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Syndemic effect of mental illness and substance use on viral suppression among recently-incarcerated, HIV-infected individuals in the CARE+ Corrections study

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Abstract

Few studies on HIV-related syndemics of co-occurring and mutually reinforcing psychosocial conditions have assessed clinical outcomes in criminal justice (CJ)-involved populations. Baseline data from the CARE+ Corrections study were used to quantify co-occurring mental illness and substance use and examine syndemic effects on viral suppression among 106 CJ-involved HIV-infected individuals. Ninety-one (86%) reported a mental illness diagnosis, 30 (28%) reported hazardous alcohol use, and 61 (58%) were drug dependent. Eighteen (17%) experienced all three conditions. Drug dependence was clustered with mental illness (prevalence odds ratio [POR] 3.20, 95% CI 1.01–10.14) and hazardous alcohol use (POR 2.61, 95% CI 1.03–6.56). The association between syndemic score, representing the number of conditions reported by each individual, and viral suppression was not statistically significant, although 86% of participants with none of these conditions were virally suppressed, compared to 56% of those with all three ($p = 0.56$). Mental illness and substance use were concentrated in this sample, indicating a need for integrated care services.

Keywords

criminal justice system; HIV; syndemics; mental illness; substance use

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Introduction

HIV infection, mental illness, and substance use disorders are highly prevalent in the criminal justice (CJ) system, and often co-occur (Baillargeon et al., 2008; Di Paola, Altice, Powell, Trestman, & Springer, 2014; Dumont, Brockmann, Dickman, Alexander, & Rich, 2012; Springer, Spaulding, Meyer, & Altice, 2011). These conditions can present substantial challenges to HIV treatment engagement and medication adherence, and may impede viral suppression (Carrico, Bangsberg, et al., 2011; Carrico, Riley, et al., 2011; Chander et al., 2009; Meyer, Chen, & Springer 2011; Pence, Miller, Gaynes, & Eron, 2007; Springer, Azar, & Altice, 2011; Yehia et al., 2015). Syndemic theory is increasingly used to characterize such co-occurring and mutually-reinforcing health and social conditions and help explain health disparities (Halkitis, Wolitski, & Millett, 2013; Tsai & Burns, 2015). Researchers have demonstrated that higher syndemic burden, measured as an additive score representing the number of syndemic conditions, is associated with reduced odds of viral suppression and higher viral load among various populations, including HIV-positive people who inject drugs and women of color (Friedman et al., 2015; Mizuno et al., 2015; Sullivan, Messer, & Quinlivan, 2015).

Most research on HIV-related syndemics has focused on HIV risk (Robinson, Knowlton, Gielen, & Gallo, 2016). The relationship between viral suppression and syndemic psychiatric and substance use disorders has not been evaluated among CJ-involved individuals. A recent systematic review found that clinical outcomes among released inmates represent the largest gap in the literature (Iroh, Mayo, & Nijhawan, 2015).

Using baseline data from the CARE+ Corrections study, we aimed to determine whether mental illness, hazardous alcohol use, and drug dependence are independent correlates of viral suppression and assess the relationship between viral suppression and syndemic burden of these conditions among recently-incarcerated, HIV-infected individuals.

Methods

Study Population

Baseline data collected between August 2013 and April 2015 were obtained from the CARE + Corrections study, a randomized controlled trial testing a computerized counseling intervention to improve linkage to care and medication adherence among HIV-infected individuals released from District of Columbia correctional facilities within the previous six months (Beckwith et al., 2017). Of 497 individuals screened, 112 study-eligible participants were enrolled. Two participants (1.8%) did not complete the baseline visit and four (3.6%) did not complete the baseline HIV plasma viral load measurement; the final analytic sample size was 106.

Measures

Participants self-reported ever being diagnosed with schizophrenia, depression, bipolar disorder/manic depression, a personality disorder, or another mental illness. Alcohol use and drug dependence in the year prior to incarceration were measured using validated instruments (WHO-Alcohol Use Disorders Identification Test and TCU Drug Dependence

scale) (Daepfen, Yersin, Landry, Pe, & Decrey, 2000; Pankow et al., 2012). Syndemic score was calculated by summing the number of conditions reported. This method has been used in the literature to investigate the effect of cumulative psychosocial factors on the outcome of interest (Friedman et al., 2015; Mizuno et al., 2015; Sullivan et al., 2015; Tsai & Burns, 2015).

Plasma viral load was obtained for all participants via blood draw or medical record abstraction, and blood samples were tested using the Roche Cobas AmpliPrep/Cobas Taqman HIV-1 Test, Version 2.0. Dichotomous viral suppression was defined as plasma viral load <200 copies/mL.

Demographic, clinical, and behavioral variables were examined as potential confounders. Variables not considered as potential confounders were race/ethnicity, as 85.5% identified as Black or African American, and ART receipt and adherence, as ART use can be a causal link between psychosocial conditions and viral suppression (Sullivan et al., 2015).

Statistical analysis

Chi-square and Fisher's exact tests were used to assess differences in mental illness, hazardous alcohol use, drug dependence, and ordinal syndemic score by viral suppression. Bivariate associations between these conditions were assessed to determine the extent to which they were clustered within the sample (Mizuno et al., 2015; Sullivan et al., 2015). Multivariable logistic regression was used to examine associations between the independent variables and the dependent variable, viral suppression, including interaction terms. P-values <0.05 were considered statistically significant.

Potential confounders found to be associated with viral suppression in bivariate analyses at $p < 0.20$ were gender, time of HIV diagnosis, and CD4 count. Single imputation with the sample median was used for one missing CD4 count. We chose *a priori* to adjust for age.

Prevalence odds ratios (POR) and 95% confidence intervals were calculated. Analyses were conducted using SAS software version 9.4.

Results

Median age was 41 years (IQR 30–49) (Table 1), 58% of participants were male, 24% were female, and 19% were male to female transgender. Fifty-two percent had been diagnosed with HIV for at least 10 years. More than 80% reported taking HIV medication during their recent incarceration. Median lifetime number of times in jail or prison was seven (IQR 4–15), and median time spent in jail or prison was 84 months (IQR 24–180), or 7 years. Overall, 66% of participants were virally suppressed.

Eighty-six percent of participants reported a mental illness diagnosis (Table 2), with 80% reporting depression and 58% reporting bipolar or manic depressive disorder diagnoses. Twenty-eight percent scored in the hazardous alcohol use category, while 58% were drug dependent. Only 7% had neither mental illness, hazardous alcohol use, nor drug dependence, while 32% had one, 44% had two, and 17% had all three conditions. The odds of being drug dependent were greater among those with mental illness and those with hazardous alcohol

use (POR 3.20, 95% CI: 1.01–10.14; POR 2.61, 95% CI 1.03–6.59, respectively). No significant association was observed between mental illness and hazardous alcohol use (Table 3).

Table 2 displays frequencies and PORs for viral suppression by exposure category. While these differences were not statistically significant, fewer participants with mental illness, hazardous alcohol use, or drug dependence were virally suppressed compared to those without each condition (63.7% vs. 80.0%, $p=0.26$; 63.3% vs. 67.11%, $p=0.71$; 63.9% vs. 68.9%, $p=0.59$, respectively). Fewer participants with syndemic score 3 were virally suppressed (55.6%) compared to syndemic scores 2 (68.1%), 1 (64.7%), and 0 (85.7%), ($p=0.56$). There was a trend towards lower odds of viral suppression with each condition, after adjusting for the set of confounders (Table 2). The smallest POR was observed for syndemic score 3 (POR 0.09, 95% CI 0.01–1.26). Interaction terms were not significant.

Discussion

We assessed mental illness and substance use among a sample of recently-released, HIV-infected individuals and found that 61% of participants reported at least two psychosocial conditions. Our findings demonstrate strong associations between hazardous alcohol use and drug dependence, and mental illness and drug dependence, which is consistent with previous research (Klinkenberg & Sacks, 2004). There was a trend towards lower odds of viral suppression for those with mental illness, hazardous alcohol use, drug dependence, and those with the highest syndemic score. More than 80% of participants without mental illness, hazardous alcohol use, and drug dependence were virally suppressed, compared to 56% of those with all three. The overall proportion of viral suppression in this sample (66%) was relatively high compared to other studies estimating rates of viral suppression to be 40% during incarceration and 21% after release (Iroh et al., 2015).

Previous research has emphasized the importance of mental health and substance use treatment for HIV care outcomes (Himelhoch et al., 2009; Meyer et al., 2014). Substance use treatment in particular is scarce in correctional facilities and the community; instead, the most common services are drug education and low intensity counseling (Belenko, Hiller, & Hamilton, 2013). If sufficient services do exist, release from facilities can result in discontinuity of care (Meyer et al., 2011). Although this study was not designed to examine mental health or substance use treatment, the prevalence of these conditions and the trend towards lower odds of viral suppression contributes to the evidence-base indicating the need for integrated care services. Interventions that integrate mental health, substance use, and HIV treatment could more effectively meet the needs of this population (Klinkenberg & Sacks, 2004).

This cross-sectional data analysis had several limitations. Mental illness and substance use were self-reported. The sample size was small, decreasing statistical power and precluding a complete examination of disease interaction. Additional computation, such as calculation of the attributable proportion of risk due to interaction, would have been necessary to identify departures from additivity. These methods require large sample sizes to achieve adequate statistical power (Tsai & Burns, 2015), and can be misleading when calculated using odds

ratios that do not approximate relative risk (Kalilani & Atashili, 2006). The findings from this study cannot be fully generalized to the greater population of recently-incarcerated, HIV-infected individuals due to convenience sampling methods.

Conclusion

This analysis was conducted to examine the effect of mental illness and substance use disorders on viral suppression among recently-incarcerated, HIV-infected individuals. Incarceration itself is an independent risk factor for HIV infection (Maru, Basu, & Altice, 2007) and a predictor of treatment non-adherence among people with HIV (Meyer et al., 2011). With the high prevalence of HIV, mental illness, and substance use disorders in the CJ system, further research is needed to determine whether a syndemic approach to intervention development may improve HIV outcomes both during incarceration and upon community reentry.

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References

- Baillargeon J, Paar D, Wu H, Giordano T, Murray O, Raimer B, ... Pulvino J. (2008). Psychiatric disorders, HIV infection and HIV/hepatitis co-infection in the correctional setting. *AIDS Care*, 20(1), 124–129. [PubMed: 18278623]
- Beckwith C, Castonguay B, Trezza C, Bazerman L, Patrick R, Cates A, ... Kuo I. (2017). Gender differences in HIV care among criminal justice-involved persons: Baseline data from the CARE+ Corrections study. *PLoS ONE*, 12(1), e0169078. [PubMed: 28081178]
- Belenko S, Hiller M, & Hamilton L (2013). Treating substance use disorders in the criminal justice system. *Current Psychiatry Reports*, 15(11), 414. [PubMed: 24132733]
- Carrico AW, Bangsberg DR, Weiser SD, Chartier M, Dilworth SE, & Riley ED (2011). Psychiatric correlates of HAART utilization and viral load among HIV-positive impoverished persons. *AIDS*, 25(8), 1113–1118. [PubMed: 21399478]
- Carrico AW, Riley ED, Johnson MO, Charlebois ED, Neilands TB, Remien RH, ... Chesney MA. (2011). Psychiatric risk factors for HIV disease progression: The role of inconsistent patterns of antiretroviral therapy utilization. *Journal of Acquired Immune Deficiency Syndromes*, 56(2), 146–150. [PubMed: 21116186]
- Chander G, Himelhoch S, Fleishman JA, Hellinger J, Gaist P, Moore RD, & Gebo KA (2009). HAART receipt and viral suppression among HIV-infected patients with co-occurring mental illness and illicit drug use. *AIDS Care*, 21(5), 655–663. [PubMed: 19444675]
- Daepfen J, Yersin B, Landry U, Pe A, & Decrey H (2000). Reliability and validity of the Alcohol Use Disorders Identification Test (AUDIT) imbedded within a general health risk screening questionnaire: Results of a survey in 332 primary care patients. *Alcoholism: Clinical and Experimental Research*, 24(5), 659–665.

- Di Paola A, Altice FL, Powell ML, Trestman RL, & Springer SA (2014). A comparison of psychiatric diagnoses among HIV-infected prisoners receiving combination antiretroviral therapy and transitioning to the community. *Health & Justice*, 2(1), 11.
- Dumont DM, Brockmann B, Dickman S, Alexander N, & Rich JD (2012). Public health and the epidemic of incarceration. *Annual Review of Public Health*, 33, 325–339.
- Friedman M, Stall R, Silvestre A, Wei C, Shoptaw S, Herrick A, ... Plankey M. (2015). Effects of syndemics on HIV viral load and medication adherence in the multicentre AIDS cohort study. *AIDS*, 29(9), 1087–1096. [PubMed: 25870981]
- Halkitis PN, Wolitski RJ, & Millett GA (2013). A holistic approach to addressing HIV infection disparities in gay, bisexual, and other men who have sex with men. *The American Psychologist*, 68(4), 261–273. [PubMed: 23688093]
- Himelhoch S, Brown CH, Walkup J, Chander G, Korthius PT, Afful J, & Gebo KA (2009). HIV patients with psychiatric disorders are less likely to discontinue HAART. *AIDS*, 23(13), 1735–1742. [PubMed: 19617816]
- Iroh PA, Mayo H, & Nijhawan AE (2015). The HIV Care Cascade before, during, and after incarceration: A systematic review and data synthesis. *American Journal of Public Health*, 105(7), e5–e16.
- Kalilani L, & Atashili J (2006). Measuring additive interaction using odds ratios. *Epidemiologic Perspectives & Innovations*, 3(1), 5. [PubMed: 16620385]
- Klinkenberg W, & Sacks S (2004). Mental disorders and drug abuse in persons living with HIV/AIDS. *AIDS Care*, 16(Suppl 1), S22–S42. [PubMed: 15736820]
- Maru DS-R, Basu S, & Altice FL (2007). HIV control efforts should directly address incarceration. *The Lancet Infectious Diseases*, 7(9), 497. [PubMed: 17646018]
- Meyer JP, Cepeda J, Springer SA, Wu J, Trestman RL, & Altice FL (2014). HIV in people reincarcerated in Connecticut prisons and jails: An observational cohort study. *The Lancet HIV*, 1(2), e77–e84. [PubMed: 25473651]
- Meyer JP, Chen NE, & Springer SA (2011). HIV treatment in the criminal justice system: Critical knowledge and intervention gaps. *AIDS Research and Treatment*, 2011, 680617. [PubMed: 21776379]
- Mizuno Y, Purcell DW, Knowlton AR, Wilkinson JD, Gourevitch MN, & Knight KR (2015). Syndemic vulnerability, sexual and injection risk behaviors, and HIV continuum of care outcomes in HIV-positive injection drug users. *AIDS and Behavior*, 19(4), 684–693. [PubMed: 25249392]
- Pankow J, Simpson DD, Joe GW, Rowan-Szal G, Knight K, & Meason P (2012). Examining concurrent validity and predictive utility for the Addiction Severity Index and Texas Christian University (TCU) Short Forms. *Journal of Offender Rehabilitation*, 51(1–2), 78–95. [PubMed: 23087588]
- Pence BW, Miller WC, Gaynes BN, & Eron JJ (2007). Psychiatric illness and virologic response in patients initiating highly active antiretroviral therapy. *Journal of Acquired Immune Deficiency Syndrome*, 44, 159–166.
- Robinson AC, Knowlton AR, Gielen AC, & Gallo JJ (2016). Substance use, mental illness, and familial conflict non-negotiation among HIV-positive African-Americans: latent class regression and a new syndemic framework. *Journal of Behavioral Medicine*, 39(1), 1–12. [PubMed: 26296521]
- Springer SA, Spaulding AC, Meyer JP, & Altice FL (2011). Public health implications for adequate transitional care for HIV-infected prisoners: five essential components. *Clinical Infectious Disease*, 53(5), 469–479.
- Springer S, Azar M, & Altice F (2011). HIV, alcohol dependence, and the criminal justice system: a review and call for evidence-based treatment for released prisoners. *The American Journal of Drug and Alcohol Abuse*, 37(1), 12–21. [PubMed: 21171933]
- Sullivan K, Messer L, & Quinlivan E (2015). Substance abuse, violence, and HIV/AIDS (SAVA) syndemic effects on viral suppression among HIV positive women of color. *AIDS Patient Care and STDs*, 29(Suppl 1), S42–S48. [PubMed: 25397666]

- Tsai AC, & Burns BFO (2015). Syndemics of psychosocial problems and HIV risk: A systematic review of empirical tests of the disease interaction concept. *Social Science & Medicine*, 139, 26–35. [PubMed: 26150065]
- Yehia BR, Stephens-Shield AJ, Momplaisir F, Taylor L, Gross R, Dubé B, ... Brady KA. (2015). Health outcomes of HIV-infected people with mental illness. *AIDS and Behavior*, 19(8), 1491–1500. [PubMed: 25931243]

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Table 1.

Baseline characteristics of 106 recently-incarcerated, HIV-infected participants in the CARE+ Corrections study

	Total (N=106)^a
Median age (IQR), years	41 (30–49)
Gender	
Male	61 (57.55)
Female	25 (23.58)
Transgender (MTF)	20 (18.87)
Current employment status	
Employed	5 (4.72)
Unemployed	44 (41.51)
Other	57 (53.77)
Education	
Less than high school	27 (25.47)
High school or greater	79 (74.53)
Health insurance pre-incarceration	93 (87.74)
Healthcare provider pre-incarceration	88 (83.02)
Median times in jail/prison (IQR)	7 (4–15)
Median lifetime spent in jail/prison (IQR), months	84 (24–180)
Recruitment site	
Jail	33 (31.13)
Community	73 (68.87)
Psychological support pre-incarceration	61 (57.55)
Alcohol treatment pre-incarceration	25 (23.58)
Drug treatment pre-incarceration	34 (32.08)
HIV treatment during incarceration	87 (82.08)
Time since HIV diagnosis	
<1 year	11 (10.38)
1–4 years	14 (13.21)
5–9 years	26 (24.53)
10 years	55 (51.89)
CD4 count	
200 cells/uL	10 (9.43)
>200 cells/uL	96 (90.57)
Virally suppressed (<200 copies/mL)	70 (66.04)

IQR (interquartile range); MTF (male to female)

^a All values are n (%) unless otherwise indicated

Frequencies and prevalence odds ratios for syndemic factors and baseline viral suppression among 106 recently-incarcerated, HIV-infected participants in the CARE+ Corrections study

Table 2.

	Total n (%)	Virally suppressed n (%)	p-value	Unadjusted POR (95% CI)	Adjusted POR ^a (95% CI)
Mental illness diagnosis			0.26		
Yes	91 (85.85)	58 (63.74)		0.44 (0.12–1.67)	0.34 (0.08–1.49)
No	15 (14.15)	12 (80.00)		1.00 (ref)	1.00 (ref)
Hazardous alcohol use (12 months pre-incarceration)			0.71		
Yes	30 (28.30)	19 (63.33)		0.85 (0.35–2.05)	0.58 (0.19–1.76)
No	76 (71.71)	51 (67.11)		1.00 (ref)	1.00 (ref)
Drug dependence (12 months pre-incarceration)			0.59		
Yes	61 (57.55)	39 (63.93)		0.80 (0.35–1.82)	0.80 (0.30–2.11)
No	45 (42.45)	31 (68.89)		1.00 (ref)	1.00 (ref)
Syndemic score ^b			0.56		
0	7 (6.60)	6 (85.71)		1.00 (ref)	1.00 (ref)
1	34 (32.08)	22 (64.71)		0.31 (0.03–2.84)	0.14 (0.01–1.67)
2	47 (44.34)	32 (68.09)		0.36 (0.04–3.22)	0.17 (0.02–1.79)
3	18 (16.98)	10 (55.56)		0.21 (0.02–2.10)	0.09 (0.01–1.26)

POR (prevalence odds ratio); CI (confidence interval)

^a Adjusted for age, gender, time of HIV diagnosis, and CD4 count

^b Syndemic score is comprised of mental illness, hazardous alcohol use, and drug dependence

Table 3.

Bivariate associations between syndemic factors among 106 recently-incarcerated, HIV-infected participants in the CARE+ Corrections study

	Unadjusted POR (95% CI)	
	Mental illness	Hazardous alcohol use
Mental illness	--	--
Hazardous alcohol use	0.39 (0.13–1.18)	--
Drug dependence	3.20 (1.01–10.14)	2.61 (1.03–6.59)

POR (prevalence odds ratio); CI (confidence interval)

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