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# Syndemic Indicators Predict Poor Medication Adherence and Increased Health Care Utilization for Urban HIV-Positive Men Who Have Sex with Men

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## Abstract

Research on men who have sex with men (MSM) has uncovered psychosocial factors (syndemic indicators) that are associated additively with poor health. To test these relations in a sample of HIV-positive MSM, we enrolled 166 patients from two HIV clinics. We investigated relations between syndemic indicators and outcomes including medication nonadherence, condomless anal sex (CAS), and healthcare utilization. A large proportion of participants reported each syndemic indicator: polysubstance use 43%, suicide attempt 28%, childhood sexual abuse 39%, partner abuse 64%. Analyses confirmed an additive effect, whereby endorsing 1+ indicator was associated with increased odds of medication nonadherence and medical hospitalization.

### Keywords

Healthcare utilization; HIV; medication adherence; MSM; syndemics

Since the 1990s, behavioral health researchers have become increasingly interested in the ways that co-occurring psychosocial problems exacerbate health problems in specific populations (for a review, see Singer & Clair, 2003). Researchers coined the term

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"syndemics" to refer to the synergistic effect of multiple psychosocial problems on the risk for disease acquisition, as well as on the worse health of those living with a given ailment. Syndemic theory asserts that these co-occurring psychosocial problems mutually interact to produce negative health effects, above and beyond the effect of a singular health problem (Singer, 2009). More recently, researchers have applied syndemic theory to understand relations between co-occurring psychosocial problems among men who have sex with men (MSM) and HIV acquisition risk (Dyer et al., 2012; Herrick et al., 2013; Kurtz, Buttram, Surratt, & Stall, 2013; Mustanski, Garofalo, Herrick, & Donenberg, 2013; Parsons, Grov, & Golub, 2012; Stall et al., 2003).

Decades of research on the health of MSM in the U.S. has revealed substance use, psychological distress (e.g., depression, suicidality), childhood sexual abuse (CSA), and partner abuse (PA) as specific psychosocial problems that negatively impact health (for a review, see Pimentel, 2014). In a seminal study, using these problems to represent the HIV-related syndemic indicators for MSM, Stall and colleagues (Stall et al., 2003) discovered an additive effect—whereby MSM who possessed three or four of the syndemic indicators were significantly more likely to engage in condomless anal sex (CAS) and, further, were more likely to be infected with HIV, relative to MSM who endorsed zero, one, or two of the syndemic indicators. Associations between syndemic indicators and CAS—as well as HIV acquisition—have been replicated in a variety of U.S. and international samples. A recent systematic review (Tsai & Burns, 2015) identified 40 unique published reports on the associations between HIV-related syndemics and sexual risk behavior or HIV-positive serostatus, 21 of which were focused on MSM. Some studies have examined other outcomes; for example, Kurtz and colleagues (2005) found that compared to men reporting two or less indicators, men reporting more than two indicators were less likely to engage in serosorting (only engaging in CAS with partners of the same HIV-serostatus) as a sexual risk reduction strategy. This finding suggests that men who possess more syndemic indicators may be more likely to engage in CAS with serodiscordant partners, thereby increasing their risk for acquiring HIV.

Although there have been many published articles investigating syndemic theory among HIV-negative MSM, predicting CAS or HIV-seroconversion (e.g., Dyer et al., 2012; Mustanski et al., 2013; Parsons et al., 2012;), there are relatively few published articles focused on syndemics among HIV-positive MSM. This is somewhat surprising, since syndemic indicators remain after HIV infection; that is, they are likely to continue to exert an influence on men's functioning throughout their lives, impacting outcomes other than sexual risk taking and HIV status alone. Further, CAS among HIV-negative men can lead to HIV seroconversion and, thus, the HIV-negative men in a study in 2010 may be the HIV-positive men in a study in 2015, for example. We assert that these are not different groups of men, when viewed over time. The factors that influence HIV-negative men towards engagement in CAS may, after infection, complicate the experience of living with HIV by serving as barriers to full engagement with medical recommendations. Thus, the study of syndemic indicators on the physical and mental health of HIV-positive MSM is an important and understudied endeavor.

We could identify only one quantitative examination of syndemics in a sample of exclusively HIV-positive MSM (Friedman et al., 2015), in which syndemic exposure was associated with nonadherence to HIV medications; similar findings emerged from another study, this one enrolling HIV-positive men and women (Blashill et al., 2015), and yet another, this one enrolling HIV-positive injection drug users (IDUs; Mizuno et al., 2014). Qualitative investigations of syndemics among HIV-positive MSM have described the early onset of socially produced health disparities, and have provided personal narratives of how social marginalization mutually reinforces syndemic problems and associated HIV sexual risk behaviors (Lyons et al., 2013, Bruce & Harper, 2011).

Given that, relative to HIV-negative MSM, HIV-positive MSM are more likely to report depression (Sherr, Clucas, Harding, Sibley, & Catalan, 2011), substance abuse (e.g., Wei, Guadamuz, Lim, Huang, & Koe, 2012), and interpersonal abuse (including CSA & PA; e.g., Lloyd & Operario, 2012), syndemic indicators that place MSM at risk for acquiring HIV do not simply disappear after HIV diagnosis and, thus, likely continue to exert a negative influence on men's behavior and their health status post-diagnosis. Most studies on the psychosocial health of HIV-positive MSM have investigated relations between individual indicators and HIV health variables (e.g., Carrico, Johnson, Colfax, & Moskowitz, 2010) without using a syndemics framework. In the HIV literature, depression, substance use, CSA, and PA have each been independently associated with poorer HIV health (Blashill, Perry, & Safren, 2011; Carrico et al., 2011), including medication nonadherence (e.g., Carrico et al., 2010; Kong, Nahata, Lacombe, Seiber, & Balkrishnan, 2012; Woodward & Pantalone, 2012). These psychosocial problems have also been widely associated with sexual risk behaviors among HIV-positive MSM (e.g., Markowitz et al., 2011; Pappas & Halkitis, 2011; Wilson, Stadler, Boone, & Bolger, 2014). Further, depression, substance use, and interpersonal violence are all related to increases in healthcare utilization among MSM living with HIV (Catz, McClure, Jones, & Brantley, 1999; O'Cleirigh, Skeer, Mayer, & Safren, 2009; Pantalone, Hessler, & Simoni, 2010). It seems prudent to further the investigation of syndemics on health indicators of HIV-positive MSM.

## PURPOSE

Although three previous quantitative studies have investigated relations between syndemics and HIV health outcomes (Friedman et al., 2015; Blashill et al., 2014; Mizuno et al., 2014), only one study investigated syndemics in a full sample of HIV-positive MSM (Friedman et al., 2015). In the present study, we aim to extend the existing literature by applying a syndemic framework to a sample of HIV-positive MSM, investigating not just adherence, but also health behaviors and healthcare utilization.

## Methods

### Procedures

Participants were recruited from two urban, public, university-affiliated outpatient HIV clinics in the Northwestern U.S. Case managers, medical providers, or a research nurse recruiter referred potential participants, who were asked to participate in a one-time, computer-based interview study investigating "certain life experiences you may have had,

and how they have affected your health and the way you feel about yourself." Study visits were conducted at the patient's usual clinic site or nearby at the investigators' research offices, based on the participant's preference.

Eligible patients were actively engaged with medical care at one of the participating HIV clinics, over 18 years old, biologically male at birth, English-speaking, and reported—in response to a question about lifetime sexual behavior—"men and women about equally," "mostly men," or "only men" as response choices. Participants consented to all study procedures, including completing the survey and allowing project staff to retrieve data from their electronic medical records (EMRs). Because of the format of pre-screening patients ad hoc during regular medical appointments by a large pool of providers, no data on refusal rates or reasons were obtained. All referred patients who passed the initial screening were deemed eligible and fully enrolled after study staff obtained informed consent.

We collected survey data via computer-assisted self-interview (CASI), which maximizes time efficiency, increases accessibility to individuals with low literacy, increases confidentiality, and decreases socially desirable responding (e.g., Metzger et al., 2000). Participants were paid $20 for their time and given a list of free or low-cost local resources related to the mental health and psychosocial needs of people living with HIV/AIDS. This study was approved by the university Institutional Review Board.

## Measures

The interview included well-validated measures with established psychometric properties whenever possible. Items querying abuse experiences were based on behaviorally specific definitions of abuse (e.g., "My partner threw something that could hurt me"), as these tend to be more valid and yield higher rates of socially undesirable behaviors than more subjective data collection methods (Silvern, Waelde, Baughan, Karyl, & Kaersvang, 2000). Relationship terminology was modified so that all questions were applicable to individuals engaged in male-male relationships.

## Demographics

We collected basic data about the sample using investigator-created questions about age, race, ethnicity, income, education, employment, disability status, and self-identification of gender identity and sexual orientation. Dichotomous variables indicating racial or ethnic minority status, level of education (college degree vs. less than college degree), and age (<40 years vs. 40+ years) were included in all adjusted regression models.

## Syndemic indicators and composite variable

We examined four indicators that have been identified in the primary literature on HIV-related syndemics among MSM (e.g., Stall et al., 2003), including mental health (i.e., depression, suicidality), PA, CSA, and substance use (in this study, we did not include a measure of sexual compulsivity, unfortunately; Parsons et al., 2012). To create our 4-level syndemic predictor variable, we dichotomized each indicator; this analytic approach has been standard in similar reports (e.g., Tsai et al., 2015). Specifically, the four levels indicate

the endorsement of zero, one, two, or three/four (typically combined because of the small number of cases with four syndemics) of the syndemic indicators described below.

**(a) Mental health—**We used the Centers for Epidemiological Study—Depression Scale (CES-D; Radloff, 1977) to assess depressive symptoms. Respondents were asked to rate the frequency with which they had experienced any of 20 depressive symptoms in the past week. Response choices ranged from 0 (*rarely or none of the time, less than 1 day/week*) to 3 (*most or all of the time, 5–7 days/week*). For the interrelation analyses, we operationalized depressive symptoms as the sum of all items ($\alpha$ = .91 in the current sample, compared to $\alpha$ = .90 in the original validation samples [Radloff, 1977]). Elevated levels of depressive symptoms were observed across most of the sample ($M$ = 20 with a normed cutoff of 20 for medical populations indicating a high likelihood of major depressive disorder in other samples, $SD$ = 12.7); therefore, we opted for a more stringent event-based indicator of significant depression that has also been used in previous studies when creating our syndemic variable, i.e., history of suicide attempts. We created a dichotomous variable for history of suicide attempts (attempts coded as 1 vs. no attempts coded as 0) based on a response of "yes" to either one or both of two relevant survey questions ("Before 18, did you try to ever attempt suicide" or "Since 18, did you ever attempt suicide?").

**(b) Partner abuse—**We used relevant subscales of the Revised Conflict Tactics Scale (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996) to assess physical, sexual, and psychological partner abuse victimization in the past five years. Chronbach's alphas across subscales ranged from .70 to .87 (compared to $\alpha$ = .79 to .95 in validation studies [Straus et al., 1996]). For the interrelations analyses, we used a continuous score of PA—a total count of the number of PA victimization acts endorsed in the past five years, the timeframe frequently used in PA research with MSM (e.g., Greenwood et al., 2002). For the syndemics variable, we dichotomized responses into 1 (*PA*) or 0 (*no PA*).

**(c) Child sexual abuse—**We used two items from the sexual abuse subscale of the Childhood Maltreatment Interview Schedule—Short Form (CMIS-SF; Briere, 1992) to assess for behaviorally-defined penetrative and non-penetrative CSA (i.e., sexual abuse before the age of 18 by someone who was 5+ years older and/or by someone of any age who used force or coercion). Endorsement of at least one item on the CSA subscale was coded as 1 (*abuse*), whereas endorsement of no items on the CSA subscale was coded as 0 (*no abuse*). Correlations between the two CSA items were high ($r$ = .80). The dichotomous variable was used for both the interrelation analyses and the creation of the syndemic variable.

**(d) Polysubstance use—**Items from the Daily Drug Taking Questionnaire (DDTQ; Collins, Parks, & Marlatt, 1985) were used to assess past year drug use. Participants were asked to report their average weekly use (none, <1, 1, 2, 3, 4, 5, 6, or 7 days per week on average) of each of several illegal drugs over the past year, including powder cocaine, crack cocaine, amphetamines, methamphetamines, stimulants, ecstasy, heroin, methadone, barbiturates, or hallucinogens. We did not include commonly used substances like tobacco, alcohol, or marijuana in our analysis. For the interrelation analyses, we used a continuous variable to represent the number of illicit substances used in the past year (excluding legal

and/or commonly used alcohol, tobacco, or marijuana). For the syndemics analyses, we used a dichotomous indicator for polysubstance use by collapsing the continuous variable into 1 (reported *>2 illicit substances used in the past year*) or 0 (*≤ 2 illicit substances used in the past year*); this procedure is consistent with Stall and colleagues (2003).

## Outcome variables

We investigated associations between syndemics and three primary outcome variables: two measures of health behaviors (HIV medication nonadherence, serodiscordant CAS) and one measure of healthcare utilization (inpatient medical admissions).

**Health behaviors—**We assessed the specific behavioral outcomes of HIV medication nonadherence and serodiscordant CAS. Adherence was assessed through the single item of participant self-reported number of doses missed in the week prior to assessment. Participants responses were coded as 0 (*no missed doses/100% adherent*) or 1 (*missed doses/non-adherent*). This conservative adherence estimate is supported in the literature, especially for samples of HIV patients recruited from within healthcare settings (e.g., Pearson, Simoni, Hoff, Kurth, & Martin, 2007). Participants were asked a variety of questions pertaining to their recent sexual risk behavior. To calculate a variable representing CAS with a serodiscordant partner (i.e., a partner with a negative or unknown HIV status) in the past six weeks, we first subtracted the number of serodiscordant partners with whom the participant used a condom from the total number of reported serodiscordant partners. We dummy coded difference scores as 0 (*no unprotected sex*) or 1 (any *unprotected sex with a partner of negative or unknown HIV status*).

**(b) Healthcare utilization—**All of the participants in the study were fully engaged patients in outpatient clinics for routine and preventive care. Thus, there is an expectation is that utilization of inpatient medical (non-psychiatric) hospitalization should not be needed in most cases. Information regarding inpatient medical hospitalization was extracted from the EMR. All of the participants were enrolled patients in HIV primary care clinics. We counted the number of inpatient medical admissions in the year prior to the assessment visit. In analyses, this item was coded as either 0 (*no admissions*) or 1 (*at least one admission*).

## Data Analysis

The dataset was screened for outliers, skewness, kurtosis, and missing data. Given the CASI format of the interview, few participants had missing data (<5%). Thus, for participants with missing data, we used mean subscale replacement when more than half of the questions were answered; participants with missing data on any key variables were excluded from further analysis. Analysis proceeded in three steps. First, we ran frequencies to determine the proportion of the sample that endorsed each dichotomous indicator, as well as the proportion of the sample that endorsed 0, 1, 2, and 3–4 indicators, respectively. Second, we examined interrelations between the four indicators, using the continuous forms of the variables described above. A series of twelve linear regression models were used, in which each indicator was regressed on another. Third, we used a series of logistic regression models (for dichotomous outcome variables) and linear regression models (for continuous outcome variables), adjusted for age, education, and race/ethnicity, to determine the relation

between syndemics and the odds of HIV medication nonadherence, sexual risk (i.e., serodiscordant CAS), and healthcare utilization.

## Results

A total of 178 men completed an enrollment visit, although data from some men were excluded due to technical difficulties, unfinished questionnaires, duplicate enrollments, and an improbable pattern of responding indicating that the participants did not provide valid data. Our final sample consisted of 166 HIV-positive MSM. The mean age of the sample was 44.1 years ($SD$ = 8.4). Participants identified primarily as White/European-American (63.3%), with other racial/ethnic groups represented as well: Black/African-American (18.1%), biracial/multiracial (7.8%), American Indian/Native American (5.4%), and Hispanic/Latino (11.9%). The majority of the sample was unemployed (80.7%) and considered disabled (62.7%), with almost one-third of the sample reporting an extremely low annual income (≤$6600/year). Four-fifths of the participants were prescribed HIV medications (81.3%) and three-fifths had an undetectable viral load at the time of their last medical visit (58.3%). About a quarter of the sample (26.5%) reported at least one inpatient medical hospitalization in the past year (Range = 0–2).

### Syndemic Indicators

Descriptive statistics revealed that only 10.8% of the sample endorsed no syndemic indicators; 30.1% endorsed 1 indicator, 36.1% endorsed 2 indicators, and 22.9% endorsed 3–4 indicators. Based on our dichotomous variable definitions, 63.9% of the sample reported PA in the past five years, 38.6% reported behavioral indicators of CSA, 43.4% endorsed polysubstance use, and 28.3% reported a history of suicide attempts. For a full list of sample characteristics based on syndemic indicators, see Table 1. A series of linear regression models were used to establish interrelations between the continuous syndemic indicators; see Table 2. Of twelve potential relations, analyses revealed six significant relations between indicators (significant at $p > .05$ or smaller) and two trends ($p < .08$).

### Health Behaviors

Using logistic regression (see Table 3), adjusted for age, education, and racial/ethnic minority status, syndemic indicators were significantly associated with HIV medication nonadherence (Wald = 3.85, Exp(B) = 3.57, $p = .05$, [95% CI: 1.00 – 12.74]). Specifically, using the group of participants who endorsed no syndemic indicators as the referent, those reporting three or four indicators had a more than three-fold increase in the odds of being non-adherent to their prescribed HIV medications. The presence of one or two indicators was not associated with an increase in the odds of nonadherence, however.

In terms of sexual risk behavior, only 86 (53%) men reported having any anal sex in the past 6 weeks. Of the men who reported having anal sex in the past 6 weeks, only 38 (45.2%) reported having sex with a partner of negative or unknown HIV status and, of these men, 18 (47.4%) reported that they had engaged in anal sex without a condom. Logistic regression analysis revealed that syndemics were not associated with serodiscordant CAS in the six weeks prior to assessment. We wondered if the low rates of CAS might be driven by low

rates of anal sex overall in the sample. Thus, we conducted an additional (post-hoc) logistic regression analysis. This analysis revealed a relation between syndemics and engagement in anal sex six weeks prior to assessment such that, relative to possessing no indicators, endorsing one or two indicators was associated with a significant decrease in the odds of having any anal sex in the six weeks prior to assessment (1 indicator: OR = 0.16, [95% CI: 0.03 – 0.69]; 2 indicators: OR = 0.27, [95% CI: 0.10 – 0.72]).

### Healthcare Utilization

Using logistic regression analysis (see Table 3), adjusted for age, education, and racial/ethnic minority status, the syndemic variable was associated with inpatient medical hospitalization in the year prior to assessment (Wald = 5.01, Exp(B) = 4.99, p = .02, [95% CI: 1.22 – 19.93]). Specifically, compared to those who endorsed no indicators, participants who endorsed any one indicator was associated with a five-fold increase in the odds of inpatient medical hospitalization. However, relative to no indicators, the presence of two or more indicators was not associated with increased odds of inpatient medical hospitalization.

## Discussion

In a sample of 166 HIV-positive MSM recruited from two urban public HIV clinics, we investigated men's endorsement of syndemic indicators, and associations between those syndemic indicators and health behaviors (medication nonadherence, CAS) and healthcare utilization (inpatient medical admissions). Overall, our pattern of findings indicated that greater exposure to, and endorsement of, syndemic indicators was associated with poorer health behaviors and more healthcare utilization. We discuss each outcome category below in greater detail. However, it bears mention that the field of behavioral HIV research needs to evaluate the prevalence and correlates of syndemic indicators among HIV-positive MSM. From our review of the literature, there are a good deal of publications investigating syndemics among HIV-negative MSM (and in other HIV-negative populations) and fewer on HIV-positive MSM. These psychosocial factors in men's histories are carried with them—from an earlier time in life when they were HIV-negative, to a later time in life when they are living as HIV-positive people. Just because one's HIV status changes does not mean that the vestiges of these experiences are not present in the lives of men; in fact, these experiences may continue to adversely affect well-being and serve as persistent barriers to engagement in adaptive health behaviors.

First, in terms of syndemic interrelations, we found six significant of twelve possible associations, with two additional associations as trends. Interestingly, partner abuse was associated with all of the other syndemics, and the others were each associated significantly with one other indicator. The pattern of findings points to one of the critiques of the syndemics model, i.e., that the creation of the composite syndemic variable is in some ways a crude measure of these factors. Potentially, it might make more sense to think of syndemics as having two distinct subscales, one for victimization (CSA, PA) and one for mental health (depression, polysubstance abuse), given that the latter could occur independent of the former, or could be consequences thereof (for a greater discussion, see [author citation omitted]).

Across both our measures of health behaviors, similar findings emerged. First, for medication nonadherence, it was men with 3–4 syndemic indicators who were much more likely to endorse nonadherence; participants endorsing 1–2 syndemic indicators were not more likely to report suboptimal adherence than those with no syndemics. It could be that these men, with their innate coping resources, could manage the task of daily adherence in the face of a single, or even a couple, psychosocial problems that they were managing simultaneously. However, for participants with three or more concomitant problems, the challenge might prove too great. Providers should be especially attentive to the potential for adherence problems in patients actively engaged in care (as these patients were) who are managing multiple syndemic problems. Assessment of syndemic indicators and referral to evidence-based treatments, either pharmacotherapy or psychotherapy, is warranted.

A similar pattern of findings emerged for serodiscordant CAS. The men who reported exposure to the most syndemic indicators—those with 3–4—were more likely to report serodiscordant CAS than men who reported no syndemics. However, this finding is more complex, given that those men who reported 1–2 syndemic indicators were, in fact, less likely to report serodiscordant CAS than those men who reported no syndemics. One explanation is that men managing 1–2 syndemics might be less likely to engage in sexual behavior at all (indeed, only about half of the sample reported any anal sex at all in the prior 6 weeks) and, thus, would be less likely to endorse serodiscordant CAS. Post hoc analyses supported this hypothesis. However, for the men who reported 3–4 syndemics, it could be that the burden of problems is so great that the men engage in CAS is a result of emotional dysregulation; some men may use sex generally or the excitement of CAS specifically to distract them from their dysphoria, while others could be using their affect regulation skills to manage other aspects of their lives, leaving them sexually disinhibited. Previous work on HIV-negative MSM found a linear association between syndemics and CAS, which we did not. Further research in this area, perhaps with a more sexually active sample, is needed.

In terms of healthcare utilization, men who endorsed one syndemic indicator, compared to those who endorsed none, had greater odds of having been hospitalized as a medical inpatient in the year prior to their study participation. We wondered whether a linear association would emerge but, it did not; men who endorsed two or more syndemic indicators were not statistically more likely to have been hospitalized, compared to those who endorsed none. The strength of this outcome measure is that it was drawn directly from men’s EMRs. However, it may be that there were too few men who were hospitalized in the sample overall (<80%) and, thus, the associations may be unreliable. It will be important for future studies to attempt to replicate these findings. We used inpatient admissions as a proxy for more serious health events—given that these participants were all patients engaged with medical care at public hospitals where ability to pay was not a barrier to healthcare access.

## Limitations

As with any individual study, this one has limitations that reduce its generalizability. First, because of resource constraints, we had to utilize a cross-sectional design, despite the research questions of interest being more appropriately answered with a longitudinal design. Second, most of the key measures used in our analyses were self-reported, and some

required the use of abbreviated versions to reduce participant burden, and there are no standardized ways to measure each of the syndemics or to operationalize a “case” of them and, thus, our findings could diverge from other, similar work because of minute differences in the operationalization of variables. Future work should attempt to address this syndemics measurement issue (e.g., Tsai & Burns, 2015). Our findings are also limited by the empirically driven indicators we selected, as some researchers have recently made the argument that sexual compulsivity should be included as a fifth syndemic indicator. Although well-established in hundreds of previous studies, self-reported medication adherence has many limitations due to reliance on recall memory; the addition of real-time assessment of adherence via unannounced home pill count or medication event monitoring system (MEMS; e.g., Haberer et al., 2010) would have yielded important collateral data. These studies have found associations between five syndemic indicators and CAS in a general sample of MSM (Parsons et al., 2012) and among Black MSM, specifically (Dyer et al., 2012). Third, although the sample was diverse in some respects, participants were engaged enough in medical care to have been recruited during the course of their regular healthcare visits, and had access to a high degree of medical and mental health services attached to the clinics. Thus, our sample may be healthier (higher proportion prescribed antiretroviral medications, higher proportional virally controlled) than the modal MSM living with HIV in the U.S. (CDC, 2015), although the prospect of recruiting HIV-positive MSM who are not engaged with care is a challenging one operationally.

Additionally, although the sample is representative of the people living with HIV in the geographical region in which the clinics were located, the population of people living with HIV in the U.S. in general includes more Black/African American and Latino/Hispanic MSM and so it is unclear to what extent our findings are applicable to members of those ethnic/racial groups. Further, minority health researchers have begun to explore additional factors that may elevate or buffer the effect of syndemics on health outcomes. For example, racism and internalized homophobia, as well as other components of cultural marginalization, have been investigated as additional developmental conditions that may contribute to syndemic production (Herrick et al., 2013; Lyons, Johnson, & Garofalo, 2013; Mizuno, Borkowf, Millett, Bingham, Ayala, & Stueve, 2012). In a sample of Latino MSM living in the U.S., Mizuno and colleagues (Mizuno et al., 2012) found that MSM who experienced both homophobia *and* racism were more likely to report CAS, and more likely to report binge drinking, relative to MSM who reported experiencing either homophobia *or* racism alone. Further, in a sample of Black MSM, O’Leary and colleagues (2014) found that education and optimism buffered the syndemic effect on CAS. These studies reinforce the developmental nature of syndemic production, and point to a complex context that should be considered when studying the health of marginalized populations.

## Future Directions

Despite more than a dozen years of research on the HIV-related psychosocial syndemics of MSM, the vast majority of the literature is focused on HIV prevention and HIV-negative MSM. Although it is a laudable goal, it is also important for the behavioral HIV research community not to forget that those same factors that increase an individual’s likelihood of

acquiring the virus may also be conspiring to complicate his experience of living with the virus.

Research is also needed to replicate and extend these findings in additional samples of HIV-positive MSM, hopefully employing a longitudinal design; more fine-grained measures; a larger sample with greater representation of the racial/ethnic groups most affected by the virus nationally; and a greater proportion of patients who are not engaged with care, prescribed medications, or virally suppressed. One such study of HIV-negative MSM (Mimiaga et al., 2015) includes many of these elements and, given the large sample size that was available for the analyses (over 4,000), takes the analyses a step further, investigating each possible set of two, three, or four syndemic indicators to determine if there are particular combinations that are especially detrimental to the men's health.

Future research might employ implementation research designs (e.g., hybrid effectiveness-implementation trials; Curran, Bauer, Mittman, Pyne, & Stetler 2012) to increase the implementation of evidence-based treatments for psychosocial problems (and sequelae of psychosocial problems, such as interpersonal violence) that interfere with HIV primary care. Prior research has found this type of coordinated care to be effective at improving overall health and reducing healthcare utilization (e.g., Pyne et al., 2011). The implementation barriers to coordinate care are great (Daniels, England, Page, & Corrigan, 2005), which, consistent with federal research funding opportunities, impresses the need for implementation research on coordinated HIV care. We hope that these and other future methodologic advances will be carried forward for the study of HIV-positive MSM as well.

## Conclusions

In our study, we found that psychosocial syndemics are, as expected, associated with poorer health behaviors—including HIV medication adherence and CAS—and greater healthcare utilization. This is the first study to examine these relations in a sample of HIV-positive MSM, and our findings draw attention to the need for routine assessment of syndemic indicators in the context of HIV primary care. Further, behavioral intervention practitioners many need to consider interventions that address co-occurring psychosocial problems that contribute to poor disease management, and health risk behaviors for this vulnerable population.

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**Table 1.**

Sample Characteristics by Syndemic Indicator ($N = 166$)

| **Indicators** | ***M*** | ***SD*** |
|---|---|---|
| Continuous | | |
| Depression (*M, SD*) | 20 | 12.7 |
| Number of substances used in the past year (*M, SD*) | 1.45 | 2.24 |
| Number of acts of partner violence in the past 5 years (*M, SD*) | 4.21 | 5.5 |
| | *n* | *%* |
| Dichotomous | | |
| Suicide attempt | 47 | 28.3 |
| Polysubstance use (>2 illicit substances in the past year) | 72 | 43.4 |
| Partner violence (past 5 years) | 106 | 63.9 |
| Child sexual abuse | 64 | 38.6 |
| Number Endorsed | | |
| 0 | 18 | 10.8 |
| 1 | 50 | 30.1 |
| 2 | 60 | 36.1 |
| 3 or 4 | 38 | 22.9 |

**Table 2.**

Linear Regression Models of the Interrelations Between Syndemic Indicators (Adjusted for Age, Race/Ethnicity, and Level of Education)

| | Criterion | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depression | | | Polysubstance Use | | | Partner Violence | | | Child Sexual Abuse | | |
| **Predictors** | ***B*** | ***SE B*** | ***β*** | ***B*** | ***SE B*** | ***β*** | ***B*** | ***SE B*** | ***β*** | ***B*** | ***SE B*** | ***β*** |
| Depression | (excluded) | | | 0.02 | 0.01 | 0.15[a] | 0.10 | 0.03 | 0.26** | 0.00 | 0.00 | 0.05 |
| Polysubstance Use | 0.98 | 0.55 | 0.15[a] | (excluded) | | | 0.86 | 0.22 | 0.32*** | 0.03 | 0.02 | 0.11 |
| Partner Violence | 0.63 | 0.20 | 0.26** | 0.17 | 0.03 | 0.32*** | (excluded) | | | 0.02 | 0.01 | 0.19* |
| Child Sexual Abuse | 1.58 | 2.31 | 0.06 | 0.44 | 0.34 | 0.11 | 2.10 | 0.93 | 0.03* | (excluded) | | |

*$p < .05$,

**$p < .01$,

***$p < .001$,

[a]$p < .08$

**Table 3.**

Adjusted Logistic Regression Model of the relations between Syndemics and the Likelihood of HIV Medication Nonadherence, Sexual Risk, and Inpatient Medical Hospitalization

| | **Odds Ratio (95% Confidence Interval)** | | |
|---|---|---|---|
| Predictors | Nonadherence (*n* = 119) | Sexual Risk (*n* = 144) | Inpatient Hospitalization (*n* = 147) |
| Age | 1.96 (0.78, 4.99) | 3.77 (1.29, 10.99) * | 1.10 (0.49, 2.46) |
| Racial/Ethnic Minority Status | 1.23 (0.48, 3.19) | 1.18 (0.37, 3.76) | 1.50 (0.66, 3.40) |
| Education | 0.46 (0.18, 1.20) | 0.42 (0.14, 1.26) | 1.03 (0.45, 2.37) |
| Syndemics Variable (0 = *referent*) | | | |
| 1 Indicator | 2.45 (0.41, 14.78) | 0.52 (0.05, 5.43) | 4.93 (1.22, 19.93) * |
| 2 Indicators | 2.49 (0.65, 9.50) | 0.82 (0.21, 3.27) | 1.97 (0.66, 5.92) |
| 3 or 4 Indicators | 3.57 (1.00, 12.74) * | 0.82 (0.22, 3.07) | 2.12 (0.73, 6.10) |

* $p < .05$