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Longitudinal evaluation of syndemic risk dyads in a cohort of young pregnant couples

Isabel Martinez, PhD, MA¹, Jeannette R. Ickovics, PhD¹, Danya Keene, PhD¹, Rafael Perez-Escamilla, PhD¹, and Trace S. Kershaw, PhD¹

¹Department of Chronic Disease Epidemiology, Yale University School of Public Health and Center for Interdisciplinary Research on AIDS, New Haven, CT

Abstract

PURPOSE—The burden of syndemics – which are clusters of overlapping risk factors that adversely impact health – have been previously evaluated among high-risk individuals, yet little is known regarding syndemics within the relationship context.

METHODS—We evaluated concordant and discordant syndemic profiles among 296 pregnant couples and their actor-partner effects longitudinally from pregnancy to one-year postpartum.

RESULTS—Syndemic score and severity were correlated across all time points for men and women. There was a significant difference in syndemic score ($\beta_{\text{Men-Women}} = 0.2736$; $P < 0.0001$) and severity ($\beta_{\text{Men-Women}} = 0.4282$, $P < 0.0001$) during pregnancy. For actor effects, we found score ($\beta_{T1 \text{ to } T2} = 0.273$, $P = 0.002$; $\beta_{T2 \text{ to } T3} = 0.300$, $P = 0.005$) and severity ($\beta_{T1 \text{ to } T2} = 0.253$, $P = 0.004$; $\beta_{T2 \text{ to } T3} = 0.418$, $P = 0.001$) were significantly associated across all time points for women. For men, only syndemic score predicted subsequent score at later time points ($\beta_{T1 \text{ to } T2} = 0.393$, $P < 0.001$; $\beta_{T2 \text{ to } T3} = 0.421$, $P < 0.001$). Severity was not significantly associated across time ($\beta_{T1 \text{ to } T2} = 0.043$, $P = 0.566$; $\beta_{T2 \text{ to } T3} = 0.172$, $P = 0.066$). For partner effects, we found women's syndemic risk to influence men's syndemic risk, while men had no significant effect on women's syndemic risk.

CONCLUSION—Pregnancy provides an opportunity to reduce syndemic burden among men and women. Couples-based prevention programs may serve to reduce syndemic risk for both partners, particularly during the postpartum period.

Keywords

Substance use; Intimate Partner Violence; Depression; Adolescents

Corresponding Author: Isabel Martinez, PhD, MA, 135 College St, Suite 200, New Haven, CT 06510, Tel: 203-737-4849, Fax: 203-737-5239, isabel.martinez@yale.edu.

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Introduction

Research on romantic relationships demonstrates partners can have a significant impact on the health and well being of one another (1–4). These partner effects impact adolescents and young adults for various behaviors including alcohol and tobacco use, intimate partner violence and other important outcomes (5–6). Given that relationships carry such important implications to health, it may be useful to explore risk factors through relationship dyads rather than focusing on individual health.

Risk factors in relationships can be heightened or attenuated based on important life events. Pregnancy is a period of transition that has been linked not only to changes in health, but also to increases in risk behavior and depression (7–10). Past research on pregnant and parenting couples have found that romantic partners can influence health during pregnancy and the postpartum period (11–13). One such study evaluating alcohol use and intimate partner violence found women were more likely to engage in violence perpetration if their partners engaged in harmful alcohol use (14). Another study found partner stressful life events to be a significant predictor of individual depression in a sample of pregnant couples (12). These studies demonstrate the interdependence of risk factors that can occur within relationships and calls for an expansion of research to evaluate clustering or co-occurring risk factors.

A Syndemic Framework

Syndemics refer to overlapping epidemics in health (15). These are comprised of two or more psychosocial or biological risk factors that cluster together, synergistically increasing risk or disease in specific populations (15). Combined effects result in a higher risk profile than each individual risk factor alone. Social and structural factors can also exacerbate the effects of syndemics, placing an added burden to health.

Previous studies have found substance use, intimate partner violence, and depression to comprise a syndemic for pregnant Latina adolescents (16). There are two measures to consider when evaluating syndemics: syndemic score and syndemic severity. Syndemic score follows an additive framework for evaluating the burden of syndemics (17–20). Score functions as a sum of the number of behaviors reported that comprise any particular syndemic (18, 20). Syndemic severity adds a measure of the mean level or degree of reported syndemic factors (16). It reflects the degree to which a combination of co-occurring risk factors burden a particular individual. As such, syndemic severity is used to evaluate the average burden of the syndemic on an individual. Both syndemic score and severity have been linked to risk factors during pregnancy (16).

Given past research on syndemics in pregnant adolescents, the current study sought to expand on existing research by exploring substance use, intimate partner violence and depression as a syndemic among couples. We addressed two gaps in research through this study. First, few studies have explored gender differences in syndemics. Although there is evidence to suggest that both men and women can be impacted by syndemics (18–19, 21), most studies including men have focused on men who have sex with men and no studies have directly compared male and female heterosexual individuals for syndemics.

Understanding how men and women experience syndemics – particularly during a period of transition like pregnancy – offers important insight into the development and progression of syndemics that can inform prevention interventions. Developing interventions that target the synergy of factors is not only useful, but necessary towards reducing their drastic effects for health in communities most affected by syndemics.

Second, while much of the work on syndemics has been focused on individuals, research suggests that romantic partners are impacted by one-another's risk taking behaviors and health. Reciprocal effects from romantic partners have been found to impact alcohol/substance use, intimate partner violence, and mental health (22–24). If partners play such an integral role within relationships for individual risk factors, it may be the case that similar effects occur within relationships for syndemics. Thus, it is essential to explore the presence and burden of syndemics within couples to understand how syndemics impact romantic partners over time.

As such, the current study sought to address three aims in a diverse cohort of 296 pregnant couples during pregnancy and postpartum. First, we sought to determine whether men's and women's syndemic risks (score and severity) are concordant (i.e., correlated) and/or discordant (i.e., mean differences) across time. Given the literature surrounding syndemics (20, 25–26), we expected to find women's levels of syndemic severity to be higher than men's. Women have been found to be affected by a syndemic of substance use, intimate partner violence and depression previously (15, 27–28). As such, we anticipate that women would have higher rates of the syndemic, without dismissing the possibility that men will be experiencing some co-occurrence of risk factors. Our second aim of this study was to identify if syndemic score and severity influence subsequent syndemic levels over time for both men and women. Third, we sought to determine whether syndemic score and severity partner effects exist for men and women over time. Overall, our goal was to evaluate whether syndemic risk exists within couples and identify how syndemic risk impacts both partners within a relationship longitudinally.

METHODS

Participants

The current study utilizes data that were obtained from 296 young expectant couples during the prenatal period, 6 months postpartum and 12 months postpartum. Participants were randomly recruited from obstetrics and gynecology clinics in four hospitals throughout the state of Connecticut between July 2007 and February 2011. All potential participants were screened and informed of the study details if eligible. If the male partner was not present, the female participant referred the partner to the study and research staff contacted the partner and asked for him to participate. Given the longitudinal study design, if participants could not be contacted after the initial screening they were treated as ineligible and could not be re-contacted after screening and before their estimated due date (29). Research staff screened 944 potential couples for participation. Of those couples screened, 413 couples were eligible, and 296 couples enrolled in the study (72.2% participation). Participants who enrolled were more likely to be 2 weeks further along in pregnancy at screening compared with those who refused ($p<.05$). Participation did not vary by any other pre-screened

demographic characteristic (all $p > .05$). Of our 592 participants, 207 males (70%) and 228 females (77%) completed their 6-month postnatal follow-up assessment, and 239 men (81%) and 261 women (88%) completed 12-month postnatal follow-up assessment. Participants were followed regardless of whether they remained with the partner and whether the partner remained in the study. All materials and procedures for this study were approved by the Yale University Human Investigations Committee.

Inclusion criteria were: (1) females in the second or third trimester of pregnancy; (2) females aged 14–21 and male partners at least age 14; (3) both dyad members report being in a romantic relationship with each other at baseline; (4) both report being the biological parents of the unborn baby; (5) both agree to participate in the study and (6) both speak English or Spanish. For Spanish-speaking participants, the interview was translated by Spanish-speaking research assistants and then back-translated. Written informed consent was obtained by a research staff member at the baseline appointment. Participants completed surveys via audio computer-assisted self-interviews (ACASI). All participants completed surveys individually in a confidential setting where partners could not see their responses. Participants were reimbursed \$25 at each assessment.

Syndemic Variables

Syndemic measures were created using men and women's reported risk factors from pregnancy to 1-year postpartum. Syndemic measures included syndemic score (total # of factors reported) and syndemic severity (mean severity across syndemic factors) and were created using reported substance use, violence and depression. Syndemic score functioned as a measure of any behavior reported in these areas, regardless of the level. Substance use included measures from the Recreational Drug Use Scale (26) for any heavy alcohol use, heavy marijuana use, and heavy drug use. Heavy use was categorized as individuals who reported use occurring "often" or "every day." For all behaviors, participants reported partaking in the behavior often or every day in the past 3 months (26). Intimate partner violence was derived from the Sexual Experiences Survey and Conflict Tactics Scale (CTS-2) to identify victimization through any reported threatening by a partner, any reported violence from a partner, and any reported abuse from a partner (30–31). While relationship status was controlled for at all time points, intimate partner violence included all forms of intimate partner violence experienced by each individual at each time point regardless of partner or relationship changes. For depression we use the Center for Epidemiologic Studies Depression (CES-D) scale (32). Using clinical guidelines, a score of 16 or greater was used to indicate depressive symptoms (32). We used this cut of score and categorized individuals with CES-D scores of 16 or greater as experiencing depression. We then created a dichotomous variable that measured any of the reported factors for each of these areas (substance use, violence, depression) to represent syndemic risk factors. These dichotomous variables were summed to create a variable for syndemic score ranging from 0 to 3 to indicate how many variables were reported.

For syndemic severity we calculated severity for each of the syndemic factors. For substance use, we used heavy alcohol use, heavy marijuana use, and heavy drug use to create a sum score of the total number of these behaviors reported. The total of these three substance use

behaviors reported was then used to create an average across these behaviors to represent severity of substance use ranging from 0 to 3. Since frequency was not available, this method was used to create a syndemic severity measure that identifies the mean level behaviors and individual reported engaging in. For intimate partner violence, we summed the total number of behaviors (partner threats, partner violence, and partner abuse) to create severity score ranging from 0 to 3. Thus, intimate partner violence severity measured multiple types of intimate partner violence experienced. For depression, we used tertiles of the CES-D to categorize participants in ascending levels of depression. Only individuals with a CES-D score of 16 or greater were categorized into one of the depression severity groups. Individuals with scores less than 16 were categorized as having no severity. For individuals scoring 16 and above, scores ranging from 16–30 received a depression severity of 1 (lowest depression); scores ranging from 31–45 received a depression severity of 2 (mid depression); and scores ranging from 46–60 received a depression severity of 3 (highest depression). For all three risk factors, individual risk factor severities ranged from 0 and 3. These three severities were then summed and divided by syndemic score (behaviors reported) to create an overall syndemic severity measure. As such, syndemic severity is a weighted average of only those behaviors reported. Syndemic score and severity were both used to measure syndemic risk at all time points for men and women.

Demographic Variables

Demographic variables were obtained from baseline data included information for both men and women's age (years), education (grade), income (<\$12,500/year), self-reported relationship status (single, married, in a relationship, other), race/ethnicity (non-Hispanic White, non-Hispanic Black, Latina/o, Other), nativity (U.S. Born, foreign born), and employment status (unemployed, part-time employment, full-time employment). We also included relationship status at 6-months postpartum and 1-year postpartum. All demographic variables were controlled for in these analyses.

Analysis

Baseline characteristics and risk factors for substance use, intimate partner violence, and depression at pregnancy, 6 months post partum, and 1-year post partum were used to create syndemic measures and evaluate associations between partners longitudinally. Paired t-tests were used to calculate mean differences between men and women at each time point. We conducted Actor-Partner Interdependence Modeling (APIM) using MPLUS 7.2 software to evaluate longitudinal effects between men and women at each of the three time points (33). Using couple as the unit of analysis, correlations between partners were modeled at baseline and follow-ups through the correlation of error terms as is recommended for dyadic longitudinal analyses (33). Fit was assessed using multiple measures (e.g., Chi-square, RMSEA, CFI) (34). RMSEA values less than .08 and CFI values greater than .90 were considered adequate fit. We used Full Information Maximum Likelihood (FIML) to estimate equations regardless of missed 6 or 12 month assessments to allow for analysis of the full sample (N=296 couples). All analyses controlled for both men and women's age, household income, relationship status, employment, nativity and race/ethnicity.

RESULTS

Table 1 contains all basic demographic information by level of syndemic score for both men and women. Women on average were younger ($M=18.71$ years) than men ($M=21.33$ years). Men and women had similar number of years of education. A higher proportion of female participants (67.69%) reported having an annual household income of less than \$12,500/year compared to male participants (60.34%). A majority of men (48.65%) and women (39.53%) were non-Hispanic Black, followed by Latina/o (Women: 39.53%; Men: 36.49%). Finally, a majority of men (47.62%) and women (47.62%) reported living with a partner at baseline. While all participants were included in analyses, those who were lost to follow up had slightly higher syndemic score among women (0.71 VS 0.65) and slightly lower syndemic score among men (0.92 VS 0.93). For syndemic degree, both women who were lost to follow up (0.64 VS 0.68) and men who were lost to follow up (0.73 VS 1.14) had lower severity compared to those who were retained.

For Aim 1, we used correlations to determine whether men's and women's syndemic score and severity were associated at each of the three time points. Men and women's correlations were significant for both score ($R_{T1}=0.331$, $P<0.0001$; $R_{T2}=0.236$, $P<0.0001$; $R_{T3}=0.243$, $P<0.0001$) and severity ($R_{T1}=0.197$, $P=0.0007$; $R_{T2}=0.174$, $P=0.0026$; $R_{T3}=0.246$, $P<0.0001$) at all times. This indicated that women's syndemic score and severity are significantly associated with their male partner's score and severity at each time point.

We then assessed if men and women differed on syndemic risk. We used paired t-tests to identify significant differences between men and women. Overall, men had a higher mean syndemic score than women during pregnancy: $\beta_{\text{Men-Women}}=0.0.2736$; $P<0.0001$) but did not differ at 6-months ($\beta_{\text{Men-Women}}=0.0811$; $P=0.1121$) and 1-year postpartum ($\beta_{\text{Men-Women}}=0.0169$; $P=0.7325$). For severity, men had a significantly higher severity during pregnancy ($\beta_{\text{Men-Women}}=0.4282$, $P<0.0001$), but no difference at 6-months ($\beta_{\text{Men-Women}}=0.1014$, $P=0.0952$) and 1-year postpartum ($\beta_{\text{Men-Women}}=0.0253$, $P=0.6824$). Therefore, our hypothesis that women would have higher syndemic score and severity was not supported.

To identify whether individual syndemic score predicted subsequent syndemic severity and visa versa, we evaluated actor effects for men and women. Figure 1 shows the significant actor effects across time points. Overall, we found women's syndemic score at baseline predicted syndemic score at 6-months post partum ($\beta_{T1 \text{ to } T2}=0.273$, $P=0.002$), which subsequently predicted syndemic score at 1-year postpartum ($\beta_{T2 \text{ to } T3}=0.300$, $P=0.005$). Men's syndemic score during pregnancy predicted syndemic score at 6-months postpartum ($\beta_{T1 \text{ to } T2}=0.393$, $P<0.001$) and score at 6-months postpartum predicted score at 1-year postpartum ($\beta_{T2 \text{ to } T3}=0.421$, $P<0.001$). This suggests consistency in syndemic score for both men and women from pregnancy to postpartum.

For syndemic severity (Figure 1), women's syndemic severity during pregnancy predicted severity at 6-months postpartum ($\beta_{T1 \text{ to } T2}=0.253$, $P=0.004$) and severity at 6-months postpartum predicted severity at 1-year postpartum ($\beta_{T2 \text{ to } T3}=0.418$, $P=0.001$). For men, severity during pregnancy did not predict severity at 6-months postpartum ($\beta_{T1 \text{ to } T2}=0.043$,

$P=0.566$) and severity at 6-months postpartum did not predict severity at 1-year postpartum ($\beta_{T2 \text{ to } T3}=0.172$, $P=0.066$). Therefore, women showed consistency in syndemic severity from pregnancy to postpartum, whereas men did not.

For actor effects, women's syndemic score and severity were not associated with one another throughout the study. Among men, only syndemic score during pregnancy was significantly associated with severity at 6-months postpartum ($\beta_{T1 \text{ to } T2}=0.210$; $P=0.027$). This suggests that the number of syndemic factors men participate in during pregnancy is associated with the burden of their combined effects in the postpartum period while women's syndemic factors function independently of one another. This may signify an opportunity for targeting syndemics among men during pregnancy, as a change in syndemic score may result in a change in severity. For women, targeting both syndemic score and severity will be a necessary component of interventions, as these seem to function independently.

For partner effects, we evaluated partner score and severity impact across all time points for both men and women (Figure 2). There were no significant partner effects for men on women's syndemic risk at any time point (all $p>.05$). Thus our hypothesis 3 was not confirmed for men's partner. However, we did find women's syndemic severity ($\beta_{T2 \text{ to } T3}=0.207$; $P=0.035$) at 6-months postpartum to impact men's score at 1-year postpartum and women's score ($\beta_{T2 \text{ to } T3}=-0.283$; $P=0.048$) and severity ($\beta_{T2 \text{ to } T3}=0.354$; $P=0.004$) at 6-months postpartum to impact men's severity at 1-year postpartum. This suggests both women's score and severity during 6-months postpartum is related to syndemic factors in men at 1-year postpartum.

DISCUSSION

Our findings suggest that men and women's syndemic score and severity are moderately related. For both men and women, syndemic risk persisted across pregnancy and postpartum period. Men's syndemic severity was less consistent across time compared to women. Following previous research on dyads, syndemics appear to be correlated between men and women during pregnancy and in the postpartum period. Future research should continue to evaluate syndemics outside of pregnancy to determine whether or not these associations exist outside of this framework.

We initially expected women would have higher levels of syndemic risk compared to men given substantial evidence of high rates of depression and intimate partner violence among women in pregnancy research (35–36). There is also evidence to suggest women experience this particular syndemic combination while no studies have shown these factors to impact men (16, 27–28). What we found were men's syndemic levels to have significantly higher correlations than women's syndemic levels during pregnancy although these differences were no longer significant at 6-months postpartum and 1-year postpartum. For both men and women, we see a decrease in syndemic correlations suggesting pregnancy may reduce syndemic risk, similar to past research on syndemics (9). Recent research on pregnant couples shows that pregnancy may act as a trigger to reduce risk factors among new fathers, which may be occurring within this syndemic framework in the postpartum period (37). This

highlights the potential for pregnancy as an opportunity to reduce both men and women's syndemic risk before they increase postpartum. Interventions should be developed to target syndemic behaviors during this transition, particularly for pregnant couples who have increased linkages to care through pregnancy and prenatal visits. While interventions that target couples during pregnancy exist, these must be adapted or developed to target syndemics in couples to reduce syndemic risk during pregnancy. Research must also explore changes that occur in syndemics prior to pregnancy. Understanding pre-pregnancy risk factors for men and women is instrumental for understanding how syndemics change longitudinally before, during and after pregnancy.

Our findings identified interdependence between syndemic measures for women. This highlights the dynamic nature of syndemic risk and the need for targeting both aspects of the syndemic among women. Men, in contrast, only showed actor effects for syndemic score suggesting their number of behaviors is constant but there is more variability of syndemic severity as they transition from pregnancy to parenthood. This highlights the need for targeted prevention among men, particularly on the number of behaviors they engage in to reduce clustering of risk factors.

Finally, for partner effects we only found significant effects for women's behaviors on their partner's. Men's syndemic risk had no effect on women at any time point. This suggests syndemics may be centered around women during pregnancy. Our findings show significant partner effects by women's syndemic risk on men's syndemic risk factors, mainly at 1-year postpartum. Research should continue exploring partner effects to better understand how and why women's risk influences men.

To our knowledge, this is the first study to evaluate syndemics in pregnant couples. As seen for individual behaviors, actor-partner effects exist within syndemics, although these are not equal among men and women. Our findings show women's syndemic factors increase over time during their first year of parenting, highlighting the need for targeted these behaviors. Although we see higher syndemic levels among men, these remain steady across time. Our analyses show behaviors to increase among women over time. This may be caused by an increase in responsibility falling on women during the first year of parenting where syndemic factors could be signs of parenting stress (36–39). Overall, these findings serve to inform prevention services for both men and women's health and highlight the need for involving couples in syndemic research.

While this study presents important findings regarding syndemics, it is not without its limitations. First, we did not look at syndemics outside of parenting couples. Women in this study were pregnant at the beginning of this study, which could have confounded associations. It is known that pregnancy is a time period when risk factors such as drug and alcohol use are reduced (9, 40). As such, it is possible that men and – in particular – women reduced drug and alcohol use and violence, thereby confounding syndemic score and severity. Future research should investigate syndemics outside of pregnancy to better understand syndemic risk over time. Second, this study is limited in that we did not account for additional romantic partners. Incorporating multiple partners into our understanding of syndemics may play a role for how certain factors (e.g., intimate partner violence) fluctuate

within the syndemic. While syndemics focus on the cluster of risk factors as a unit, differences may exist in individual experiences and vary by relationship or partner. Including multiple partners in future studies may provide important distinctions that may or may not exist for men and women during pregnancy. It is possible that other partners may influence risk in men and women, an effect we were not able to measure in this study. Future research should evaluate high-risk individuals and all sexual risk partners who may be introducing additional risks for syndemics. Finally, given that women were pregnant at the beginning of this study, there may be underreporting of risk factors, particularly of their own substance use. Even so, the findings here do present a novel and important approach to evaluating syndemics.

This study presents a new perspective to evaluating syndemics in high-risk populations. With substance use, intimate partner violence, and depression being associated with sexual risk, it is important to continue integrating partners into our evaluation of risk factors. Future research should continue to look at longitudinal trends in syndemics and incorporate important mediators and moderators of syndemics to better understand both protective and exacerbating factors for these co-occurring epidemics. Furthermore, it will be important to evaluate the effects of this syndemic on sexual risk for men and women in relationships to understand differences that exist in sexual risk given this combination of factors is tied to sexual health. Future research should evaluate the impact of syndemics on health, parenting, and child health as these may all be impacted by syndemics. Potential interventions to address these problems must be developed to reduce the burden of syndemics in young parenting couples who may be at an increased risk for these and whose health must be a priority to ensure the wellbeing of their newborn child.

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IMPLICATIONS AND CONTRIBUTIONS

This study presents a dyadic analysis of substance use, intimate partner violence and depression as a syndemic (cluster of overlapping risk factors) in pregnant couples. Men show higher syndemic severity compared to their partner during pregnancy with differences diminishing postpartum. Women's partner effects also impact men postpartum.

Figure 1.
Actor effects for syndemic risk in men and women (PARTNRS Cohort)

Figure 2.
Partner effects on syndemic risk (PARTNRS Cohort)

3a.)

3b.)

Figure 3a–b.

Unadjusted syndemic score & severity from pregnancy to 1-year postpartum (PARTNRS Cohort)

Table 1

Baseline demographic information (PARTNRS Cohort)

	Females	Males		
	μ , <i>SD</i> or <i>n</i> , %	μ , <i>SD</i> or <i>n</i> , %	<i>T</i> , <i>X</i> ²	<i>P</i> -value
Age	18.71 years (SD=1.63)	21.33 years (SD=4.06)	13.18	<0.0001
<i>M, SD</i>				
Education (yrs)	11.75 years (SD=1.82)	11.84 years (SD=1.89)	0.75	0.4560
Household Income			21.12	<0.0001
\$12,500/year	95 (32.31%)	117 (39.66%)		
<\$12,500/year	199 (67.69%)	178 (60.34%)		
Employment Status			0.94	0.3330
Unemployed	212 (71.62%)	116 (39.46%)		
Employed Part-Time	61 (20.61%)	86 (29.25%)		
Employed Full-Time	23 (7.77%)	92 (31.29%)		
Nativity			17.40	<0.0001
Foreign-Born	32 (10.81%)	51 (17.35%)		
U.S.-Born	264 (89.19%)	243 (82.65%)		
Race/Ethnicity			70.66	<0.0001
Black	117 (39.53%)	144 (48.65%)		
Latina/o	117 (39.53%)	108 (36.49%)		
Non-Hispanic White	50 (16.89%)	31 (10.47%)		
Other race/ethnicity	12 (4.05%)	13 (4.39%)		
Relationship Status^a			20.22	<0.0001
Single	115 (38.85%)	91 (30.95%)		
Living with partner	138 (46.62%)	140 (47.62%)		
Married	41 (13.85%)	56 (19.05%)		
Divorced/Widowed	2 (0.68%)	7 (2.38%)		
Syndemic Score (T1)	0.65 (SD=0.77)	0.93 (SD=0.88)	4.93	<0.0001
Syndemic Severity (T1)	0.68 (SD=0.88)	1.11 (SD=1.08)	6.07	<0.0001

^aSelf-reported