Co-Occurring Psychosocial Problems and HIV Risk Among Women Attending Drinking Venues in a South African Township: A Syndemic Approach

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Abstract

Background—In South Africa, women comprise the majority of HIV infections. Syndemics, or co-occurring epidemics and risk factors, have been applied to understanding HIV risk among marginalized groups.

Purpose—To apply the syndemic framework to examine psychosocial problems that co-occur among women attending drinking venues in South Africa, and to test how the co-occurrence of these problems may exacerbate risk for HIV infection.

Method—560 women from a Cape Town township provided data on multiple psychosocial problems, including food insufficiency, depression, abuse experiences, problem drinking, and sexual behaviors.

Results—Bivariate associations among the syndemic factors showed a high degree of co-occurrence and regression analyses showed an additive effect of psychosocial problems on HIV risk behaviors.

Conclusions—These results demonstrate the utility of a syndemic framework to understand co-occurring psychosocial problems among women in South Africa. HIV prevention interventions should consider the compounding effects of psychosocial problems among women.

Keywords

HIV risk; sexual risk behavior; syndemics; mental health; abuse; alcohol

More than any country in the world, South Africa has the highest number of people living with HIV/AIDS, with an estimated 5.6 million people in 2009. In Cape Town, South Africa's second largest city, HIV prevalence is 13%, reaching as high as 25% in the city's impoverished urban townships and informal settlements (1). Women comprise the majority of HIV infections in this country (2), making it imperative to examine the factors that contribute to women's HIV risk behavior, particularly in high-risk, impoverished areas. South Africa is a resource poor country, where substantial economic, social, and health disparities exist. Therefore, it would not be surprising to find that women in this country

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experience a great number of different psychosocial problems. In the past decade, researchers have identified the synergistic co-occurrence of multiple epidemics and risk factors that can develop in conditions of such disparities, a phenomenon known as a syndemic (3,4).

In contrast to an epidemic, which characterizes an increasing prevalence of a single disease at any given point in time, a syndemic occurs when two or more epidemics co-occur, interact, and contribute to excess burden of disease in a population (3). The syndemic framework has been applied to understanding HIV risk among marginalized groups in the United States, including urban men who have sex with men (5,6,7), Latinas (8), Hispanics (9), and women (10). In U.S.-based research, there is consistent evidence that co-occurring psychosocial problems like childhood sexual abuse, depression, and substance use compound the risk of HIV transmission. For example, among men who have sex with men in New York City, co-occurrence of sexual compulsivity, depression, childhood sexual abuse, intimate partner violence, and drug use had an additive effect on contracting HIV infection and high-risk sexual behavior (6). We applied the syndemic framework in the current study to examine HIV sexual risk behavior among women in a township near Cape Town, South Africa. Specifically, we examined whether psychosocial problems co-occur among women in a high-risk setting, and whether there is an additive effect of psychosocial problems on HIV transmission risk.

Several factors emerge as potential elements of a syndemic that may synergistically contribute to HIV risk behavior among South African women. Compared to men, women in South Africa are more likely to experience food insufficiency and hunger (11,12). Research has shown that food insufficiency is associated with high-risk sexual behavior, including trading sex to meet survival needs (13,14) and inconsistent condom use (15). The experience of violence from an intimate partner has also been shown to be another important determinant of HIV transmission risk among women (16,17), along with poor mental health problems (i.e., depression and post-traumatic stress disorder) (18,19), substance use (20), and childhood abuse (21). Not only do these psychosocial problems independently contribute to HIV risk behavior and infection, they also appear to co-occur among marginalized groups (22). The co-occurrence of these factors may have a dose-response relationship with HIV infection by additively contributing to sexual risk.

Syndemics may be particularly prevalent in high-risk environments. In South Africa, alcohol- drinking establishments are settings that contribute to HIV risk (23,24). South African drinkers consume an average of 20 liters of alcohol per year, a rate among the highest in the world (25). Furthermore, alcohol use has been identified as one of the most prevalent behaviors associated with sexual risk for HIV (23, 26). But apart from drinking behavior, drinking environments are recognized as playing a significant role in the relationship between alcohol and HIV risk (26). A study on sexual networks in South Africa found that 94% of the places where people meet sex partners are alcohol-serving venues, including taverns and informal venues known as shebeens (27). Given the role of alcohol consumption and drinking environments in influencing HIV transmission risk in South Africa, alcohol problems should emerge as an important syndemic factor in this area. Further, it is essential to understand syndemics in high-risk settings in order to inform multi-faceted and targeted HIV prevention interventions.

In this study, we examined different psychosocial problems as syndemic factors that may co-occur and contribute to HIV risk among South African women. We recruited women from alcohol drinking venues in a Cape Town township for this study. We hypothesized that food insufficiency, depression, post-traumatic stress, childhood abuse, adult physical and sexual violence, drug use, and problem drinking would be prevalent and would co-occur

among our sample of women. Based on the syndemic framework, we hypothesized that these psychosocial problems would be associated with higher sexual risk behavior by having an additive effect. To our knowledge, this is the first study to examine a syndemic approach to HIV risks among women in this setting.

METHOD

Design and Participants

This study uses baseline data from a longitudinal study following a cohort of women attending taverns and shebeens in a peri-urban township in Cape Town, South Africa.

Setting

The township is located within 20 kilometers of Cape Town's central business district and consists of both people of mixed race (i.e., Coloureds) and Black Africans. A relatively new township, the community was established in 1990 and was one of the first townships in South Africa to racially integrate. Large numbers of indigenous Black Africans started settling in and around the township during the 1990's after government policies of racial segregation during Apartheid ended. The township sampled for this study therefore includes a diverse group of women residing within one South African community.

Venue Selection

Using an adaptation of the Priorities for Local AIDS Control Efforts (PLACE) community mapping methodology (28), we located and defined alcohol-serving establishments in the township for the current study. Alcohol-serving venues were systematically identified by approaching a total of 609 members of the community at public places such as bus stands and markets, and asking them to identify places where people go to drink alcohol. Venues were eligible if they had space for patrons to sit and drink, reported >50 unique patrons per week, had >10% female patrons, and were willing to have the research team visit periodically over the course of a year.

Recruitment

Participants were recruited from the 12 study venues. Following a week of regular observations in the venues, during which time research staff gained familiarity with the setting and patrons, the staff invited female patrons in the venue to be part of a cohort study to examine drinking and sexual behavior over the course of one year. Women were eligible to participate if they drank in the venue and lived in the township. The legal drinking age in South Africa is 18; underage women were not allowed to participate in this study. A total of 604 women were approached to participate and given an appointment card to come to the study office to provide informed consent and complete a baseline assessment. When possible, the research staff provided the participants a reminder of their initial appointment and transportation to the study office. Almost all (560, 92.7%) came for the initial appointment and enrolled in the study.

Procedure

Assessment measures were administered at a community-based research site located within a community center in the township. All assessments were administered using audio computer-assisted self-interview available in English, Xhosa, and Afrikaans, the three primary languages spoken by residents of the township. Research has shown that audio computer-assisted self-interview procedures yield reliable responses in sexual behavior interviews (29,30). Participants were given a grocery store voucher (150 Rand, or approximately 20USD) in exchange for their participation.

Measures

Measures were adapted from previous research conducted in South Africa. All of the measures were translated and back-translated to produce parallel forms in the three languages of administration.

Demographics—Participants were asked to report age, education, ethnicity, and employment.

Food Insufficiency—We assessed food insufficiency using items we adapted from the Household Food Insecurity Access Scale (31). Eight items assessed food anxiety, meal quality, and food insufficiency in the previous month. Example items include, "In the past month, I could not feed my family;" and "In the past month, I or other adults in the household cut the size of our meals because there wasn't enough money for food." Responses were given on a 4 point scale with 0 = never, 1 = once or twice a month, 2 = every week, 3 = every day (α = .90). We coded each item as 0 = never and 1 = once or twice a week to everyday. Then, we summed the items (range of 0 to 8). Mean food insufficiency was 5.57 (SD=2.61), and the median was 6. Thus, more than half of the sample scored at the highest end of this measure. For our analysis purposes, we did a median split and used this dichotomous screener of high food insufficiency in our analyses (0 = at or below median, 1 = above median).

Depression—We assessed depression with the Center for Epidemiological Studies-Depression scale. This scale includes 20 items asking participants to report on depressive symptomatology in the past week (32). Example items include, "During the past week my sleep was restless;" and "During the past week I could not get going." Responses were measured on a 4-point Likert scale from 0= 0 days, 1= 1–2 days, 2= 3–4 days, and 3= 5–7 days. Items were summed to create a continuous depression score (α=0.90). Participants were screened as positive for depression if their score was at or above 16. This cut-off score suggests symptoms of depression in the general population (32) and has been used by researchers in South Africa (33). We used this screening variable in our analyses (0 = not a positive screen for depression, 1 = positive screen).

Post-traumatic stress disorder—Post-traumatic stress symptomatology was measured using the Post-Traumatic Stress Disorder Checklist-Civilian version a 17-item screener used to identify symptoms in the past month (34). Items asked whether the respondent had experienced difficulties related to a traumatic experience. Example items include, "Did you begin to feel more isolated and distant from other people?" and "Did you become jumpy or get easily startled by ordinary noises or movements?" Responses were measured on a 5-point Likert scale with 1=not at all, 2=a little bit, 3=moderately, 4=quite a bit, and 5=extremely. Items were summed with a range of scores from 17–85 (α=0.95). Consistent with epidemiological evidence, participants who scored above 50 were considered to have a positive screen for post-traumatic stress disorder (34). We used this screening variable in our analyses (0 = not a positive screen for post-traumatic stress disorder, 1 = positive screen).

Childhood abuse—We assessed childhood trauma using items we adapted from the Childhood Trauma Questionnaire (35,36). The Childhood Trauma Questionnaire assesses abuse experiences in childhood, including emotional abuse or neglect, physical abuse, and sexual abuse. Specifically, participants responded yes or no to whether they experienced any of the following six types of abuse while they were young (i.e., under 18 years old): "Someone tried to touch me in a sexual way or made me touch them;" "Threatened me unless I did something sexual;" "Forced me to have sexual intercourse;" "Hit me so hard that it left me with bruises or marks;" "People in my family called me stupid, lazy, or ugly;"

and "My parents were too drunk or high to take care of me." We coded childhood abuse as at least one episode versus none. We used this dichotomous measure in our analyses (0 = no childhood abuse episodes, 1 = one or more childhood abuse episodes).

Adult Physical and Sexual Violence—We assessed both physical and sexual violence experienced as an adult. Women's experience of physical and sexual abuse was assessed using items from the Revised Conflict Tactics Scale (37). Specifically, we asked participants to respond 'yes' or 'no' to whether they experienced the following from a sex partner: "kicked, bit, or punched you," "beat you," "hit you with something," and "used a knife or gun on you." Women's experience of sexual abuse was assessed using some items from the sexual coercion subscale of the Conflict Tactics Scale. Specifically, to assess experiences of sexual coercion, we asked participants if someone had ever: "used force to make you have sex," "made you have anal sex when you did not want to," "made you use drugs or get drunk just so they could force you to have sex," and "forced you to have sex with multiple men on one occasion, that is, have you been gang raped?" Participants responded 'yes' or 'no' to each item. All relationship abuse items were framed to ask about lifetime history of abuse. We coded violence into at least one episode of physical or sexual violence versus none. We used this dichotomous measure in our analyses (i.e., 0 = no adult abuse episodes, 1 = one or more adult abuse episodes).

Drug Use—We asked participants whether they have ever used each of the following drugs: marijuana (*dagga*), sniffers, methamphetamine (*tik*), injection drugs, and any other drug. Participants responded yes or no to each item. We coded drug use as 0 = never used any drug, 1 = used at least one drug.

Drinking Problems—We assessed alcohol problems with both the Alcohol Use Disorders Identification Test and and CAGE questionnaire, the latter stands for "Cut," "Annoyed," "Guilty," and "Eye" which are keywords from each of the four items in the scale. The Alcohol Use Disorders Identification Test is a 10-item self-report instrument that gathers information on quantity and frequency of alcohol use and was designed to identify individuals for whom the use of alcohol places them at risk for developing alcohol problems (38,39). Example items include, "How many drinks containing alcohol do you have on a typical day when you are drinking?" to which participants responded on a 5 point scale with 0 = 1 or 2, 1= 3 or 4, 2 = 5 or 6, 3 = 7 to 9, and 4 = 10 or more, and "How often do you have six of more drinks on one occasion?" to which participants responded 0 = never, 1 = less than monthly, 2 = monthly, 3 = weekly, or 4 = daily or almost daily. Scores range from 0 to 40 (α=0.80), and scores of 8 or above identify individuals who may be at risk for alcohol problems (38). The Alcohol Use Disorders Identification Test is a widely used tool and has been used in South Africa (40).

Participants were asked to also respond to the four-item CAGE questionnaire (41). This scale is specifically designed to screen for alcohol abuse and dependence. The specific items, with yes/no responses, were: "Have you ever felt that you should cut down on your drinking?" "Have people annoyed you by criticizing your drinking?" "Have you ever felt bad or guilty about your drinking?" and "Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?" Participants were coded as problem drinkers if they responded "yes" to at least two items. Participants were scored as having drinking problems if they screened positive on either or both the Alcohol Use Disorders Identification Test and CAGE.

HIV Sexual Risk Behavior—We assessed risk behavior as percent unprotected sex acts in the previous four months. Participants used an open-response format to report the number

of the following during the past four months: times of unprotected vaginal sex (i.e., without condoms), protected vaginal sex, unprotected anal sex, and protected anal sex. We created the variable "percent unprotected sex acts" by dividing total number of condom unprotected vaginal and anal intercourse by total protected and unprotected vaginal and anal acts. For this variable, only women who reported sexual intercourse in the previous four months were given a score.

HIV/Sexually Transmitted Infection History—Participants were asked if they have ever been diagnosed with a sexually transmitted infection and responded Yes, No, or Refuse to Answer. Participants were also asked whether they had ever been tested for HIV, and if so, the results of their most recent HIV test. Response options were HIV Positive, HIV Negative, Don't Know, or Refuse to Answer. Participants were coded as having a positive sexually transmitted infection and/or HIV diagnosis if they responded "Yes" to being diagnosed with a sexually transmitted infection and/or if they responded "HIV Positive".

Analyses

Consistent with previous research examining the presence of syndemics (6), we conducted analyses in 4 stages. First, we examined the prevalence of each psychosocial problem. Second, we examined the bivariate relationships among the seven psychosocial problems to test our hypothesis that the psychosocial problems clustered together. Because all of the problems were dichotomously coded, we calculated bivariate odds ratios for each pair of variables (5). We predicted that all of the associations would be significant and positive. We also examined associations between each of the psychosocial problems with HIV sexual risk behavior and with HIV/sexually transmitted infection prevalence. Third, we used a set of multivariate logistic regression models to examine factors associated with higher levels of food insufficiency, depression, post-traumatic stress disorder, childhood abuse, adult physical and sexual violence, drug use, and problem drinking (7). Each of the models used the same set of demographic and psychosocial independent variables. We ran the same logistic model to predict each of the psychosocial problems and to predict HIV/sexually transmitted infection diagnosis, and a linear regression model for HIV sexual risk behavior. For each model predicting a specific problem (e.g., post-traumatic stress disorder), we excluded measures for that problem in the model (e.g., post-traumatic stress disorder). These analyses were intended to be exploratory and point to the demographic and psychosocial problems that uniquely contribute to a given syndemic factor. Lastly, we tested our hypothesis that there is an additive effect of psychosocial problems on HIV risk. We did this by computing the total number of psychosocial problems experienced by each participant (0 to 7 problems). We then conducted a linear regression model to test the relationship between number of psychosocial problems and HIV sexual risk behavior and between number of psychosocial problems and history of HIV/sexually transmitted infection.

RESULTS

A total of 560 women participated in this study. Mean age was 33.91 (SD=11.65). Also, 47% (n=263) of the women received less than standard grade 7 in education, and 61.3% (n=343) of the sample was Coloured, whereas 36.4% (n=204) were Black African. There was a high prevalence of psychosocial problems in this sample: 399 (71.3%) of women screened positive for depression, 110 (19.6%) screened positive for post-traumatic stress disorder, 247 (44.1%) had a history of childhood abuse, 315 (56.3%) had a lifetime history of adult physical or sexual violence, 194 (34.6%) reported a lifetime use of at least one type of drug, and 469 (83.8%) reported having problems with alcohol. A total of 58 (10.4%) women reported bring HIV positive, and 89 (15.9%) reported being diagnosed with a sexually transmitted infection at least once in their life.

Bivariate Associations among Syndemic Factors

Table 1 presents bivariate associations (using odds ratios) among the psychosocial problems. The lower panel of the table also presents associations between the psychosocial problems with sexual risk behavior and with HIV/sexually transmitted infection diagnosis. There was a high degree of clustering of psychosocial problems in this sample; of the 21 odds ratios calculated between the syndemic factors, 18 were significant and positive. For example, women who experienced high food insufficiency had 4.64 higher odds of having depressive symptoms ($p < .001$), 4.46 higher odds of having post-traumatic stress symptoms ($p < .001$), 1.94 higher odds of experiencing childhood abuse ($p < .001$), 1.72 higher odds of experiencing adult violence ($p < .01$), and 1.56 marginally higher odds of being a problem drinker ($p < .10$).

HIV sexual risk behavior was associated with all 7 psychosocial problems. Women who reported a higher percentage of unprotected sex acts in the past month had 1.88 higher odds of experiencing greater food insufficiency ($p < .01$), 2.44 significantly higher odds of being depressed ($p < .01$), 2.10 higher odds of having post-traumatic stress disorder symptoms ($p < .05$), 2.04 higher odds of experiencing childhood abuse ($p < .01$), 1.69 higher odds of experiencing partner violence ($p < .05$), 1.92 higher odds of using drugs ($p < .05$), and 2.32 higher odds of having problems with alcohol ($p < .05$).

Having been diagnosed with a sexually transmitted infection and/or HIV was associated with 3 psychosocial problems. Women who reported ever being diagnosed with a sexually transmitted infection and/or who reported being HIV positive had 1.54 higher odds of experiencing childhood abuse ($p < .05$) and 1.66 higher odds of experiencing adult violence ($p < .05$). HIV/sexually transmitted infection diagnosis was also associated with food insufficiency and sexual risk behavior, but in a negative direction. That is, those who reported having HIV/sexually transmitted infection had 0.66 *lower* odds of experiencing food insufficiency ($p < .05$) and had *lower* odds of reporting unprotected sex in the past four months (OR=0.32, $p < .001$)

Multivariate Regression Analyses

Table 2 shows the multivariate logistic regression models examining predictors of the separate psychosocial problems of food insufficiency, depression, post-traumatic stress disorder, childhood abuse, adult violence, drug use, and problem drinking. Each column represents a single and independent regression model. As seen from Table 1, the problems were independently related to one another. Table 2 shows which specific syndemic factors uniquely and significantly relate to a given problem. For example, older age, greater food insufficiency, a positive screen for depressive symptoms, experience with childhood abuse, and a positive HIV and/or sexually transmitted infection diagnosis were related to a higher likelihood of experiencing post traumatic stress. In another example, in the model predicting adult violence, only experience with childhood abuse was associated with a higher likelihood of experiencing violence in adulthood after controlling for demographics and the other psychosocial problems.

We also report a multivariate linear regression model predicting sexual risk behavior, and a multivariate logistic regression model predicting HIV/sexually transmitted infection diagnosis. In the model predicting percent unprotected intercourse, lower education, being employed, being Coloured as opposed to Black, and having problems with alcohol were associated with higher sexual risk behavior. Thus, among our sample of women recruited from high-risk drinking venues, after controlling for the other psychosocial problems, only alcohol problems was associated with HIV risk behavior. In the model predicting diagnosis with a sexually transmitted infection and/or HIV, being Black as opposed to Coloured and

reporting lower food insufficiency were associated with a greater likelihood of reporting a diagnosis.

Additive Effects of Psychosocial Problems

We examined additive effects of the 7 psychosocial problems on HIV sexual risk behavior. We computed a count score for number of psychosocial problems (out of 7) reported by each participant. 2.9% (n=16) of participants reported experiencing none of the problems, 11.1% (n=62) reported 1 problem, 16.4% (n=92) reported 2 problems, 18.2% (n=102) reported 3 problems, another 18.2% (n=102) reported 4 problems, 16.3% (n=91) reported 5 problems, 13.0% (n=73) reported 6 problems, and 2.9% (n=22) reported having all 7 psychosocial problems. Among the women who engaged in sexual intercourse in the past four months (n=376), greater numbers of psychosocial problems were significantly and positively associated with higher sexual risk behavior (Figure 1). We conducted a test for linearity and found that this relationship was positive and linear $F(1, 368) = 21.08$, $p < .001$, or conversely a test for deviation from nonlinearity was nonsignificant $F(6, 368) = 0.64$, $p = .70$. As seen in Figure 1, among those who reported zero psychosocial problems, the mean percent unprotected intercourse was 24.4%, among those who reported 4 psychosocial problems the mean was 56.3%, and among those who reported 7 out of the 7 psychosocial problems, the mean was 72.6%. We regressed number of psychosocial problems on percent unprotected acts and indeed, more psychosocial problems were predictive of higher sexual risk behavior ($\beta = .23$, $t = 4.60$, $p < .001$). When controlling for age ($\beta = -.01$, $p = .85$), education ($\beta = -.13$, $p = .02$), race ($\beta = .44$, $p < .001$) and employment ($\beta = .10$, $p = .03$), the number of psychosocial problems remained a significant, although less strong predictor of sexual risk behavior ($\beta = .11$, $p = .025$).

We also examined the association between number of psychosocial problems and HIV/ sexually transmitted infection prevalence (Figure 2). The Mantel-Haenszel χ^2 test for linear-by-linear association was marginally significant (3.33, $p = .068$), suggesting a trend for higher number of psychosocial problems to be positively associated with HIV/sexually transmitted infection prevalence.

DISCUSSION

The purpose of the present study was to examine co-occurring psychosocial problems among women in a township in Cape Town, South Africa, and to test a syndemic model of these psychosocial problems being related to HIV sexual risk behavior and HIV/sexually transmitted infection status. We examined seven different problems in this study: food insufficiency, depression, post-traumatic stress disorder, childhood abuse, adult violence, drug use, and alcohol problems. Results showed a high degree of co-occurrence of these psychosocial problems; 18 of the 21 bivariate associations were significant and positive. We also found an additive effect of psychosocial problems on HIV sexual risk behavior, and results supported a trending effect on HIV/sexually transmitted infection status. Among recently sexually active women in our sample, those who reported more psychosocial problems had a greater proportion of unprotected intercourse in the past four months. Further, regardless of sexual activity, those who reported more psychosocial problems were marginally more likely to have been diagnosed with a sexually transmitted infection and/or HIV. These findings are consistent with recent research on syndemics and HIV among men who have sex with men and among women in sexually transmitted infection clinics in the United States (5–7,22).

The presence of syndemics has been well established in the United States. The current study extends our understanding of syndemics to illustrate the existence of a syndemic among women in South Africa that potentially contributes to HIV transmission. We were able to

examine profiles of women who have specific psychosocial problems. These analyses helped shed light on the important demographic and psychosocial predictors that may uniquely contribute to a specific problem. Employment status did not emerge as a demographic risk factor for any of the psychosocial problems, whereas older age was associated with higher food insufficiency and a greater likelihood of post-traumatic stress disorder. Further, lower education was associated with a higher likelihood of depression and drug problems. After controlling for demographics and the other psychosocial problems, depression was associated with food insufficiency, post-traumatic stress disorder, childhood abuse, and alcohol problems. This suggests that women in our sample who have experienced childhood abuse were more likely to experience depression and post-traumatic stress disorder symptoms, and may be using alcohol in an effort to cope with their mental problems. Further, a downward spiral may be operating such that women with such problems may be less able to meet their basic survival needs (i.e., experience hunger and food insufficiency), which in turn may work to exacerbate their psychosocial problems. In addition, consistent with previous research, experiencing childhood abuse was associated with a greater likelihood of also experiencing relationship abuse (42), and both childhood abuse and post-traumatic stress disorder were positively associated with being diagnosed with a sexually transmitted infection and/or HIV. Altogether, these results suggest that HIV prevention programs should work to address a broad spectrum of psychosocial problems, including abuse, mental health problems, and substance use. These problems not only co-occur, they may also operate to exacerbate one another and have a compounding effect on HIV infection risk.

Results of this study showed that among recently sexually active women, lower education and being Coloured as opposed to Black was associated with higher sexual risk behavior. However, Blacks were more likely to report having been diagnosed with a sexually transmitted infection and/or HIV. Future research should examine the social and cultural factors that may help to explain these racial differences. Results also showed that those who experienced a greater number of psychosocial problems also exhibited higher sexual risk behavior. This dose-response relationship is a key aspect of a syndemic. Syndemic factors like the ones studied here not only co-occur, but they often interact to contribute to disease transmission (6). Having to live with numerous health and psychosocial problems like depression, post traumatic stress, childhood and adult violence, and substance use likely makes it more difficult for a woman to meet her basic needs, let alone access condoms and negotiate safer sex practices with a partner. This challenge may be exacerbated among the women in our sample who all patronize high risk-venues in an impoverished township in Cape Town, South Africa, placing them among the highest at-risk women for HIV infection anywhere in the world. Further, poverty may exacerbate the likelihood that women experience more and serious psychosocial problems. Conceptually, poverty may be the glue that holds the syndemic together. Finally, the HIV prevalence in this sample was 10%, lower than the national and local estimates. This may be due in part to potentially low HIV testing rates in this sample. Indeed, poor economic status and the same psychosocial problems that appear to increase risk of HIV may also serve as barriers to HIV testing.

The results of the present study should be interpreted in light of its limitations. Given the potentially sensitive or stigmatizing questions that were included in the survey, self-report responses could have had the potential to be biased by social desirability. Also, the use of dichotomous measures limits conclusions about the magnitude of the relationships between the psychosocial problems and HIV risk. Finally, our sample consisted of South African women recruited from drinking venues in a single township in Cape Town. We have no knowledge about whether the findings are generalizable to the larger population. Thus, future research should examine how syndemics feed into HIV risk using other samples and in other socioenvironmental settings.

In conclusion, this study demonstrates the existence of a syndemic among women attending drinking venues in Cape Town, South Africa. Women living in the impoverished township we studied experienced a great number of psychosocial problems, and these problems had a compounding effect on HIV risk behavior. To our knowledge, this is the first study to examine a syndemic among women in South Africa, the country with the highest number of people living with HIV/AIDS. As women make up the majority of new infections in South Africa, HIV prevention interventions that are directed towards them have typically focused on gender and economic issues. For example, the IMAGE (Intervention with Microfinance for AIDS and Gender Equity) study focused on raising South African women's empowerment and economic independence. While the intervention significantly reduced rates of intimate partner violence, it did not significantly influence sexual risk behavior (43). Findings from the current study suggest that syndemics, or the synergistic interplay between psychosocial problems should be acknowledged and addressed in these interventions. Specifically, interventions that are multi-faceted are needed to curb the epidemic and reduce the number of new HIV infections in this country. Ideally, these interventions should focus on individual level (e.g., mental health), relationship level (e.g., gender-based violence), as well as structural level (e.g., economic, educational, socio-cultural support for women) factors to reduce risk. HIV prevention interventions would have more success in reducing transmission rates by addressing a broad array of psychosocial problems at multiple levels and across different domains of women's lives (44,45).

Acknowledgments

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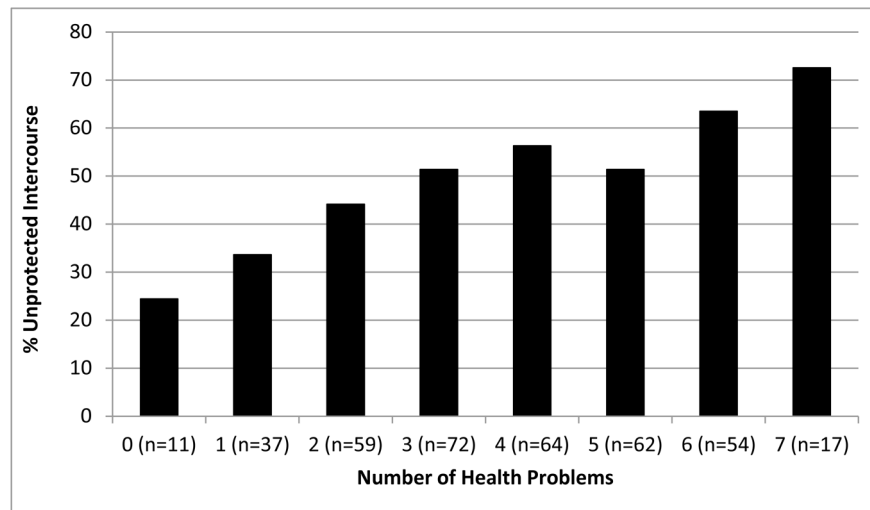
Figure 1.
Mean percentage of unprotected sex by number of psychosocial problems among sexually active women (n=376).
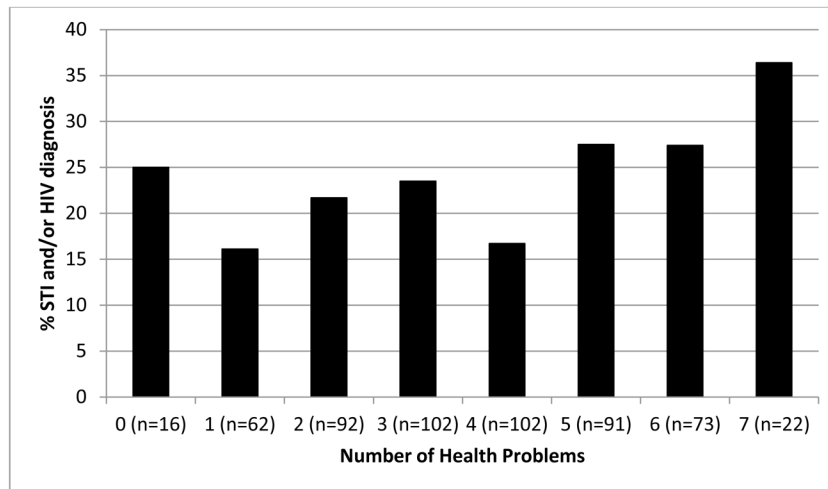
Figure 2.
Percent of women with a positive HIV and/or sexually transmitted infection (STI) diagnosis
by number of psychosocial problems (n=560)

Table 1

Bivariate associations among psychosocial problems and HIV sexual risk behavior (n=560)

	Food Insufficiency	Depression	PTSD	Childhood Abuse	Adult Violence	Drug Use	Alcohol Problems	HIV Sexual Risk Behavior[a]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Food Insufficiency	--							
Depression	4.64 *** (3.06, 7.02)	--						
PTSD	4.46 *** (2.77, 7.20)	29.51 *** (7.19, 121.09)	--					
Childhood Abuse	1.94 *** (1.38, 2.71)	3.72 *** (2.46, 5.65)	5.59 *** (3.52, 9.19)	--				
Adult Violence	1.72 ** (1.22, 2.40)	2.77 *** (1.90, 4.04)	2.73 *** (1.71, 4.35)	6.03 *** (4.12, 8.83)	--			
Drug Use	1.19 (0.84, 1.68)	2.08 *** (1.37, 3.15)	1.54 * (1.00, 2.36)	2.58 *** (1.81, 3.69)	2.36 *** (1.64, 3.42)	--		
Alcohol Problems	1.56 † (0.99, 2.47)	2.02 ** (1.27, 3.21)	2.50 ** (1.21, 5.15)	1.56 † (0.98, 2.49)	2.24 *** (1.42, 3.55)	3.43 *** (1.88, 6.24)	--	
HIV Sexual Risk Behavior[a]	1.88 ** (1.14, 3.10)	2.44 ** (1.40, 4.25)	2.10 * (1.12, 3.94)	2.04 ** (1.23, 3.37)	1.69 * (1.02, 2.80)	1.92 * (1.14, 3.23)	2.32 * (1.14, 4.72)	--
HIV/STI Diagnosis	0.66 * (0.47, 0.93)	1.28 (0.81, 2.00)	1.42 (0.89, 2.29)	1.54 * (1.04, 2.29)	1.66 * (1.10, 2.51)	1.18 (0.78, 1.77)	1.47 (0.82, 2.63)	0.32 *** (0.18, 0.57)

Notes:

[a] among sexually active women; PTSD=Post-Traumatic Stress Disorder; OR=odds ratio; CI=confidence interval; STI=sexually transmitted infection;

† p<.10;

* p<.05,

** p<.01,

*** p<.001.

Table 2

Multivariate regressions among intersecting psychosocial problems (n=560)

Independent Variables	Food Insufficiency AOR (95% CI)	Depression AOR (95% CI)	PTSD AOR (95% CI)	Childhood Abuse AOR (95% CI)	Adult Violence AOR (95% CI)	Drug Use AOR (95% CI)	Alcohol Problems AOR (95% CI)	HIV Sexual Risk Behavior[a], β (95% CI)	HIV/STI Diagnosis AOR (95% CI)
				Dependent Variables					
Age	1.06 *** (1.03, 1.08)	1.00 (0.97, 1.03)	1.05 ** (1.02, 1.08)	0.99 (0.96, 1.01)	0.98 (0.95, 1.01)	0.93 *** (0.90, 0.96)	1.01 (0.97, 1.04)	0.02 (−0.99, 0.01)	1.008 (0.98, 1.04)
Education	1.07 (0.83, 1.22)	0.75 *** (0.64, 0.89)	0.96 (0.82, 1.13)	0.94 (0.82, 1.08)	1.08 (0.94, 1.24)	0.90 † (0.79, 1.02)	0.96 (0.80, 1.16)	−0.12 * (−0.02, 0.00)	0.897 (0.77, 1.04)
Race[b] (Coloured)	1.36 (0.74, 2.49)	0.73 (0.37, 1.46)	1.31 (0.57, 3.00)	1.61 (0.84, 3.08)	1.04 (0.56, 1.90)	2.08 * (1.13, 3.83)	0.46 † (0.21, 1.02)	0.42 *** (0.27, 0.44)	0.188 *** (0.10, 0.36)
Employed	0.65 (0.38, 1.11)	0.93 (0.51, 1.70)	0.84 (0.41, 1.71)	0.90 (0.51, 1.60)	0.99 (0.57, 1.71)	0.98 (0.57, 1.68)	1.40 (0.67, 2.93)	0.08 † (−0.01, 0.16)	0.733 (0.40, 1.34)
Food Insufficiency	--	3.11 *** (1.72, 5.62)	2.10 * (1.06, 4.15)	1.12 (0.64, 1.97)	1.56 (0.92, 2.65)	1.51 (0.89, 2.55)	1.31 (0.65, 2.64)	−0.04 (−0.12, 0.05)	0.474 ** (0.27, 0.84)
Depression	3.094 *** (1.74, 5.50)	--	9.21 ** (2.09, 40.63)	2.15 * (1.15, 4.02)	1.39 (0.78, 2.47)	1.49 (0.81, 2.74)	2.14 * (1.06, 4.30)	0.05 (00.04, 0.14)	1.295 (0.67, 2.50)
PTSD	2.03 * (1.04, 3.96)	8.56 ** (1.95, 37.49)	--	4.85 *** (2.35, 10.03)	1.09 (0.54, 2.22)	1.20 (0.64, 2.27)	2.39 (0.75, 7.60)	−0.02 (−0.12, 0.08)	1.686 (0.84, 3.40)
Childhood Abuse	1.16 (0.67, 2.01)	2.28 ** (1.21, 4.28)	4.93 *** (2.37, 10.25)	--	5.75 *** (3.37, 9.80)	1.32 (0.76, 2.28)	0.69 (0.32, 1.46)	0.03 (−0.06, 0.11)	1.791 (0.96, 3.35)
Adult Violence	1.54 (0.90, 2.61)	1.36 (0.75, 2.44)	1.13 (0.55, 2.32)	5.79 *** (3.38, 9.90)	--	1.17 (0.68, 2.01)	1.59 (0.79, 3.17)	0.06 (−0.04, 0.13)	1.411 (0.78, 2.56)
Drug Use	1.53 (0.91, 2.59)	1.34 (0.72, 2.48)	1.26 (0.66, 2.42)	1.31 (0.75, 2.28)	1.24 (0.73, 2.11)	--	2.38 * (1.08, 5.25)	0.04 (−0.01, 0.11)	1.139 (0.64, 2.03)
Alcohol Problems	1.22 (0.61, 2.45)	2.03 † (0.99, 4.15)	2.31 (0.69, 7.80)	0.69 (0.33, 1.47)	1.59 (0.79, 3.18)	2.46 * (1.12, 5.41)	--	0.10 * (0.01, 0.22)	1.144 (0.52, 2.50)
HIV Sexual Risk Behavior	0.76 (0.38, 1.52)	1.59 (0.73, 3.48)	0.85 (0.36, 2.00)	1.27 (0.61, 2.63)	1.46 (0.74, 2.91)	1.33 (0.68, 2.59)	2.62 * (1.10, 6.24)	--	0.541 (0.25, 1.16)
HIV/STI Diagnosis	0.48 * (0.27, 0.86)	1.37 (0.69, 2.72)	1.77 * (0.85, 3.67)	1.79 † (0.96, 3.37)	1.42 (0.79, 2.56)	1.23 (0.69, 2.18)	1.17 (0.53, 2.58)	−0.08 (−0.16, 0.02)	--
				Model Statistics					
Model r^2	0.29 ***	0.38 ***	0.39 ***	0.40 ***	0.29 ***	0.21 ***	0.16 ***	0.30 ***	0.23 ***

Notes: Each column represents a single and independent regression model. PTSD=Post-Traumatic Stress Disorder; AOR=adjusted odds ratio; CI=confidence interval; STI=sexually transmitted infection.

[a] HIV sexual risk behavior was measured continuously, therefore a multiple linear regression analysis was conducted among sexually active women;

[b] Race (0=Black, 1=Coloured);

† < .10;

* < .05,

** p < .01,

***
$p < .001.$