-seropositive injection drug using men. JAIDS. 2007; 46(Supplement 2):S80–S87. [PubMed: 18089988]
10. Latka MH, Metsch LR, Mizuno Y, et al. Unprotected sex among HIV-positive injection drug using women and their serodiscordant male partners: Role of personal and partner influences. JAIDS. 2006; 42:222–228. [PubMed: 16760799]
11. Latkin CA, Buchanan AS, Metsch LR, et al. Predictors of sharing injection equipment by HIV-seropositive injection drug users. JAIDS. 2008; 49:447–450. [PubMed: 19186356]
12. Metsch LR, McCoy CB, Lai S, Miles C. Continuing risk behaviors among HIV-seropositive chronic drug users in Miami, Florida. AIDS Behav. 1998; 2:161–169.
13. Meader N, Semaan S, Halton M, et al. An International systematic review and meta-analysis of multisession psychosocial interventions compared with educational or minimal interventions on the HIV sex risk behaviors of people who use drugs. AIDS Behav. 2013; 17:1963–1978. [PubMed: 23386132]

14. Purcell DW, Mizuno Y, Metsch LR, et al. Unprotected sexual behavior among heterosexual HIV-positive injection drug using men: associations by partner type and partner serostatus. J Urban Health. 2006; 83:656–668. [PubMed: 16736116]
15. Krusi A, Evan W, Julio M, Thomas K. Social and structural determinants of HAART access and adherence among injection drug users. Int J Drug Policy. 2010; 21:4–9. [PubMed: 19747811]
16. Mizuno Y, Purcell DW, Borkowski TM, Knight K. The life priorities of HIV-seropositive injection drug users: findings from a community-based sample. AIDS Behav. 2003; 7:395–403. [PubMed: 14707536]
17. Singer M. AIDS and the health crisis of the US urban poor; The perspective of critical medical anthropology. Soc Sci Med. 1994; 39:931–48. [PubMed: 7992126]
18. Mustanski B, Garofalo R, Herrick A, Donenberg G. Psychological health problems increase risk for HIV among urban young men who have sex with men: preliminary evidence of a syndemic in need of attention. Ann Behav Med. 2007; 34:37–45. [PubMed: 17688395]
19. Singer MC, Erickson PI, Badiane L, et al. Syndemics, sex, and the city: understanding sexually transmitted diseases in social and cultural context. Soc Sci Med. 2006; 63:2010–21. [PubMed: 16782250]
20. Dyer TP, Shoptaw S, Guadamuz TE, et al. Application of syndemic theory to black men who have sex with men in the Multicenter AIDS Cohort Study. J Urban Health. 2012; 89:697–708. [PubMed: 22383094]
21. Halkitis PN, Moeller RW, Siconolfi DE, Storholm ED, Solomon TM, Bub KL. Measurement model exploring a syndemic in emerging adult gay and bisexual men. AIDS Behav. 2013; 17:662–673. [PubMed: 22843250]
22. Jie W, Ciyong L, Xueqing D, Hui W, Lingyao H. A syndemic of psychosocial problems places the MSM population at greater risk of HIV infection. PLoS ONE. 2012; 7:e32312. [PubMed: 22479319]
23. Parsons JT, Grov C, Golub SA. Sexual compulsivity, co-occuring psychosocial health problems, and HIV risk among gay and bisexual men: further evidence of a syndemic. AJPH. 2012; 102:156–162.
24. Stall R, Mills T, Williamson J, Hart T, et al. Association of co-occurring psychosocial health problems and increased vulnerability to HIV/AIDS among urban men who have sex with men. AJPH. 2003; 93:939–942.
25. Brennan J, Kuhns LM, Johnson AK, Belzer M, Wilson EC, Garofalo R. the Adolescent Medicine Trials Network for HIV/AIDS Interventions. Syndemic theory and HIV-related risk among young transgender women: the role of multiple, co-occurring health problems and social marginalization. AJPH. 2012; 102:1751–1757.
26. Senn TE, Carey MP, Vanable PA. The intersection of violence, substance use, depression, and STDs: testing of a syndemic pattern among patients attending an urban STD clinic. Journal of National Medical Association. 2010; 102:614–620.
27. Pitpitan EV, Kalichman SC, Eaton LA, et al. Co-occurring psychosocial problems and HIV risk among women attending drinking venues in a South African township: a syndemic approach. Ann Behav Med. 2013; 45:153–162. [PubMed: 23054944]
28. Gonsalez-Guarcia RM, McCabe BE, Florom-Smith A, Cianelli R, Peragallo N. Substance abuse, violence, HIV, and depression: An underlying syndemic factor among Latinas. Nurs Res. 2011; 60:182–189. [PubMed: 21522030]
29. Kurtz SP, Buttram ME, Surratt HL, Stall RD. Resilience, syndemic factors, and serosorting behaviors among HIV-positive and HIV-negative substance-using MSM. AIDS Educ Prev. 2012; 24:193–205. [PubMed: 22676460]
30. Operario D, Nemoto T. HIV in transgender communities: Syndemic dynamics and a need for multicomponent interventions. JAIDS. 2013; 55(Supplement 2):S91–S93. [PubMed: 21406995]
31. Knight KR, Purcell D, Dawson-Rose C, Gómez CA, Halkitis PN. and The SUDIS Team. Sexual risk taking among HIV-positive injection drug users: contexts, characteristics, and implications for prevention. AIDS Educ Prev. 2005; (Supplement 17):76–88. [PubMed: 15843119]
32. Anema A, Wood E, Weiser SD, Qi J, Montaner JS, Kerr T. Hunger and associated harms among injection drug users in an urban Canadian setting. Subst Abuse Treat Pr. 2010; 5:20.

33. Mateu-Gelabert P, Maslow C, Flom PL, Sandoval M, Bolyard M, Friedman SR. Keeping it together: stigma, response, and perception of risk in relationships between drug injectors and crack smokers, and other community residents. AIDS Care. 2005; 17:802–813. [PubMed: 16120497]
34. Mitchell SG, Edwards LV, Mackenzie S, et al. Participants' description of social support within a multisite intervention for HIV-seropositive injection drug users (INSPIRE). JAIDS. 2007; 46(Supplement 2):S55–S63. [PubMed: 18089985]
35. Friedman SR, Sandoval M, Mateu-Gelabert P, Meylakhs P, Des Jarlais DC. Symbiotic goals and the prevention of blood-borne viruses among injection drug users. Subst Use Misuse. 2011; 46:307–515. [PubMed: 21303250]
36. Centers for Disease Control and Prevention. Integrated prevention services for HIV infection, viral hepatitis, sexually transmitted diseases, and tuberculosis for persons who use drugs illicitly: Summary guidance from CDC and U.S. Department of Health and Human Services. MMWR. 2012; 61(rr05):1–40.
37. Milloy M-J, Kerr T, Buxton J, et al. Social and environmental predictors of plasma HIV RNA rebound among injection drug users treated with antiretroviral therapy. JAIDS. 2012; 59:393–399. [PubMed: 22134149]
38. Milloy M-J, Wood E, Small W, et al. Incarceration experiences in a cohort of active injection drug users. Drug Alcohol Rev. 2008; 27:693–699. [PubMed: 19378451]
39. Kittikraisak W, Davidson PJ, Hahn JA, et al. Incarceration among young injectors in San Francisco associations with risk for hepatitis virus infection. J Subst Use. 2006; 11:271–281.
40. Small W, Wood E, Betteridge G, Montaner J, Kerr T. The impact of incarceration upon adherence to HIV treatment among HIV-positive injection drug users: a qualitative study. AIDS Care. 2009; 21:708–714. [PubMed: 19806487]
41. Martikainen P, Bartley M, Lahelma E. Psychosocial determinants of health in social epidemiology. Int J Epidemiol. 2002; 31:1091–1093. [PubMed: 12540696]
42. Purcell DW, Latka MH, Metsch LR, et al. Results from a randomized controlled trial of a peer-mentoring intervention to reduce HIV transmission and increase access to care and adherence to HIV medications among HIV-seropositive injection drug users. JAIDS. 2007; 46(Supplement 2):S35–S47. [PubMed: 18089983]
43. Purcell DW, Metsch LR, Latka M, et al. Interventions for seropositive injectors-research and evaluation: an integrated behavioral intervention with HIV-positive injection drug users to address medical care, adherence, and risk reduction. JAIDS. 2004; 37:S110–S118. [PubMed: 15385907]
44. Derogatis, LR.; Spencer, PM. The Brief Symptom Inventory (BSI): Administration, scoring, and procedure manual – 1. Baltimore, MD: John Wiley; 1982.
45. Barrera MA. A method for assessing social support networks in community survey research. Connections. 1980; 3:3–8.
46. Arnsten JH, Li X, Mizuno Y, et al. Factors associated with antiretroviral therapy adherence and medication errors among HIV-infected injection drug users. JAIDS. 2007; 46(Supplement 2):S64–S71. [PubMed: 18089986]
47. Rhodes T, Singer M, Bourgois P, Friedman SR, Strathdee SA. The social structural production of HIV risk among injection drug users. Soc Sci Med. 2005; 61:1026–1044. [PubMed: 15955404]
48. Ferlatte O, Hottes TS, Trussler T, Marchand R. Evidence of a syndemic among young Canadian Gay and bisexual men: Uncovering the associations between anti-gay experiences, psychosocial issues, and HIV risk. AIDS Behav. 2014; 18:1256–1263. [PubMed: 24129844]
49. Mizuno Y, Borkowf C, Millett GA, Bingham T, Ayala G, Stuve A. Homophobia and racism experienced by Latino men who have sex with men: Correlates of exposure and associations with HIV risk behaviors. AIDS Behav. 2012; 16:724–735. [PubMed: 21630014]
50. Mizuno Y, Borkowf CB, Ayala G, Carballo-Dieguez A, Millett GA. Correlates of sexual risk for HIV among US-born and foreign-born Latino men who have sex with men (MSM): An analysis from the Brothers y Hermanos Study. J Immigr Minor Health. 201310.1007/s10903-013-9894-5
51. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. Bethesda (MD): Department of Health and Human Services (DHHS); 2013 Feb 12. Various p. [937 references]

52. Valdiserri RO, Forsyth AD, Yakovchenko V, Koh HK. Measuring what matters: Development of standard HIV core indicators across the U.S. Department of Health and Human Services. Public Health Rep. 2013; 128:354–359. [PubMed: 23997280]

Table 1

Characteristics of HIV-positive injection drug users in the INSPIRE Study (Baltimore, Miami, New York, and San Francisco; 2001–2005, n=1052[a]).

Variable	No. (%) or Mean (SD)
Mean age, y	42.2 (6.6)
Sex	
Male	666 (63.3)
Race/ethnicity	
White	104 (10.1)
African American	671 (65.4)
Hispanic	175 (17.1)
Other	76 (7.4)
Less than high school education	462 (44.0)
Annual income less than <$5000	548 (53.3)
City	
Baltimore	290 (27.6)
Miami	271 (25.8)
New York	244 (23.2)
San Francisco	247 (23.5)
Had vaginal/anal sex without condoms with HIV-negative or unknown HIV status sex partners in the past 3 months	281 (27.5)
Lent a used needle to or shared injection equipment (cooker, cotton, or rinse water) with HIV-negative or unknown HIV status drug use partners in the past 3 months	280 (27.1)
No HIV care visit in the past 6 months	212 (21.1)
Not currently taking HIV medication	459 (43.6)
Not adherent to HIV medication (<90% adherent) in the previous day	127/501[b] (25.3)
Detectable HIV viral load (≥400 copies/mL)	813 (80.4)
Experienced psychosocial problems	
Poly-drug use in the past 3 months	620 (58.9)
Abuse in adulthood	553 (52.6)
Psychological distress in the past week	388 (36.9)
Homelessness in the past 12 months	341 (32.4)
Incarceration in the past 6 months	265 (25.2)
Low social support	137 (13.0)

[a] Total does not always equal 1052 due to missing data.

[b] Sample size for adherence =501 (participants taking medication at baseline who provided valid adherence data)

Table 2

Bivariate associations among psychosocial problems of HIV-positive injection drug users in the INSPIRE Study (Baltimore, Miami, New York, and San Francisco; 2001–2005, n=1052).

	Poly-drug use in the past 3 months		**Abuse in adulthood**		**Psychological distress in the past week**		**Low social support**		**Homelessness in the past 12 months**	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Poly-drug use in the past 3 months	--	--	--	--	--	--	--	--	--	--
Abuse in adulthood	**1.44**[a]	**1.12–1.84**	--	--	--	--	--	--	--	--
Psychological distress in the past week	**1.54**	**1.19–1.99**	**2.24**	**1.73–2.89**	--	--	--	--	--	--
Low social support	1.08	0.75–1.56	**1.51**	**1.04–2.17**	**3.07**	**2.13–4.44**	--	--	--	--
Homelessness in the past 12 months	**1.44**	**1.10–1.88**	**1.49**	**1.15–1.93**	**1.84**	**1.41–2.39**	**2.95**	**2.05–4.25**	--	--
Incarceration in the past 6 months	1.04	0.78–1.38	1.15	0.87–1.52	1.19	0.89–1.59	1.32	0.89–1.96	**2.17**	**1.62–2.89**

[a]Bolded indicates significant (p<0.05) association

Table 3

Bivariate association between each of the psychosocial problems and behavioral/health outcomes of HIV-positive injection drug users in the INSPIRE Study (Baltimore, Miami, New York, and San Francisco; 2001–2005, n=1052).

	Transmission risk behavior				**Continuum of care**							
	Had vaginal/anal sex without condoms with HIV-negative or unknown status partner in the past 3 months		**Lent needle to or shared cotton, cooker, or rinse water with HIV-negative or unknown status partner in the past 3 months**		**No HIV care visit in the past 6 months**		**Not currently taking HIV medication**		**Not adherent to HIV medication (<90% adherent) in the previous day**		**Blood specimen indicates detectable HIV viral load (≥400 copies/mL)**	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Poly-drug use in the past 3 months	**1.45**[a]	**1.09–1.93**	**1.69**	**1.27–2.26**	0.86	0.63–1.17	1.22	0.95–1.57	**1.59**	**1.05–2.41**	**1.41**	**1.04–1.93**
Abuse in adulthood	**1.50**	**1.13–1.98**	1.32	0.99–1.73	0.91	0.67–1.24	0.97	0.76–1.23	0.88	0.59–1.32	0.80	0.58–1.09
Psychological distress in the past week	**1.55**	**1.17–2.04**	**1.41**	**1.07–1.87**	1.23	0.89–1.68	1.23	0.96–1.59	1.36	0.89–2.06	**1.46**	**1.04–2.03**
Low social support	**2.10**	**1.44–3.07**	**1.49**	**1.01–2.19**	**1.61**	**1.06–2.43**	**1.51**	**1.05–2.17**	1.59	0.81–3.14	**1.99**	**1.13–3.49**
Homelessness in the past 12 months	**2.12**	**1.59–2.81**	**2.03**	**1.52–2.69**	**1.72**	**1.26–2.35**	**1.76**	**1.36–2.29**	**2.39**	**1.56–3.68**	**1.73**	**1.21–2.48**
Incarceration in the past 6 months	**1.64**	**1.21–2.22**	**1.96**	**1.45–2.66**	**1.65**	**1.19–2.29**	**1.37**	**1.03–1.81**	1.21	0.76–1.93	1.37	0.94–1.99

[a] Bolded indicates significant ($p<0.05$) association

Table 4

Bivariate association between the number of psychosocial problems and behavioral outcomes of HIV-positive injection drug users in the INSPIRE Study (Baltimore, Miami, New York, and San Francisco; 2001–2005, n=1052).

	Zero (n=102; 9.7%)	One (n=238; 22.6%)	Two (n=324; 30.8%)	Three (n=208; 19.8%)	Four to six (n=180; 17.1%)	Mantel-Haneszel X^2 Test Statistics
Had vaginal/anal sex without condoms with HIV-negative or unknown status partner in the past 3 months	14 (14.1%)	51 (22.0%)	73 (23.1%)	62 (30.2%)	81 (47.4%)	X^2=42.479, df=1, P<0.001
Lent needle to or shared cotton, cooker, or rinse water with HIV-negative or unknown status partner in the past 3 months	21 (20.8%)	42 (17.9%)	79 (24.9%)	58 (28.2%)	80 (46.0%)	X^2=34.627, df=1, P<0.001
No HIV care visit in the past 6 months	12 (12.0%)	50 (22.0%)	64 (21.1%)	38 (19.1%)	48 (27.7%)	X^2=4.897, df=1, P<0.05
Not currently taking HIV medication	28 (27.5%)	99 (41.6%)	139 (42.9%)	105 (50.5%)	88 (48.9%)	X^2=13.145, df=1, P<0.001
Not adherent to HIV medication (<90% adherent) in the previous day[a]	10 (15.4%)	26 (22.6%)	37 (22.8%)	28 (32.9%)	26 (35.1%)	X^2=9.576, df=1, P<0.005
Blood specimen indicates detectable HIV viral load (>=400 copies/mL)	67 (70.5%)	179 (78.9%)	248 (79.7%)	165 (82.5%)	154 (86.5%)	X^2=9.835, df=1, P<0.005

[a] Sample size for adherence =501 (participants taking medication at baseline who provided valid adherence data; n for zero=65, one=115, two=162, three=85, four or more=74)

Table 5

Multivariate logistic regression analyses of associations between the number of psychosocial problems and behavioral outcomes of HIV-positive injection drug users in the INSPIRE Study (Baltimore, Miami, New York, and San Francisco; 2001–2005, n=1052).

	Transmission risk behavior				**Continuum of care**							
	Had vaginal/anal sex without condoms with HIV-negative or unknown status partner in the past 3 months		**Lent needle to or shared cotton, cooker, or rinse water with HIV-negative or unknown status partner in the past 3 months**		**No HIV care visit in the past 6 months**		**Not currently taking HIV medication**		**Not adherent to HIV medication (<90% adherent) in the previous day**		**Blood specimen indicates detectable HIV viral load (≥400 copies/mL)**	
	AOR[a]	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
One problem (vs. None)	1.56	0.80–3.03	.99	0.54–1.82	1.85	0.92–3.74	**2.03**[d]	**1.20–3.43**	1.39	0.61–3.18	1.52	0.87–2.67
Two problems (vs. None)	1.58	0.83–3.01	1.66	0.93–2.94	1.64	0.83–3.27	**2.07**[d]	**1.24–3.44**	1.12	0.49–2.49	1.46	0.85–2.50
Three problems (vs. None)	**2.36**[b,c]	**1.22–4.57**	**2.12**[c]	**1.16–3.89**	1.47	0.71–3.03	**2.79**[e]	**1.63–4.78**	**2.34**[c]	**1.01–5.42**	1.77	0.97–3.20
Four to six problems (vs. None)	**4.39**[e]	**2.25–8.57**	**4.85**[e]	**2.62–9.00**	2.05	0.99–4.23	**2.47**[d]	**1.41–4.30**	**2.56**[c]	**1.07–6.13**	**2.24**[c]	**1.18–4.27**

[a] AOR=Adjusted Odds Ratio; All models controlled for age, sex, race, income, education, and city.

[b] Bolded indicates significant (p<0.05) association

[c] p<0.05

[d] p<0.01

[e] p<0.001