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## Syndemic conditions and medication adherence in older men living with HIV who have sex with men

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### Abstract

For people living with HIV, lack of adherence to antiretroviral therapy (ART) is a serious problem and frequently results in HIV disease progression. Reasons for non-adherence include concomitant psychosocial health conditions – also known as syndemic conditions – such symptoms of depression or posttraumatic stress disorder (PTSD), past physical or sexual abuse, intimate partner violence (IPV), stimulant use, and binge drinking. The aim of this study was to investigate the association between syndemic conditions and medication adherence. The sample included 281 older men living with HIV who have sex with men (MSM). The study period was December 2012–July 2016. We observed the following syndemic conditions significantly decreased medication adherence: symptoms of depression ( $p = .008$ ), PTSD ( $p = .002$ ), and stimulant use ( $p < .0001$ ). Past physical or sexual abuse, IPV, and binge drinking were not significantly associated with decreased medication adherence. The findings suggest that syndemic conditions may impact medication adherence in older MSM living with HIV.

### Keywords

HIV; men who have sex with men; older; medication adherence; syndemic conditions

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Disclosure statement

Conflict of interest Dr Malcolm D. John is on the speaker's bureau and advisory boards of Gilead Sciences, Inc.; Merck & Co., Inc.; and ViiV Healthcare. The remaining authors declare that they have no conflicts of interest.

## Introduction

The Centers for Disease Control and Prevention (CDC, 2018a) estimated that in the United States (US) in 2015 45% of people living with HIV (PLWH) were age 50 years and older. That percentage is higher in San Francisco where 65% of PLWH were 50 years and older as of the end of 2017 (SFDPH, 2018). Additionally, in 2015, men who have sex with men (MSM) represented 56% of PLWH in the US (CDC, 2018b) and 89% of PLWH in San Francisco (SFDPH, 2018).

Despite advances in HIV treatment, a sizable proportion (38%) of PLWH are not engaged in regular HIV care in the US (Mugavero et al., 2013). Data from the US in 2014 found that only 49% of PLWH were estimated to be virologically suppressed (HIV viral load [VL] of less than 200 copies) compared to 25% in 2011 (CDC, 2017). This was an improvement but still did not reach the national goal of 90% of PLWH being undetectable (CDC, 2017). PLWH of all ages with concomitant psychiatric or substance use (SU) diagnoses have been reported to be less adherent to their ART regimen than are individuals diagnosed with only HIV and without co-occurring psychiatric or SU diagnoses (Nahvi et al., 2012). In addition to psychiatric conditions and SU, a number of other synergistically interacting psychosocial health problems – known as *syndemic conditions* – have also been reported to adversely affect ART adherence (Stall et al., 2003).

In the 1990s, Merrill Singer first used the term *syndemic* to refer to the concurrent, synergistic interaction of two or more psychosocial health problems that may lead to or exacerbate health problems or diseases (Singer, 1994). Among the syndemic conditions associated with HIV-infection are symptoms of depression, abuse, violence, SU, incarceration, and stress (Singer, 1994). For MSM, protracted social adversity and life trauma are believed to potentiate the development of these syndemic conditions, which are associated with higher rates of HIV seroconversion (Herrick et al., 2013) and faster progression of HIV disease (Freedman et al., 2004). In addition to affecting individuals, these syndemic conditions also fuel the HIV/AIDS epidemic as a whole (Stall et al., 1999).

In people living without HIV infection, syndemic conditions have been observed to negatively affect medication adherence (Friedman et al., 2015). Among people with HIV, adherence to ART is paramount for slowing HIV disease progression yet few studies have examined the impact of syndemic conditions on ART adherence (Friedman et al., 2015). A systematic review and meta-analysis of twelve studies – which included participants living with HIV who were 45 years and older and that used an medication adherence cut-off of at least 80% – concluded that older age is a protective factor for better medication adherence (Ghidei et al., 2013). However, those studies did not include syndemic conditions and substance use. Studies like Friedman et al. (2015) found that syndemics and poorer medication adherence in MSM living with HIV were associated but the researchers did not control for age. Halkitis et al. (2014) reported that psychosocial burdens such as depression, HIV-related stigma, and sexual compulsivity were associated with adherence behaviors of older MSM living with HIV.

Researchers have been investigating reasons for non-adherence as well as interventions for improving medication adherence among PLWH (Saber et al., 2015). However, data show that in the US, inadequate ART medication adherence is still a barrier to overcome (Saber et al., 2015). Furthermore, syndemic conditions among MSM living with HIV are more frequent than in the general population (Blashill et al., 2015; Friedman et al., 2015). However, only a few studies have assessed the relationship between syndemic factors among older MSM living with HIV. A better understanding of syndemic conditions among older MSM living with HIV is important, given the aging of the HIV population and prior studies suggesting syndemic conditions are common in this population. Thus, the aim of this study was to evaluate whether syndemic conditions such as symptoms of depression, symptoms of post-traumatic stress disorder (PTSD), past physical or sexual abuse, intimate partner violence (IPV), stimulant use, and binge drinking were associated with poorer medication adherence in a population of MSM over 50 years of age and living with HIV.

## Methods

### Design: sample, setting, and data collection

From 2012 to 2016, 438 participants were enrolled in a cross-sectional study. To be eligible for participation, patients had to be living with HIV and 50 years of age or older. For this investigation, participants who did not identify as gay or bisexual were excluded. As a result, 157 participants were excluded: 50 women, six male to female transgender persons, 2 female to male transgender persons, 93 heterosexual men, and six participants who did not complete the survey.

This investigation used a subset of the “Silver Project” (Greene et al., 2018; Hessol et al., 2017; John et al., 2016). The Silver Project was initiated in 2012 at two sites to address aging concerns in PLWH: (1) 360: The Positive Care Center at the University of California, San Francisco (UCSF 360), an outpatient HIV practice that serves privately insured and marginally insured people living with HIV and (2) the UCSF Positive Health Program (Ward 86) located at Zuckerberg San Francisco General, a city-funded hospital-based safety net clinic serving publicly insured, marginally insured, and uninsured people living with HIV.

The UCSF Institutional Review Board approved this study (#12–08879).

### Instruments

Medication adherence was measured using the Self-Rating Scale Item (SRSI) adherence assessment which has been widely used to determine medication adherence (Feldman et al., 2013). This single-item scale can be administered quickly and asks “Rate your ability to take all your medications as prescribed in the past 30 days” (Feldman et al., 2013). The SRSI uses a 6-point scale from “very poor” adherence scored as “1” to “excellent” adherence scored as “6” (Feldman et al., 2013). The SRSI included all medications (not just ART).

Health-related quality of life (HRQoL) was measured using the question “In general, how would you rate your health?” Responses were on a 5-point scale from “poor” scored as “1” to “excellent” scored as “5” (Crane et al., 2006).

Syndemic conditions were defined as self-reported (a) depressive symptoms, (b) symptoms of PTSD, (c) past physical or sexual abuse, (d) IPV, (e) stimulant use, and (f) binge drinking.

The Patient Health Questionnaire 9 (PHQ-9) assesses and screens for levels of symptoms of depression in the primary care setting (Spitzer et al., 1999). The higher the score the more symptoms of depression. For the purpose of this study, the cutoff point was greater than or equal to 10 – as recommended in other studies (Manea et al., 2012) – which represents symptoms consistent with at least moderate depression. Internal consistency was measured using Cronbach’s alpha and was found to be high (0.88).

The Breslau screening tool, which assesses PTSD in the primary care setting, consists of a 7-item questionnaire (Breslau et al., 1999). The higher the score the more symptoms of trauma. Scores of 4 and higher indicate likely PTSD, which was used as an indicator of trauma in this study (Breslau et al., 1999). Internal consistency was high (Cronbach’s alpha of 0.92).

To ascertain information about participants’ experience with past abuse, the study queried participants about any sexual, physical, mental, emotional, or financial abuse. The abuse questions were not validated measures; rather, they simply ask participants whether “In the past, have you ever been sexually, physically, mentally, emotionally, or financially abused”? Participants could select one or more options. If abuse was present a score of “1” was assigned. If abuse was absent a score of “0” was assigned. In accordance with the theory of syndemics – only past physical or sexual abuse were considered as abuse (Blashill et al., 2015).

The HITS measure, which assesses *IPV*, was developed by Sherin, Sinacore, Li, Zitter, and Shakil (Sherin et al., 1998). The higher the score the higher the IPV. Shakil et al. (2005) found that a cutoff point score of greater than or equal to 11 showed a sensitivity of 88% and specificity of 97%. The present study used a cutoff point score of greater than or equal to 11. The HITS measure’s internal consistency was also high (Cronbach’s alpha of 0.77).

The study included three stimulant-use questions pertaining to how often participants used methamphetamine, crack, or cocaine in the past 30 days. Responses were on a 9-point scale ranging from “never”, scored as “0”, to “10 or more times a day”, scored as “8”.

To assess alcohol use, the first alcohol question asked whether participants drink alcohol. If a participant responded with a *yes* to alcohol drinking, a subsequent question asked the participant the number of days that the participant had had 5 or more standard drinks (per day) in the preceding 12 months. The National Institute on Alcohol Abuse and Alcoholism (NAAA) defines *binge drinking* as 5 or more standard drinks per day for men. Reporting at least one episode of binge drinking (“yes” for 5 or more drinks in a day for any period of time in the preceding 12 months) was coded as binge drinking (Smith et al., 2009) and the participant was counted as having this syndemic condition.

It took about 30–40 min for participants to complete the assessments.

## Data analysis

Cronbach's alpha measured the internal consistency (reliability) of scales composed of multiple questions for each item. For continuous variables, the mean and *SD* were calculated and a one-way analysis of variance (ANOVA) was used to ascertain differences among participants with no or one syndemic conditions and participants with two or more syndemic conditions. For categorical variables, a frequency table was used to describe the relationship between syndemic conditions (none, one, or two or more) and demographic variables. Unadjusted and adjusted linear regression models were used to analyze one or more independent predictors and their association with medication adherence. Adjusted models included the following variables: symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking. A *p*-value of .05 was used to determine statistical significance. All analyses were performed using IBM SPSS Software Version 25 (IMB Corporation, 2017).

## Results

### Demographic characteristics

The study's sample ( $N=281$ ; 250 [89%] MSM and 31 [11%] bisexual men) was a subset of the all participants enrolled in the Silver Project. The sample was 55% Caucasian, 19% African American, and 9% Latino (Table 1). Participants ranged in age from 50 to 80 years old with a mean of 57.89 years ( $SD \pm 6.1$ ). Eighty-nine percent identified as gay. The mean duration of HIV-infection was 20.6 years ( $SD \pm 8.1$ ). Most participants (83%) had some college education and a quarter (26%) were employed at least part-time. Almost half of the participants (42%) were receiving disability benefits. The majority of participants' (69%) had an annual income of \$40,000 or less.

Most participants (62.3%) reported "excellent" medication adherence, 21.7% reported "very good", 7.8% reported "good", 3.6% reported "fair", 2.5% reported "poor", and 2.1% reported "very poor".

Nearly one third (27.4%) of the sample indicated symptoms of depression. Fewer participants (13.5%) indicated symptoms of PTSD. Over one third (34.9%) of the sample indicated past physical or sexual abuse (any past physical or sexual abuse counted as abuse). A minority of participants (5.0%) indicated having IPV (the HITS measure score was at least 11, i.e., likely to be experiencing IPV). Sixteen percent of the participants indicated stimulant use (defined as having used "methamphetamine", "cocaine", or "crack") scored at least "1" (a few times) in the 30-day period preceding survey. Nearly one third (29.9%) of the sample indicated binge drinking (Table 2).

Fewer than one third (29.5%) of participants indicated having no syndemic conditions, over one third (34.5%) indicated having one syndemic condition, 22.1% indicated having two syndemic conditions, 9.3% indicated having three syndemic conditions, 3.2% indicated having four syndemic conditions, 1.5% indicated having five or more syndemic conditions.

### Syndemic condition count

The mean age of participants experiencing two or more syndemic conditions was 56.68 ( $SD \pm 5.$ ) compared with a mean age of 58.57 ( $SD \pm 6.587$ ) for participant with less than two conditions ( $p = .013$ ). Participants who were employed full-time were more likely to have less than two syndemic conditions ( $p = .008$ ). Participants who perceived HRQoL as “excellent”, “very good”, or “good” were more likely to have none or one syndemic condition than participants who perceived their HRQoL as “fair” or “poor” ( $p = .004$ ). Participant who rated their adherence as “excellent” were more likely to have none or one syndemic condition than participants who rated their adherence as less than excellent ( $p < 0.001$ ).

### Syndemic conditions and medication adherence

In unadjusted linear regression models, depressive symptoms, ( $p < .0001$ ), PTSD ( $p < .0001$ ), past physical or sexual abuse ( $p = .009$ ), stimulant use ( $p < .0001$ ), and binge drinking ( $p = .0015$ ) were significantly associated with medication adherence.

In adjusted analyses, experiencing syndemic conditions was associated with decreased medication adherence ( $p < .0001$ ) and the overall model accounted for 17.3% of the explained variability in medication adherence. Participants’ with symptoms of depression ( $p = .008$ ), PTSD ( $p = .002$ ), and stimulant use ( $p < .0001$ ) had decreased medication adherence and after controlling for other syndemic conditions. IPV ( $p = .421$ ), past physical or sexual abuse ( $p = .060$ ), and binge drinking ( $p < .085$ ) were not significantly associated with medication adherence and after controlling for other syndemic conditions.

### Discussion

Stimulant use and PTSD had the strongest influence on medication adherence in the final model. Previous studies had also found that depression and PTSD (Halkitis et al., 2014) were associated with poorer medication adherence. The present study may be the first to report that binge drinking was also associated with poorer medication adherence in aging MSM living with HIV. Even though Ghidei et al. (2013) found that age was a protective factor in medication adherence, the current study found that even older MSM living with HIV may experience poorer medication adherence. Similar to the study by Nahvi et al. (2012), participants in this investigation reported poorer medication adherence when using drugs or binge drinking. Using drugs and binge drinking seem to be an important contributor to poor medication adherence in the aging MSM living with HIV.

The present study observed that participants with two or more syndemic conditions reported poorer medication adherence than participants with no or one syndemic condition. In the study by Blashill et al. (2015) more syndemic conditions were associated with poorer medication adherence. The present study showed that, even among older MSM living with HIV, syndemic conditions are present and contribute to poorer medication adherence.

Stall et al. (2003) reported that syndemic conditions adversely affect medication adherence and Friedman et al. (2015) reported that syndemic conditions mediated viral suppression. Our study contributes to this prior work that syndemic conditions can lead to poor HIV-



related health outcomes via low adherence to medication, particularly among older MSM living with HIV.

There were limitations to this study. First, this was a cross-sectional study and thus we cannot determine the sequence of events or speculate about causation. Second, we relied heavily on self-reports and thus the data is subjective and may be prone to recall, measurement, or desirability bias. Last, the analyses were limited by the data available for this secondary analysis. Drug questions were limited to stimulant use and did not include opioids and sedatives that might have increased the number of participants using drug. If the stimulant use questions had included the past 12 months instead of 3 months, a higher number of participants might have self-reported stimulant use. Our study only assessed binge drinking and not heavy drinking because assessment of binge drinking only requires use of a quick clinical screening tool.

## Conclusions

The aim of this investigation was to evaluate whether selected syndemic conditions – symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking – were associated with poorer medication adherence in a population of older MSM living with HIV. Our findings make an important contributions to the body of literature on medication adherence because they suggest that in older MSM living with HIV, syndemic conditions – specifically, symptoms of depression, symptoms of PTSD and stimulant use – may affect medication adherence.

Before implementing an intervention to improve medication adherence, we must understand the social determinants that contribute to non-adherence to medication, and then target interventions for reducing or ameliorating syndemic conditions, including those identified in the present study. We hope that by reducing symptoms of depression and PTSD, IPV, stimulant use, and binge drinking we may be able to improve medication adherence.

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Table 1.

Demographic characteristics of older MSM living with HIV.

Demographics	1 Syndemic condition <i>n</i> =180	2 Syndemic conditions <i>n</i> =101	Total MSM <i>n</i> = 281	<i>p</i> -value
<i>Age (mean, SD)</i>	58.57 (±6.587)	56.68 (±5.006)	57.89 (±6.124)	<b>.013</b>
Range	50–80	50–73	50–80	
<i>Race/ethnicity</i>				.200
Caucasian	101 (56.1%)	53 (52.5%)	154 (54.8%)	
African American	31 (17.2%)	21 (20.8%)	52 (18.5%)	
Hispanic	12 (6.7%)	13 (12.9%)	25 (8.9%)	
<i>Sexual orientation</i>				.461
Gay	162 (90.0%)	88 (87.1%)	250 (89.0%)	
Bisexual	18 (10.0%)	23 (12.9%)	31 (11.0%)	
<i>Years of HIV-infection</i>				.562
Total Years (mean, SD)	20.85 (±7.942)	20.24 (±8.392)	20.64 (±8.094)	
Range	1–35	1–33	1–35	
<i>Education</i>				.216
College	153 (85.0%)	80 (79.2%)	233 (82.9%)	
<i>Employment</i>				<b>.008</b>
Full-/part-time	53 (29.4%)	21 (20.8%)	74 (26.3%)	
Unemployed	16 (8.9%)	8 (7.9%)	24 (8.5%)	
Retired	45 (25.0%)	12 (11.9%)	57 (20.3%)	
Receiving disability	60 (33.3%)	57 (56.4%)	117 (41.6%)	
<i>HRQoL</i>				<b>0.004</b>
Excellent	17 (9.4%)	6 (5.9%)	23 (8.2%)	
Very good	57 (31.7%)	24 (23.8%)	81 (28.8%)	
Good	71 (39.4%)	29 (28.7%)	100 (35.6%)	
Fair	30 (16.7%)	32 (31.7%)	62 (22.1%)	
Poor	4 (2.2%)	9 (8.9%)	13 (4.6%)	
<i>HIV VL</i>				.564
Undetectable (<40 copies/ml)	151 (83.9%)	82 (81.2%)	233 (82.9%)	
<i>Medication Adherence (SRSI)</i>				<b>&lt;.0001</b>

Demographics	1 Syndemic condition <i>n</i> =180	2 Syndemic conditions <i>n</i> =101	Total MSM <i>n</i> = 281	<i>p</i> -value
Very poor	4 (2.2%)	2 (2.0%)	6 (2.1%)	
Poor	0 (0.0%)	7 (6.9%)	7 (2.5%)	
Fair	2 (1.1%)	8 (7.9%)	10 (3.6%)	
Good	9 (5.0%)	13 (12.9%)	22 (7.8%)	
Very good	34 (18.9%)	27 (26.7%)	61 (21.7%)	
Excellent	131 (72.8%)	44 (43.6%)	175 (62.3%)	
<i>Syndemic conditions</i>				
Symptoms of depression	N/A	N/A	77 (27.4%)	N/A
Symptoms of PTSD	N/A	N/A	38 (13.5%)	N/A
Past physical or sexual abuse	N/A	N/A	98 (34.9%)	N/A
IPV	N/A	N/A	14 (5.0%)	N/A
Stimulant use	N/A	N/A	45 (16.0%)	N/A
Binge drinking	N/A	N/A	84 (29.9%)	N/A

Notes: Significance <.105 are in boldface. HIV VL = Human Immunodeficiency Virus Viral Load; HRQoL = Health-Related Quality of Life; IPV = Intimate Partner Violence; MSM = Men who have sex with men; N/A = Not Applicable; PTSD = Post-Traumatic Stress Disorder; SD = Standard Deviation; SRSI = Self-Rating Scale Item.

**Table 2.**

Association between syndemic conditions – symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, binge drinking and outcome variable: medication adherence.

Syndemic conditions	Medication adherence change: increase +; decrease –		p-value	Medication adherence change: increase +; decrease –		Unique contribution	p-value
	Unadjusted Regression			Adjusted Regression			
Symptoms of depression	-.574		<.0001	-.391		22.4%	<b>.008</b>
Symptoms of PTSD	-.849		<.0001	-.616		25.4%	<b>.002</b>
Past physical or sexual abuse	-.371		<b>.009</b>	-.257		15.4%	.060
IPV	-.254		<b>.420</b>	-.240		4.8%	.421
Stimulant use	-.849		<b>.0001</b>	-.739		27.2%	< <b>.0001</b>
Binge drinking	-.362		<b>.015</b>	-.240		14.5%	.085

Notes: All measurements controlling for the other variables within this model. Significance <.05 are in boldface. IPV = Intimate Partner Violence; PTSD = Post-Traumatic Stress Disorder.