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Mental Health Pathways From Interpersonal Violence to Health-Related Outcomes in HIV-Positive Sexual Minority Men

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Objective: We examined mental health pathways between interpersonal violence (IPV) and health-related outcomes in HIV-positive sexual minority men engaged with medical care. ***Method:*** HIV-positive gay and bisexual men ($N = 178$) were recruited for this cross-sectional study from 2 public HIV primary care clinics that treated outpatients in an urban setting. Participants (M age = 44.1 years, 36% non-White) filled out a computer-assisted survey and had health-related data extracted from their electronic medical records. We used structural equation modeling to test associations among the latent factors of adult abuse and partner violence (each comprising indicators of physical, sexual, and psychological abuse) and the measured variables: viral load, health-related quality of life (HRQOL), HIV medication adherence, and emergency room (ER) visits. Mediation was tested for the latent construct mental health problems, comprising depression, anxiety, symptomatology of posttraumatic stress disorder, and suicidal ideation. ***Results:*** The final model demonstrated acceptable fit, $\chi^2(123) = 157.05$, $p = .02$, CFI = .95, TLI = .94, RMSEA = .04, SRMR = .06, accounting for significant portions of the variance in viral load (13%), HRQOL (41%), adherence (7%), and ER visits (9%), as well as the latent variable mental health problems (24%). Only 1 direct link emerged: a positive association between adult abuse and ER visits. ***Conclusions:*** Findings indicate a significant role of IPV and mental health problems in the health of people living with HIV/AIDS. HIV care providers should assess for IPV history and mental health problems in all patients and refer for evidence-based psychosocial treatments that include a focus on health behaviors.

Keywords: interpersonal violence, mental health, HIV/AIDS, men who have sex with men

Interpersonal violence (IPV) is a widespread and devastating public health concern. In addition to negative health consequences for victims, it exacts a high toll from society in the form of millions of dollars in health care expenditures and losses in job-related productivity (Corso, Mercy, Simon, Finkelstein, & Miller, 2007). IPV includes child and partner abuse as well as adult abuse perpetrated by nonpartners, such as hate crimes, stranger rape, and sexual assault (e.g., Tjaden & Thoennes, 2000).

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Interpersonal Violence and HIV-Positive Sexual Minority Men

Although women are more likely than men to be victims of IPV, men are certainly at risk as well. Moreover, there is mounting evidence that sexual minority men—those who identify as gay or bisexual, as well as men who have sex with men regardless of their sexual orientation—are at especially high risk of experiencing IPV. For example, one large study found that sexual minority men were more likely than their heterosexual siblings to report abuse as children and sexual violence in adulthood (Balsam, Rothblum, & Beauchaine, 2005). Sexual minority men may be targeted because of their sexual orientation (Relf, 2001) and thus may be vulnerable to increased negative psychological sequelae, such as internalized homophobia (Herek, Gillis, & Cogan, 1999). Further support for the disproportionate risk of IPV among sexual minority men comes from a large probability sample of men who have sex with men that examined the 5-year prevalence of partner violence (Greenwood et al., 2002). Findings indicated a staggering prevalence of sexual (5%), physical (22%), and psychological (34%) battering—rates comparable to those among women and much higher than those reported for men in the general population. However, these are likely gross underestimates because of sampling and reporting biases (Tjaden, Thoennes, & Allison, 1999).

There is some indication that HIV status is associated with IPV. Certainly, among women, the data are consistent that HIV-positive versus HIV-negative women are more likely to experience physical victimization as well as multiple forms of partner violence (McDonnell, Gielen, & O'Campo, 2003). A recent review found that HIV-positive women appear to experience partner violence, specifically, at rates that are comparable to HIV-negative women drawn from the same populations (Gielen et al., 2007). However, the abuse faced by HIV-positive women appears to be more frequent and more severe. We could locate no comprehensive review on IPV in HIV-positive sexual minority men. However, several factors suggest that HIV-positive men may be more at risk for IPV than HIV-negative men, including social inequalities related to economic marginalization, substance abuse, and childhood trauma (Greenwood et al., 2002).

Interpersonal Violence and Health

For all victims of IPV, there appear to be considerable decrements in health and functioning associated with experiencing adult (e.g., Stein & Barrett-Connor, 2000) and partner abuse (e.g., Plichta, 2004). These include more severe symptoms of depression and posttraumatic stress disorder (PTSD), greater physical injury and chronic pain, and more health risk behaviors and health care utilization.

The mechanisms by which IPV leads to adverse health outcomes remain empirically unspecified (Dutton et al., 2006). In the case of physical or sexual (i.e., contact) abuse, it is clear that physical injuries may be sustained during the violent incident. The physical consequences may be acute or develop into a chronic syndrome (Resnick, Acierno, & Kilpatrick, 1997). Negative physical effects may be gross (bruises, broken bones) or less obvious yet still significant, such as impaired immune functioning (Dougall & Baum, 2004) or increased allostatic load (Friedman & McEwan, 2004). In addition, abuse may have an impact on health via less direct pathways. For example, psychological victimization appears to be associated with physical and mental health problems even in the absence of physical violence (Follingstad, 2007). Further, there may be interactive effects on health in which the mental health problems resulting from IPV exacerbate acute physical injury or hamper an individual's efforts to engage with health care, facilitating the development of chronic health problems.

Interpersonal Violence and the Health of HIV-Positive Individuals

There is a growing literature on the associations between stressful or traumatic experiences and the mental and physical health of people living with HIV/AIDS. In studies of HIV-positive individuals, experiencing abuse or trauma has been consistently associated with mental health problems including depression, anxiety, and PTSD, as well as poorer quality of life, sexual risk behaviors, and suboptimal medication adherence (for a review, see Whetten, Reif, Whetten, & Murphy-McMillan, 2008). For example, findings related to poor adherence remain even when controlling for current psychiatric symptoms and substance use (Mugavero et al., 2006), which highlights both direct and indirect associations between abuse and health. A recent review of longitudinal work in this area (Leserman, 2008) found that even with differences in measurement and follow-up period, "stressful life events" (as a proxy for abuse or trauma) were also related to poorer disease-related outcomes in HIV-positive individuals. Across studies, outcomes include a higher viral load and a greater likelihood of meeting criteria for an AIDS diagnosis or opportunistic infection, as well as faster AIDS-related and all-cause mortality. The relationship between traumatic events and CD4 count appears to be less stable, with pre-antiretroviral therapy studies more likely to find this association than more recent studies. Despite the robust negative associations between abuse or trauma and health, the literature to date has failed to examine the specific effects of different types of abuse; instead, it has relied on composite measures that aggregate stressful or traumatic experiences across the lifetime.

How Psychosocial Variables Impact the Health of HIV-Positive Individuals

Although there is a substantial literature on associations between stress and the health of people living with HIV, there is little understanding of the mechanisms by which abuse experiences or traumatic events affect health. Our focus is on acute, extreme experiences of IPV and not on stress generally, which could encompass important concerns about disclosure or stigma, bereavement, and distress about mortality (Scott-Sheldon, Kalichman, Carey, & Fielder, 2008). We know of no studies that systematically examine potential mediators of the relation between IPV and health in HIV-positive individuals.

There is growing evidence about the biological mechanisms that mediate the relation between general psychosocial factors and HIV-related outcomes, including contributions of the sympathetic nervous system and the hypothalamic-pituitary-adrenal axis (Cole, 2008). Also, in the general stress literature there is strong support for behavioral factors that may influence these relations, including treatment nonadherence, substance abuse, and sexual risk behaviors (Gore-Felton & Koopman, 2008). Even in the general area, there have been few reports of model testing that employ advanced statistical techniques to assess overall model fit as well as the direct and indirect effects of the relevant constructs. More common are reports of well-conducted studies that use multiple regression (e.g., Leserman et al., 2005) to compare some but not all of the variables of interest.

In the present study, our objective was to use structural equation modeling (SEM) to test a mediational model that explores the mental health pathways by which IPV may affect health-related outcomes. Our work is based on previously theorized models of the associations between violence and health (e.g., Resnick et al., 1997), which is consistent with a social action theory framework (Ewert, 1991). This social–contextual view conceptualizes movement toward health or illness as based primarily upon individual-level behavior but acknowledges the contribution of social interaction and interdependence as well as broader environmental and policy forces that shape behavior.

We improve on the existing literature by focusing on HIV-positive sexual minority men, a socially and medically vulnerable population, and by including multiple types of IPV, multiple measures of mental health problems, both self-report and objective measures of our outcomes of interest, and advanced statistical methods to test overall model fit as well as specific indirect effects. The hypothesized model is pictured in Figure 1.

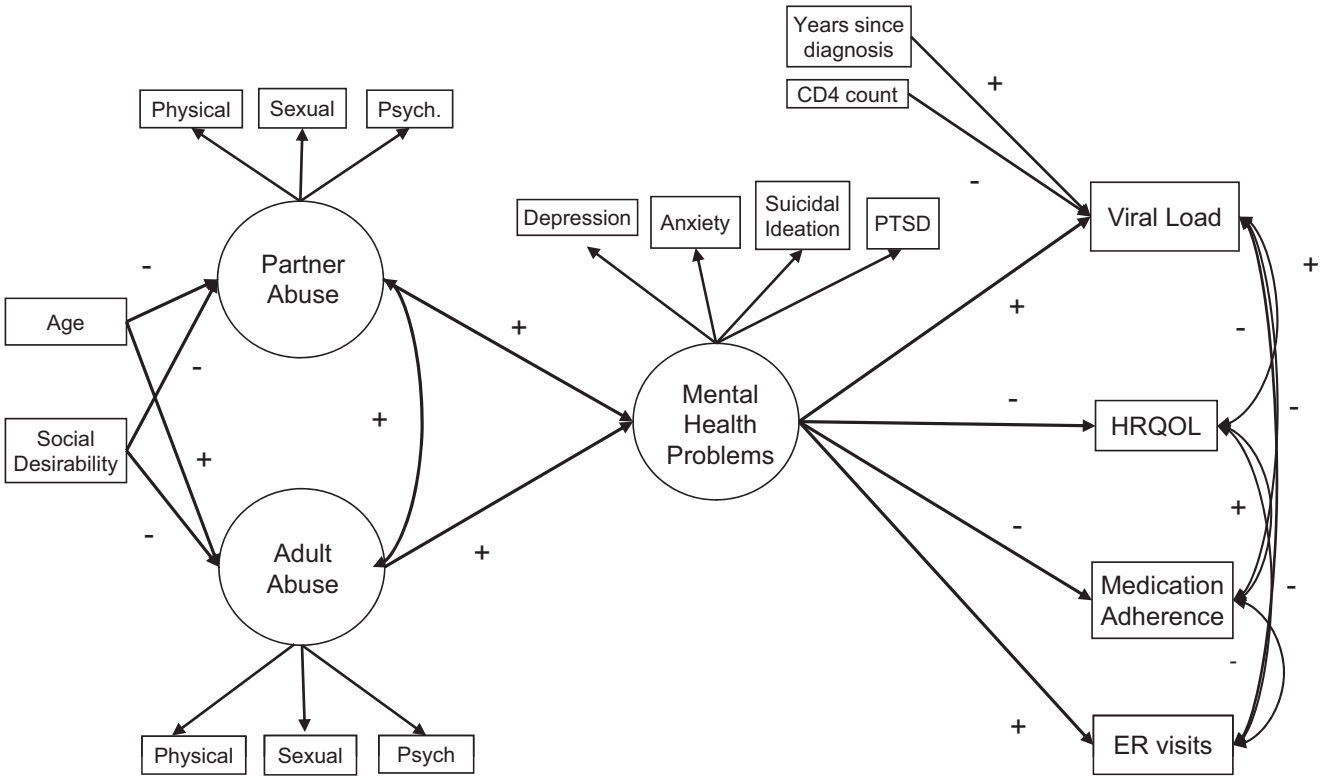

Figure 1. Hypothesized path model. Paths where a positive association was predicted are represented with a plus sign (+) and paths where a negative association was predicted are represented with a minus sign (−). PTSD = posttraumatic stress disorder; HRQOL = health-related quality of life; ER = emergency room.

Method

Procedures

A purposive (i.e., targeted) sampling strategy (Watters & Biernacki, 1989) was used to recruit HIV-positive sexual minority men engaged with medical care from two university-affiliated public HIV/AIDS clinics in Seattle, Washington. Both clinics serve urban, medically underserved populations in which more than half of the participants receive some form of public assistance. All study procedures were approved by the university's institutional review board, and all participant data were protected by a federal certificate of confidentiality.

Referrals were made through a social worker or a nurse dedicated to research participant recruitment. Potential participants were asked about their willingness to participate in a one-time, computer-based study called Project LEAP (Life Experiences Affecting Prognosis) to investigate "certain life experiences you may have had and how they have affected your health and the way you feel about yourself." No recruitment materials specifically mentioned IPV. Due to the recruitment procedures, no data on rates of or reasons for refusal are available.

Eligible individuals were active patients at either clinic, over 18 years old, biologically male at birth, English-speaking, self-identified as sexual minority men, and agreeable to all study procedures, including the computerized interview and data extraction from the patient's electronic medical record. All patients who were referred and passed the initial screening (N = 178) were deemed eligible, consented, and enrolled.

Participants were instructed on how to fill out the computer-assisted self-interview (CASI) survey. The use of CASI aimed to decrease socially desirable responding and maximize time efficiency, confidentiality, and data management (Rhodes, Lauderdale, He, Howes, & Levinson, 2002). Participants were paid $20 cash and given a list of free or low-cost community resources. At the end of the study, research staff extracted data from the patient's electronic medical record.

Measures

Well-validated self-report measures with established psychometric properties were used whenever feasible. To decrease participant burden, we administered only relevant subscales for some measures, and the CASI format permitted skip patterns to eliminate redundant or irrelevant questions on the basis of prior responses. Questions concerning abuse experiences were based on behavioral definitions of abuse rather than subjective victimization, as the former tend to be more valid (Silvern, Waelde, Baughan, Karyl, & Kaersvang, 2000). We replaced *husband* and *wife* with more inclusive terms such as *romantic partner* or *dating partner*. Two research assistants extracted electronic medical record data using a standardized form; interrater reliability for exact matches surpassed 93%.

Sociodemographics. Using standard formats, we assessed participants' age, race, income, education, employment and disability status, and living situation, as well as gender identity, sexual orientation, relationship status, and time since diagnosis with HIV.

Social desirability. To estimate biased responding, we administered the short form (10 items, true or false) of the Marlowe-Crown Social Desirability Scale (Crowne & Marlowe, 1960). After reverse coding the appropriate items, social desirability was operationalized in the analyses as the mean of all items ($\alpha = .73$).

Interpersonal Violence Exposure

Adult abuse experiences. Measures of adult abuse experiences consisted of behaviorally anchored questions about physical, sexual, and psychologically abusive acts perpetrated on the respondent since age 18. Questions were based upon established measures, but many measures were truncated to decrease participant burden. Participants were asked about the frequency of their experiences with *crime victimization* (i.e., verbally attacked, physically injured) in questions adapted from Herek et al. (1999). Three items were used to assess *serious physical abuse* (i.e., robbed or mugged; punched, kicked, hit, or beaten; and assaulted with a weapon; $\alpha = .76$), and one item was used to assess *serious psychological abuse* (i.e., verbally threatened or attacked). Respondents were also questioned about *adult sexual abuse experiences*, using an abbreviated version of the Sexual Experiences Survey (Koss & Gidycz, 1985), with questions designed to tap progressively more severe sexual victimization (nine items; $\alpha = .92$).

Partner abuse. We assessed physical, sexual, and psychological abuse in current and prior romantic relationships in the past year with the Revised Conflict Tactics Scale (Straus, Hamby, Boney-McCoy, & Sugarman, 1996), a behaviorally anchored measure with well-established psychometric properties. Responses (indicating ordinal frequency of recent abuse experiences) were summed across items for the Physical Abuse (12 items; $\alpha = .89$), Sexual Coercion (seven items; $\alpha = .70$), and Psychological Abuse (eight items; $\alpha = .84$) subscales.

Mental Health Problems

Anxiety. Anxiety was assessed with the 10-item Trait Anxiety subscale of the State-Trait Personality Inventory (Spielberger, 1979). Participants are asked to respond to statements about "how you generally feel." Response choices ranged from 1 (*almost never*) to 4 (*almost always*), and alpha in this sample was .81.

Depression. Depressive symptoms were measured with the Center for Epidemiological Study–Depression Scale (Radloff, 1977). Respondents were asked to rate the frequency with which they experienced 20 depressive symptoms in the past week. Ordinal response choices ranged from 1 (*rarely or none of the time; less than 1 day/week*) to 4 (*most or all of the time; 5–7 days/week).* In the analyses, we removed the five-item Somatic subscale, as these experiences overlap with symptoms of HIV disease. We operationalized depression as the sum of the remaining 15 items, as recommended by the measure's authors ($\alpha = .90$).

Suicidal thinking. Suicidal ideation was assessed with the Passive Suicidal Behavior subscale of the Harkavy Asnis Suicide Survey (Harkavy Friedman & Asnis, 1989), a valid and internally consistent scale developed to measure suicidality in psychiatric outpatients. This subscale comprises 14 questions about the frequency of suicidal thinking measured on a scale of 0 (*never*) to 4 (*all the time*). The original measure uses a 2-week timeframe, but in this study, we modified the timeframe to "since your HIV diagnosis" ($\alpha = .97$).

Posttraumatic stress disorder. PTSD symptoms were measured by the self-report version of the PTSD Symptom Scale (Foa, Riggs, Dancu, & Rothbaum, 1993). Respondents who endorsed a Criterion A event were asked 17 additional questions about symptom frequency in the past week. Response choices ranged from 0 (*not at all/only once*) to 3 (*almost always/five or more times per week*). In analyses, we used the mean score (average of ordinal frequency ratings for all symptoms) for the 84 participants endorsing a Criterion A event ($\alpha = .94$).

Health-Related Outcomes

Viral load. Results of the most recent HIV-1 polymerase chain reaction RNA test were extracted from participants' electronic medical records at the end of the study period. This allowed the research team to record the viral load test result (range: undetectable [< 50] to $> 1{,}000{,}000$ copies/mL) closest in time to the study visit, whether the blood draw occurred before or after the day the self-report measures were filled out. On average, the viral load test was 30.4 days ($SD = 27.7$, range 0–118) away from the study visit. In the model, we use viral load as a continuous measure, covaried with self-reported time since diagnosis and chart-extracted CD4 count.

Health-related quality of life. Health-related quality of life (HRQOL) and perceptions of health status were measured by the Medical Outcomes Study–HIV Health Survey (Wu, Revicki, Jacobson, & Malitz, 1997). This well-validated instrument covers 10 dimensions, with various time frames that include *today*, *a typical day*, and *within the past 4 weeks*. We used all items from the physical health subscales (19 items; $\alpha = .77$) and excluded all items from the mental health and cognitive functioning subscales out of potential redundancy with the mental health variables used as mediators (e.g., Leserman et al., 2005).

HIV medication adherence. There are no uniformly accepted HIV medication adherence measures. In this study, we computed a composite adherence score based on six items identified in a recent review of self-report adherence measures (Simoni et al., 2006). One item asked about the number of missed doses in the past 7 days. We dichotomized this item at 100% to increase validity, per the recommendation of Simoni et al. (2006), given that continuous self-report measures are highly skewed and nonnormal (e.g., in our sample only 17% endorsed any missed doses). The remaining five yes/no questions, also recommended in the Simoni et al. review, tap a more qualitative sense of the participant's typical adherence behaviors. Examples include, "In general, are you careless at times about taking your HIV medicine?" and "In general, if you feel worse, do you sometimes stop taking your HIV medicine?" In the analysis, we used a composite score of the sum of the endorsed dichotomous items (Kuder-Richardson $20 = .76$).

Emergency room visits. Using the participants' electronic medical record data and counting back 1 year from the partici-

pant's enrollment date, we captured the number of emergency room (ER) visits to any of the facilities in the university's network as a measure of excessive health care utilization (as all participants were already enrolled in primary HIV care).

Analysis Plan

To examine associations between the variables and consider the mediating role of mental health problems in the hypothesized model (see Figure 1), we performed path analysis using SEM with Mplus statistical modeling software (Version 4.0; Muthén & Muthén, 2006). SEM allowed us to test the relations of all variables and underlying constructs simultaneously. The major advantage of this approach is its ability to identify direct and indirect effects and the corresponding standard errors, as well as to examine measures of overall model fit. Moreover, complications associated with measurement error, correlated measurement error, and feedback can be taken into account in the model (e.g., Kline, 2005). The sample size in this study ($N = 171$) is considered small for SEM. However, our analyses used full information maximum likelihood estimation which corrects for the moderate skewness found in some measured variables (such as the IPV indicators) and has been shown to perform reasonably well in SEM, even for small samples (e.g., Hoyle & Panter, 1995). Full information maximum likelihood also handles missing data, assuming data are missing at random.

Model fit to the sample data was assessed through the commonly used two-step procedure (Anderson & Gerbing, 1988). First, a measurement model was tested with all relevant paths left free to vary. Then, the hypothesized structural path model was tested wherein all hypothesized paths shown in Figure 1 were first estimated freely (Model A). Modification indices were inspected for significant areas of model misfit, and the model was adjusted and run again (Model B). Next, model trimming was conducted following procedures recommended by Chou and Bentler (2002). Estimated regression coefficients were inspected, paths not significantly different from zero ($z > 1.96$, $p < .05$) were fixed to zero, and the model was computed again (Model C). A chi-square test comparing the final trimmed model (Model C) to Model B was computed. Model fit was assessed by the comparative fit index (CFI), Tucker-Lewis index (TLI), root-mean-square error of approximation (RMSEA), and standardized root-mean-square residual (SRMR). Indicators of acceptable model fit are considered to be a CFI $> .90$, RMSEA $< .06$, and SRMR $< .08$ (e.g., Hu & Bentler, 1999; Kline, 2005).

Results

Sample

HIV-positive sexual minority men ($N = 178$) participated in the study, of whom seven were excluded (listwise deletion) due to technical difficulties (two), unfinished self-report questionnaires (two), duplicate enrollment (two), and an improbable pattern of responding (one). The final sample consisted of 171 participants (M age = 44.12, $SD = 8.40$, range 25–66). Most participants identified as White (63.6%); 18.5% were African American, 7.7% multiracial, 6% Native American, and 4.2% declined to identify. Overall, 12.3% of participants identified their ethnicity as Hispanic/Latino. Only 19% were employed, and 60.8% were currently considered disabled by the state or federal government. Most (82.2%) had incomes less than $1,477 a month; 38% reported a current steady sexual or romantic partner; and 64% reported having received an AIDS diagnosis. Participants had been diagnosed with HIV for a mean of 12.7 years ($SD = 7.25$, range 1–27 years), and 93.3% were currently taking antiretroviral medications.

Preliminary Data Analyses

Data were screened for outliers, skewness, kurtosis, and missing data. Missing data from items in scaled scores were replaced with the mean of the answered items in the scale, provided more than 50% of the questions were answered. Descriptive statistics are presented in Table 1. Untransformed descriptives are presented for ease of interpretation. However, in the model, some variables were transformed to meet the assumption of normality. A natural log transformation was used for indicators of partner (physical, sexual, psychological) and adult abuse (physical and sexual abuse). A square-root transformation was used for ER visits. CD4 cell count was divided by 100 to achieve a standard metric with the other health-related outcomes.

Preliminary bivariate correlations indicated no site differences and no associations of race or income with any variables in the hypothesized model. Bivariate correlations among all measured variables are presented in Table 2. Moderate strength correlations were found among measures of adult abuse and partner abuse. Measures of mental health problems were all highly intercorrelated in the expected direction, especially depression and anxiety. Indicators of mental health were associated with viral load, HRQOL, and adherence in the expected direction.

Measurement Model

Latent variables were formed for adult abuse and partner abuse factors, with each latent construct comprising the three indices of abuse (physical, sexual, psychological) to capture the full variety of possible abuse experiences. A latent variable was formed for

Table 1
Descriptive Statistics

Measure	*M*	*SD*	Range
Social desirability	5.69	2.48	0–10
CD4 cells/mL	403.28	219.89	8–1329
Adult physical abuse	13.88	14.63	1–60
Adult sexual abuse	2.04	2.63	0–10
Adult psychological abuse	0.98	0.73	0–2
Partner physical abuse	1.50	4.27	0–25
Partner sexual abuse	1.11	3.05	0–20
Partner psychological abuse	4.75	7.14	0–34
Depression	32.14	9.10	20–59
Trait Anxiety	1.93	0.71	1–3.8
PTSD symptoms	0.84	0.73	0–3
Suicidal ideation	0.71	0.88	0–4
HIV medication adherence	0.72	0.29	0–1
Viral Load (log of copies/mL)	0.32	0.21	.17–.78
HRQOL	3.19	0.47	1.24–4.38
ER visits	0.77	1.28	0–7

Note. PTSD = posttraumatic stress disorder; HRQOL = health-related quality of life; ER = emergency room.

Table 2
Correlations Between Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Adult physical abuse	—	.41***	.56***	.24**	.14†	.24**	.14†	.16*	.19†	.22**	.04	.05	−.20**	.23**
2. Adult sexual abuse		—	.29***	.20**	.23**	.13	.11	.19*	.23*	.19*	.03	.03	−.20**	.18*
3. Adult psychological abuse			—	.10	.06	.13	.10	.07	.21*	.23**	−.07	.06	−.10	−.15*
4. Partner physical abuse				—	.49***	.61***	.25***	.34***	.27**	.23**	−.12	.04	−.26**	.19*
5. Partner sexual abuse					—	.46***	.06	.17*	.15	.14†	.10	−.01	−.17*	.10
6. Partner psychological abuse						—	.21**	.20**	.24*	.13†	.01	.05	−.18*	.10
7. Depression							—	.68***	.54***	.49***	−.29**	.10	−.46***	.04
8. Trait Anxiety								—	.53***	.47***	−.27**	.13†	−.45***	.01
9. PTSD symptoms									—	.62***	−.15	.32**	−.53***	.20†
10. Suicidal ideation										—	−.14	.20**	−.44***	.14†
11. Medication adherence											—	−.18*	.15†	−.08
12. Viral load												—	−.26**	.19*
13. HRQOL													—	−.04
14. ER visits														—

Note. PTSD = posttraumatic stress disorder; HRQOL = health-related quality of life; ER = emergency room.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

mental health problems, using the indices of depression, anxiety, PTSD, and suicidal ideation. The latent factors and health-related outcomes were allowed to freely correlate in a preliminary model. The model demonstrated acceptable fit, $\chi^2(60) = 96.50$, $p < .05$, CFI = .94, TLI = .90, RMSEA = .06, SRMR = .06. Factor loadings for the indicators of each latent variable were > .60.

Model Testing

SEM was used to test the hypothesized model (see Figure 1), examining the indirect effects of different forms of abuse on various health-related outcomes through the mediator mental health problems. The following path model was tested: The health-related outcomes of viral load, medication adherence, HRQOL, and ER visits were regressed on mental health problems. Mental health problems were, in turn, regressed on adult abuse and partner abuse. Correlations were estimated between adult and partner abuse and between the health-related outcomes. Finally, we estimated specific paths with covariates based on the literature. Viral load was regressed on time since diagnosis and CD4 count, given the well-documented relations between these factors. Adult abuse and partner abuse were regressed on social desirability, because of the stigmatizing nature of these experiences. Adult abuse and partner abuse were regressed on age. We predicted that age would be negatively associated with partner abuse—because these items assess recent experiences and published rates of partner abuse are higher in younger individuals—and positively associated with adult abuse, given that these items assess abuse across a longer time period (i.e., older men had more years to accrue such experiences).

The hypothesized structural path model shown in Figure 1 (Model A) fit the data well, $\chi^2(118) = 175.80$, $p < .05$, CFI = .92, TLI = .89, RMSEA = .05, SRMR = .07. Inspection of the modification indices revealed potential areas of misfit and suggested the estimation of two additional paths: the direct paths from adult abuse to ER visits and the error covariance between the mental health indictors of depression and anxiety. The addition of these paths makes sense theoretically, given that both physical and sexual abuse could result in acute physical injuries necessarily treated in an ER (Campbell, 2002), and because of the common diagnostic comorbidity of depression and anxiety (e.g., Mineka, Watson, & Clark, 1998). The model was rerun after these two paths were left free to vary. The resulting model (Model B; not shown) demonstrated acceptable fit, $\chi^2(116) = 149.71$, $p = .02$, CFI = .95, TLI = .93, RMSEA = .04, SRMR = .06. Inspection of the modification indices revealed no further areas of misfit. Estimated regression coefficients were examined, paths that did not differ significantly from zero (i.e., path from mental health to ER visits) were fixed to zero, and the model was run again.

The resulting final trimmed model, shown in Figure 2 (Model C), continued to demonstrate acceptable fit, $\chi^2(123) = 157.05$, $p = .02$, CFI = .95, TLI = .94, RMSEA = .04, SRMR = .06. Chi-square difference testing was used to compare Models B and C; Model C was not found to differ significantly from Model B, $\Delta\chi^2(8) = 7.34$, $p = ns$. Because Model C was more parsimonious, it was considered the final model. The final model demonstrated that both adult abuse and partner abuse were positively associated with increased mental health problems, which were in turn associated with lower HRQOL and adherence. Mental health problems, more recent HIV diagnosis, and lower CD4 count were each independently associated with a higher viral load at the most recent clinic visit. Mental health problems were not associated with past-year ER visits, although adult abuse was directly linked with this outcome.

The final model accounted for 13% of the variance in viral load, 41% of the variance in HRQOL, 7% of the variance in adherence, and 9% of the variance in ER visits. The model also accounted for 24% of the variance in the mental health problems latent variable. Following procedures outlined by Bryan, Schmiege, and Broaddus (2007), indirect effects of adult abuse and partner abuse on the health-related outcomes were tested. Results of indirect effects are presented in Table 3. The indirect effects of both adult and partner abuse on viral load through mental health problems reached significance. Likewise, there was a significant indirect effect for adult and partner abuse on HRQOL and on adherence, through mental health problems. Results suggest that exposure to multiple forms

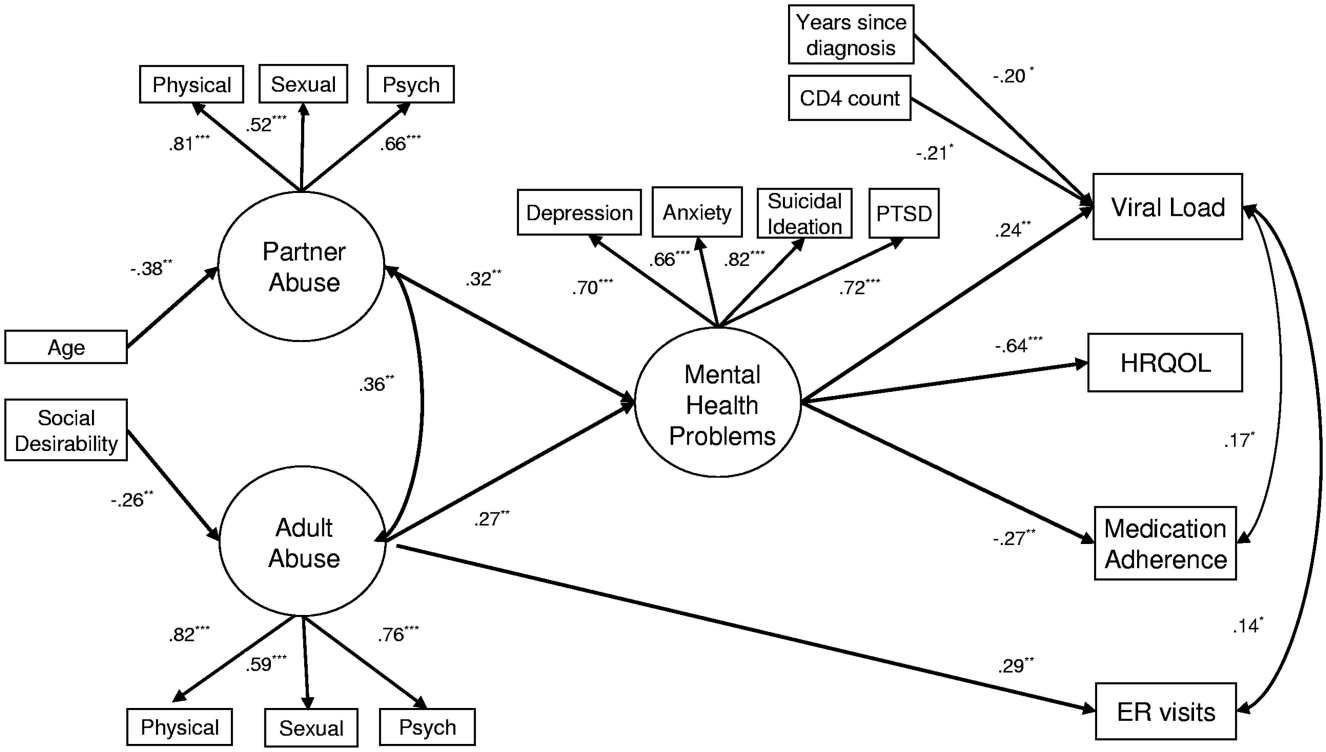

Figure 2. Path model and standardized path coefficients for prediction of health outcomes. Paths estimated in the model that are not pictured in figure: Error covariance between depression and anxiety ($\beta = -.24^{**}$). PTSD = posttraumatic stress disorder; HRQOL = health-related quality of life; ER = emergency room. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

of abuse exerts indirect effects on health behaviors, working through increases in mental health symptomatology.

Finally, to test whether there were direct effects in addition to the indirect effects, we tested an alternative model to Model C wherein the paths from the predictors (adult and partner abuse) to the health-related outcomes (viral load, HRQOL, and adherence) were left free to vary. Although the model demonstrated acceptable fit, $\chi^2(117) = 152.51$, $p = .02$, CFI = .94, TLI = .93, RMSEA = .04, SRMR = .06, none of the individual paths from the predictors to the outcomes were significant, providing additional support that changes in the outcomes are, as hypothesized, a result of the indirect effects through mental health problems.

Discussion

In the first comprehensive study of its kind, we tested a model through which the health-related outcomes of IPV were mediated by mental health problems in a sample of HIV-positive sexual minority men. This is the first report of which we are aware to examine the relations among latent factors representing different types of abuse that include multiple measures of violent physical, sexual, and psychological acts, and their associations with mental health and health-related outcomes. This is also one of the few reports to focus on HIV-positive sexual minority men or even same-sex IPV in general. Although IPV is primarily studied among

Table 3
Indirect Effects of Abuse on Health Outcomes

Indirect pathways	*B*	*SE*	B	Z-score
Viral load				
Effect of partner abuse on viral load via mental health problems	.304	.151	.07	2.02*
Effect of adult abuse on viral load via mental health problems	.110	.055	.08	2.01*
Health-related quality of life (HRQOL)				
Effect of partner abuse on HRQOL via mental health problems	−.281	.107	−.17	−2.63**
Effect of adult abuse on HRQOL via mental health problems	−.102	.036	−.20	−2.79**
Medication adherence				
Effect of partner abuse on medication adherence via mental health problems	.075	.038	−.074	−1.98*
Effect of adult abuse on medication adherence via mental health Problems	.027	.013	−.086	−2.03*

$^{*}p < .05$. $^{**}p < .01$.

women, men (especially sexual minority men) are also frequently victims of abuse, and sexual minority men with HIV may be particularly vulnerable to abuse and susceptible to adverse health outcomes if abused (Greenwood et al., 2002; Relf, 2001).

Through our model testing efforts, we found our hypothesis to be largely supported. In the final trimmed model, greater frequency of adult and partner abuse experiences was associated with more frequent or severe mental health problems. Having more mental health problems was, in turn, related to self-reported HRQOL, self-reported adherence, and chart-extracted viral load. One unexpected direct link emerged during the model testing—that of adult abuse to ER visits, unmediated by mental health problems.

As hypothesized, both adult and partner abuse were independently related to mental health problems while controlling for each other. This finding in itself has important clinical implications in terms of the need to assess for all forms of IPV as vulnerability factors for mental disorders, poorer HIV health, and overuse of health care resources. Frequently, the HIV literature focuses on child abuse leading to HIV risk behaviors (e.g., Arriola, Louden, Doldren, & Fortenberry, 2005), which highlights an important but incomplete picture of IPV-health relations. Mental health problems resulting from abuse experiences may be exacerbated by homophobia or anti-HIV attitudes of the perpetrator (Meyer, 2003). Unfortunately, data indicate that screening for abuse experiences frequently does not occur in health care settings (e.g., Rodriguez, Bauer, McLoughlin, & Grumbach, 1999), despite victim support for screening efforts (Zink, Elder, Jacobson, & Klostermann, 2004). It is possible that provider-focused interventions aimed at increasing both screening efforts and sensitivity to posttrauma sequelae would identify IPV victims and more successfully triage them into mental health care (Whetten et al., 2008).

As expected, participants who endorsed greater frequency and severity of mental health problems were those whose health-related outcomes were poorer. It appears clear that violence victimization and mental health problems influence individuals' perceptions of their physical health and their ability to function independently to meet the demands of multiple roles. The self-report HRQOL measure was highly correlated with virtually all of the predictors and mediators at the bivariate level. The final model was able to explain 41% of the variance in HRQOL, providing a clear message about the potential benefits of treating mental health problems to improve perceptions of physical health as well as functional capabilities. Interventions that focus on increasing social support and self-care behaviors may be able to improve HRQOL (Gielen, McDonnell, Wu, O'Campo, & Faden, 2001).

In addition, the model explained a small but significant amount (7%) of the variance in medication adherence, our health behavior measure. This finding is consistent with other published reports in the adherence literature. Symptoms of both PTSD and depression (Boarts, Sledjeski, Bogart, & Delahanty, 2006) have been associated with poorer adherence, and a study by Mugavero et al. (2006) showed a linear relationship between the number of categories of abuse experienced and the proportion of the sample reporting $<$ 100% adherence. Few published HIV-related interventions address abuse exposure (not just stress), and fewer still report adherence as an outcome. There are some promising findings from a group psychoeducational intervention for female HIV-positive childhood sexual abuse survivors; postintervention improvements were seen in adherence but only for women who attended eight or more sessions (Wyatt et al., 2004). Dose may be crucial in impacting adherence behavior, which has been found to be especially difficult to improve through behavioral interventions, according to recent meta-analyses (e.g., Simoni, Pearson, Pantalone, Crepaz, & Marks, 2006). Research focused on teaching adherence skills in the context of treatment for mental disorders, such as depression, appears promising (Safren et al., 2009). Additional research is needed that integrates mental health and health behavior interventions for PTSD.

Given the innumerable biological and psychological factors that could impact biomarkers of HIV infection, it is notable that our model explains a significant amount of the variance in viral load (13%), especially with controls for time since diagnosis, CD4 count, and adherence. Because viral load is much less stable over time than our other outcome measures, its direct relations with predictor and mediator variables are likely to be based on events that occur relatively close in time to the interview. The accumulation of experiences that chronically up-regulate the sympathetic nervous system may increase cellular vulnerability to infection and diminish immune responses (e.g., Cole, 2008). Although the discrete experiences of abuse exposure provide a less ambiguous link in a potential causal chain than depression, for example (Leserman et al., 2005), future longitudinal studies with frequent assessments are needed to address questions of sequencing and causality of symptom exacerbations and consequent changes in health behaviors and biomarkers.

Nine percent of the variance in past year ER visits was accounted for by the model, predicted directly from adult abuse. Those who reported for emergency care were also those who reported experiencing more frequent IPV by nonpartners. This was the only direct effect that emerged, and it is consistent with the results of several large-scale studies of HIV-positive outpatients (Eisenman et al., 2003; Leserman et al., 2005). Our sample was actively engaged with medical care; the modal participant attended at least one outpatient visit per quarter, the recommendation for HIV-infected patients. We would expect acute care to be more related to physical or sexual (i.e., contact) IPV or to more recent or severe abuse than the indirect effects of mental health. This finding is surprising, though, because the partner abuse measure captures more recent (past year) experiences than the adult abuse measure (since age 18), although it may be that participants experiencing partner abuse were less likely to visit an ER out of fear that providers would discover the abuse. In any event, ER staff should routinely screen for IPV in all HIV patients, irrespective of the presenting problem. No data were collected on the presenting problem of ER visits; however, there were chart-extracted data (not shown) on past year physical injuries, and there were no associations between physical injuries noted by providers and any of the violence measures.

This study incorporates novel design elements that build on the existing model testing literature by addressing several limitations of previously published work. Participants were recruited from two clinic sites and were not selected for having experienced previous abuse, providing for the full range of frequency and severity of predictor variables and examination of the specific contributions of each type of abuse experience. Previously published studies limited their abuse variables to one type (e.g., partner abuse only) or neglected the role of psychological abuse, which exerts unique

effects on mental health, especially PTSD (e.g., Mechanic, Weaver, & Resick, 2008). We measured frequency as a proxy for severity of violence rather than just presence or absence, and we assessed all domains of abuse (physical, sexual, psychological) to capture all potential victimization experiences. To increase comparability and minimize socially desirable responding, we administered commonly used measures with established psychometric properties via CASI. Outcomes included objective data extracted from medical records on viral load, CD4 count, and ER visits to increase validity.

As with any individual study, there are limitations that restrict generalizability. Most significantly, the design is cross-sectional; thus, no causality can be inferred (despite the "causal models" terminology of SEM). The project has a relatively small sample size for SEM and may be underpowered, compromising reliability. Replication in another, larger sample would provide greater assurance of the stability of these relations. The sample consists of patients engaged with medical care; some research suggests that such patients are qualitatively and quantitatively different than those who are not in care, which further limits generalizability (Cunningham et al., 2006). Critics find behaviorally based IPV measures undesirable because they neglect the context, function, and chronology of IPV experiences. Most measures were self-reported and thus are subject to participant misunderstanding or biased responding, although social desirability was retained in the model as a covariate on the abuse variables. Some important questions were not asked, including the length of time on antiretroviral therapy and the relationship of perpetrators to victims in the adult abuse questionnaire. The latter omission creates a potential confound between the adult and partner abuse factors, as the adult abuse questions were presented first. Future models with more statistical power should incorporate child abuse as a predictor, as well as additional mediators such as substance use, HIV stigma, and other HIV biomarkers. As it unfortunately falls outside the scope of this article, future investigators may wish to address the issue of whether PTSD alone or mental health problems more generally best account for IPV–health relations (e.g., Boarts et al., 2006).

As discussed above, provider-based interventions to increase IPV detection and treatment are needed. However, interventions to increase provider skill at identifying and triaging patients to mental health services more generally are also likely to be helpful. Results from a large-scale study of HIV-positive clinic patients indicate that more than one third of individuals who required mental health intervention were not receiving it (Taylor, Burnam, Sherbourne, Andersen, & Cunningham, 2004), and other work has shown that providing such services to HIV-positive individuals with mental disorders decreased healthcare costs and increased health-related outcomes (Whetten et al., 2006). Changes are needed to more accurately portray to traditional medical providers the impact of psychosocial variables on disease processes (Gore-Felton & Koopman, 2008). Increased training and education or implementation of policy or practice guidelines appear to be needed to reinforce necessary attention to behavioral factors.

In light of these data and our own findings, it seems warranted to focus on integrating psychosocial interventions for patients into primary HIV care settings, especially those that address lifetime abuse exposure, negative affect, and anxiety or PTSD. What kinds of interventions are needed? The literature encourages a focus on active coping training as well as efforts to increase self-efficacy, process traumatic experiences, find or maintain meaning in life, connect with spiritual beliefs, and remain generally engaged with life (e.g., Ironson & Hayward, 2008). Few interventions for HIV-positive IPV victims exist except those focused on childhood sexual abuse (e.g., Wyatt et al., 2004). In contrast, there have been many published interventions on stress management more generally, tested in a variety of populations with different formats. A recent integrative review (Carrico & Antoni, 2008) and meta-analysis (Scott-Sheldon et al., 2008) each found strong support for postintervention improvements in stress-related and psychosocial factors. However, there is disagreement about the extent to which the interventions were able to impact immunologic and hormonal markers. For the studies in which the interventions were unable to change the psychosocial factors, no changes in biomarkers occurred, highlighting the significance of mental health factors in the relation between stress and health. Clearly, this is an area ripe for future research building upon the weaknesses of the extent literature (e.g., small sample sizes, short follow-up).

In conclusion, the results of this study provide strong support for the contribution of violence exposure and mental health problems to poor health-related outcomes among HIV-positive sexual minority men. Clinical practice implications include provision of more intensive mental health services to patients in order to contain costs associated with physical health problems, which are potentially exacerbated by psychological distress and an IPV history. Also, provider interventions that increase identification of abuse and mental health problems may be needed. Given their social and financial problems, many HIV-positive individuals clearly need referral to social services. However, rather than providing supportive counseling or case management alone, HIV care settings may also wish to offer evidence-based mental health treatments that target specific disorders or symptom clusters. Investigators are encouraged to test and disseminate such interventions in HIV care settings, especially those that combine traditional evidence-based approaches to mental disorders with a specific focus on relevant health-promotion behaviors (Safren et al., 2009).

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