Title

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Journal

International Journal of STD & AIDS, 28(12)

ISSN

0956-4624

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Publication Date

2017-10-01

DOI

10.1177/0956462417692278

Peer reviewed

Self-rated health and substance use among individuals in HIV care in Rio de Janeiro, Brazil: a cross-sectional study

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Objective: Self-rated health (SRH) is associated with morbidity and mortality in HIV-uninfected populations but is understudied in HIV. Substance use may affect SRH in addition to its deleterious effect on HIV disease. This analysis aimed to estimate SRH and substance use prevalence and evaluate factors associated with poor SRH among individuals in HIV care in Rio de Janeiro, Brazil.

Methods: A convenience sample of HIV-infected adults completed one item of SRH, the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST), and the Patient Health Questionnaire-2 (PHQ-2). Logistic regression models identified factors associated with poor SRH.

Results: Participants' (n= 1029) median age was 42.9 years, 64.2% were male, and 54.5% were non-white. Poor SRH was reported by 19.5% and the use of alcohol, tobacco, marijuana, and crack/cocaine by 30.1%, 19.5%, 3.9%, and 3.5%, respectively. Less than high-school education (adjusted odds ratio (aOR) 1.54, 95% confidence interval (CI): 1.08-2.20), lack of sexual activity in previous 12 months (aOR 1.53, 95% CI: 1.01-2.30), crack/cocaine use (aOR 3.82, 95% CI: 1.80-8.09), positive PHQ-2 screen (aOR 3.43, 95% CI: 2.09-5.62), and HIV-1 RNA 40 c/mL (aOR 2.51, 95% CI: 1.57-4.02) were significantly associated with poor SRH. as identified by multivariable logistic regression analyses. Alcohol, marijuana, and sedative use was not significantly associated with poor SRH.

Conclusions: These results emphasize the need for substance use and mental health screening and treatment in this population. Further research may elucidate the consequences of poor SRH on treatment adherence, morbidity, and mortality in HIV-infected individuals.

Key-words: self-rated health, substance use, HIV/AIDS, self-assessment

Introduction

Self-rated health (SRH) assessments refer to questions that assess the respondent's perception of his/her own health status. Different methods are used to evaluate SRH including validated questionnaires, like the Short Form Health Survey (SF-36), and the question, "How would you rate your health in general?" [1]. This question is particularly useful for its ease of implementation and is frequently used to assess national population health [1]. The single-item of SRH became commonly used in the 1980s when an association between the single-item of SRH and mortality was demonstrated [1–3]. In prior literature, associations with mortality persisted even when accounting for depression and physical function, but weakened when controlling for objective health measures [1]. Poor SRH could therefore be associated with worse long-term health outcomes.

Accordingly, the number of studies searching for factors that predict good or poor SRH is increasing. Poor SRH is predicted by older age [4], race [5–7], low education [5,7–9], low income [5,8,9], socioeconomic disparity [10], low physical activity [5,8,9,11], comorbid disease and other objective health markers [1,3,8,12], and depressive symptoms [4,13]. Studies from developed countries addressing sex differences have reported mixed results [3,7,9,14].

Some of the aforementioned variables have been implicated in the syndemic theory of HIV, in which, a co-occurring disease such as depression or an adverse psychosocial health condition, such as low socioeconomic status or substance use, may nurture or worsen the disease and related health outcomes, such as SRH, in a given community [15]. Though poor SRH in general populations has been consistently linked to syndemic conditions such as low education and income, the effects of substance use on SRH are less understood, likely due to variations in the studied populations, substance use definitions, and research methodologies. While the literature on the effects of illicit drug use on SRH is scarce, more research is published on tobacco and alcohol use. Results from a Canadian national health

48survey administered to nearly 14,000 adults reported that ever smoking was associated with a 74%
49increased chance of reporting poor SRH [9]. The cumulative results of several studies on the association
50between alcohol and SRH are mixed [3,8,16–19] with variations in study populations and methodologies.

51 Despite the relevance of syndemics in SRH and other poor long-term health outcomes in HIV,
52SRH is understudied in persons living with HIV/AIDS. One U.S. study of over 1700 HIV-infected adults
53found an association between poor SRH and death [20]. Other international literature has shown that the
54absence of symptoms or medication side effects [21], high socioeconomic status, having a community-
55based network [22], and the absence of anxiety and depressive feelings [23] were associated with good SRH,
56but HIV-related markers like $CD4^+$ T lymphocyte counts were not included in adjusted analyses. With
57respect to the effect of substance use on SRH in HIV-infected persons, Mrus et al., using a 2-item
58measure of SRH for a sample of 1649 adults, found that injection drug use history was associated with
59poor SRH [24]. In another U.S. study of 184 adults, HIV-infected persons with alcohol use disorders that
60completed a 21-item variant of the Medical Outcome Survey: Health-Related Quality of Life, another
61measurement of SRH, reported lower health-related quality of life than those with either HIV or alcohol
62use disorder [25], thereby supporting the synergistic relationship between substance use and long-term
63health outcome.

64 In the 2013 Brazilian National Health Survey, 33.9% rated their health as fair, bad, or very bad [26],
65similar to the proportion found (35%) in one cohort of Brazilian HIV-infected persons on antiretroviral
66therapy (ART) [21]. Moreover, 24% of adults reported consuming at least one alcoholic beverage per week
67and 15% used tobacco products daily or occasionally, but no information is available regarding current
68marijuana or crack/cocaine use. Apart from the aforementioned study of Brazilian HIV-infected
69individuals, there is no data on SRH or substance use prevalence in this population. Considering the
70relevance of SRH and substance use to long-term health outcomes, the aim of this paper was to estimate

the prevalence of poor SRH and substance use and identify potential groups at risk for poor SRH among HIV-infected adults in care in Rio de Janeiro, Brazil.

Methods

Study Design

The STD/AIDS Clinical Research Laboratory at Instituto Nacional de Infectologia Evandro Chagas at Fundação Oswaldo Cruz (INI/FIOCRUZ), in Rio de Janeiro, Brazil, is a reference center for HIV treatment and research. As recommended by Brazil's HIV treatment guidelines, patients have at least biannual appointments for follow-up care at INI [27]. A cross-sectional study of a convenience sample of 1050 HIV-infected adults (≥18 years of age) who attended a routine appointment at INI between August 2013 and December 2015 was performed. The sole exclusion criterion was inability to provide informed consent. Trained nurses administered a short, structured interview that assessed SRH, depression, substance use, and sexual activity. This data was linked to INI's HIV cohort database, a longitudinal database maintained since 1998 that includes demographic and clinical information, as previously described [28]. Ethical approval was granted by the INI Institutional Review Board to the cross-sectional study (CAAE 17844113.2.0000.5262) as well as the parent cohort study (CAAE 0032.0.009.000-10).

Outcome

SRH was measured by the question "How is your health?" with possible answer choices of "Very bad," "Bad," and "Neither good nor bad" categorized as "Poor SRH" and "Good, "Very good" categorized as "Good SRH," as previously dichotomized [26].

Demographic, Clinical and Behavioral Variables

Socio-demographic factors were self-reported on the participant's first clinic visit. Sex was defined as sex at birth (male/female). Age at interview was defined as the difference in years between

the questionnaire administration date and birth date, and *a priori* dichotomized so as to explore the effect of "older age" for participants ≥50 years old, as suggested by Blanco et al. [29]. Educational level was dichotomized as no high school education vs. ≥high school education. Race was categorized as "white," "black," or "mixed." Years with HIV diagnosis and years in HIV care were calculated as the difference in years between the interview date and the dates of the first positive HIV test and of the first clinic visit, respectively. The study instrument ascertained marital status, dichotomized as "single" vs. "married or living with partner," and sexual orientation, with response choices of "homosexual/gay," "heterosexual," and "bisexual" dichotomized as "heterosexual" vs. "other."

CD4$^+$ T-lymphocyte counts and HIV-1 RNA levels closest to the study administration date and within the prior 12 months were selected for analysis. Hepatitis B or C virus co-infection was defined as any record of a positive hepatitis B antigen test or hepatitis C antibody test. Metabolic disease was defined as meeting ≥1 of the following criteria by medical history: hypercholesterolemia (total cholesterol >239 mg/dL), hypertriglyceridemia (triglycerides >199 mg/dL), dyslipidemia (LDL >159 mg/dL or HDL <40 mg/dL), hypertension (diastolic blood pressure >100 mmHg), and diabetes (fasting blood glucose ≥126 mg/dL, random blood glucose ≥200 mg/dL, or hemoglobin A1c ≥6.5%). Lifetime history of an AIDS-defining illness was defined using the CDC 1993 criteria [30].

Current tobacco, alcohol, marijuana, crack/cocaine, and non-prescription sedative use were assessed using the Portuguese validated version of the WHO's Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) [31] questions that asked "In the last 3 months, with what frequency did you use…". Possible answers were "Never," "1-2 times," "1-3 times/month," "1-4 times/week," and "5-7 days/week," dichotomized into "never" and "any" use. Binge drinking was assessed by the question "Have you ingested 5 or more alcoholic drinks in one occasion? One drink is one can of beer (300 mL) OR a glass of wine (120 mL) OR a shot of liquor (cachaça, vodka, whisky – 30 mL)" with responses of "no,

never," "yes, but not in the last 3 months," and "yes, in the last three months." This was dichotomized as "yes in the last three months" or "no, not in the last 3 months."

Depression screening used the Patient Health Questionnaire-2 (PHQ-2), validated in Brazilian primary health care populations (33), with the cut-off for a positive depression screen as a PHQ-2 value 3. The study instrument's one item of sexual history asked participants to "mark all" sexual partners that the participant had in the last 12 months: men, women, transsexuals, transvestites, and none. This was dichotomized into "any" and "none."

Statistical Analyses

Categorical variables are described by their absolute and relative frequencies. Unadjusted logistic regression evaluated associations between demographic, clinical, and behavioral variables and poor SRH. Stepwise backward logistic regression modeling was performed with all variables with p-values <0.10 in univariate modeling, removing terms of greatest non-significance until a final model was reached where all included variables presented a p-value ≤0.05. To account for a large number of participants with missing $CD4^+$ T lymphocyte counts (n=442) and HIV-1 RNA levels (n=429), a sensitivity analysis was conducted using the aforementioned statistical methods for participants with both $CD4^+$ T lymphocyte counts and HIV-1 RNA levels (n=576). Guided by previous findings [32], co-linearity between 90-day crack/cocaine use and 90-day tobacco use was tested. When it was found, tobacco was excluded from regression models. Since co-linearity between 90-day sedative and crack/cocaine use was found only in subset data, sedative use was also excluded from the regression model for the subset analysis. Age [4], sex at birth [3,7,9,14], and race [5–7] were kept *a priori* in the final adjusted model because these variables were previously associated to SRH. Current $CD4^+$ T lymphocyte count was kept in the final model despite borderline significance because it significantly changed the effect of HIV-1 RNA viral load. All statistical analyses were performed with R Statistical Software version 3.2.2.

Results

Of the 1050 study participants, 1029 were included for data completeness. Table 1 characterizes the overall study population. The participants were 64.2% male and 45.6% white, with a median age of 42.9 years (interquartile range (IQR) 34.7, 50.6). About half of the population had some high school education or more and two thirds identified as heterosexual. The median time since HIV diagnosis was 8.2 years, and the median time from initiation of HIV care was 6.1 years. Of the 587 participants with a $CD4^+$ T lymphocyte count measured in the year prior to study administration, the median count was 599 cells/mm^3.

In this population, 19.5% (n=201) reported poor SRH and 80.5% (n=828) reported good SRH with a distribution of: very good 36% (n=368), good 45% (n=460), neither good nor bad 15% (n=155), bad 3% (n=36), and very bad 1% (n=10). 30.1% and 19.5% of study participants reported 90-day alcohol and tobacco use, respectively while less than 5% reported 90-day marijuana, crack/cocaine use, or sedative use. Overall, 8.4% of participants were identified as having depressive symptoms per the PHQ-2 depression screen. Unadjusted analysis showed that age ≥50 years, female sex, less than high school education, heterosexual self-identification, absence of 12-month sexual activity, a lifetime diagnosis of an AIDS-defining illness, $CD4^+$ T-lymphocyte count <500 cells/mm^3, detectable HIV-1 RNA level, and reported tobacco, crack/cocaine, or sedative use in the last 90 days were significantly associated ($p<0.05$) with poor SRH (Table 1).

In adjusted analyses, those with poor SRH were less likely than those with good SRH to attend high school ($p=0.016$) and have engaged in sexual activity in the last 12 months ($p=0.043$). Persons with poor SRH were more likely to have a recent detectable HIV-1 RNA level ($p<0.001$), report crack/cocaine use in the last 90 days ($p<0.001$), and have a positive depression screen on the PHQ-2 ($p<0.001$) (Figure 1A). The effect sizes of recent crack/cocaine use (adjusted Odds Ratio - aOR=3.82) and positive PHQ-2

screen (aOR=3.43) were at least a third larger than the effect size of detectable HIV-1 RNA level (aOR=2.51). Age ≥50 years (p=0.057), female sex (p=0.057), and a current $CD4^+$ T lymphocyte count <500 cells/mm^3 (p=0.067) approached significance in the adjusted analysis (Figure 1A). The results of the sensitivity analysis of participants with complete data for both a recent $CD4^+$ T lymphocyte count and a recent HIV-1 RNA level (n=576) were not significantly different from those of the overall analysis (Figure 1B, see Supplementary Material Table S1).

Discussion

Of individuals in HIV care at INI, 19.5% reported poor SRH. SRH was associated with lower schooling, no reported sexual activity in the last 12 months, positive 90-day recall of crack/cocaine use, a positive PHQ-2 screen, and HIV-1 RNA levels ≥40 c/mL. The lower prevalence of poor SRH compared to that found in the Brazilian general population (33.9%) [26] is intriguing. It is possible that because our population was recruited at a multidisciplinary care center, our sample likely has better access to care than the general population. In addition, participants may be primed to respond to SRH questions from the perspective of an HIV-infected individual, using other HIV-infected peers or their own prior health experiences as a frame of reference, and, consequently, may find themselves to be in comparatively good health [1]. Our prevalence of poor SRH was also lower than that of a multicenter Brazilian cohort of HIV-infected persons (35%) by 15% [21], possibly because there are unmeasured factors related to health services at play and because current ART regimens are better tolerated than those available in 2008 when the study was conducted.

The prevalence of 90-day alcohol use (30.1%), marijuana use (3.9%), and crack/cocaine use (3.1%) was similar to a 1-week prevalence found in the same cohort [33], although 90-day tobacco use (19.5%) was smaller than that of 12-month use (29%)[32], as expected. All estimates, however, were lower than that of U.S. HIV-infected cohorts, where 50-70% report smoking [34], 53% report drinking in the past

185month [35], and 24% and 9% report 90-day marijuana and crack/cocaine use, respectively [36]. These lower
186prevalences may reflect the difficulty in reaching and linking substance users with HIV care [37,38].

187 Both a positive depression screen and current crack/cocaine use showed the largest effect size
188on poor SRH in our analysis, roughly a third larger than the most strongly associated clinical variable, a
189detectable HIV-1 RNA level. Depression is a significant contributor to SRH, not only because of its effects
190on objective health measures [39], but also because it distorts self-perception [1,3]. Hence, it is important to
191screen for depression in HIV-infected persons. The association between crack/cocaine and poor SRH
192adds to a small, conflicting body of literature in which one study found that crack/cocaine smokers were
193more likely to report poor SRH [16], while another U.S. survey of roughly 19,000 adults aged 50 or older did
194not find an association (though the analysis was limited by small sample of crack/cocaine users) [17]. In our
195analysis, this association presented a large effect size even after controlling for standard measures of HIV
196disease severity implying that crack/cocaine use may affect other non-HIV related clinical variables or the
197process of self-evaluation of health. For example, crack users may see crack addiction as worse for their
198health than alcohol or tobacco addiction [16] and consequently evaluate their SRH as poor. Adding to the
199conflicting body of literature, there was no association between alcohol use and SRH. In sum, the data
200suggests that substance use screening should be a part of routine HIV care.

201 The association between poor SRH and low levels of education may reflect limited access to
202resources, like information about health-promoting behaviors and social support networks, or a
203conception of health rooted in a weaker base of clinical information [40,41]. Not only was the proportion of
204study participants reporting sexual activity in the last year (80.5%) similar to that of Brazilians ages 15-64
205(77.3%), but the breakdown by sex was also similar: 81% of men and 73.7% of women in the national
206population, and 85.2% of men and 73% of women in our study population reported 12-month sexual
207activity [42]. Those with no recent sexual activity could be mentally distressed or too physically ill [43], or may

suffer from decreased libido from chronic illness [44], all of which may thereby affect SRH. This adds another dimension to the importance of asking HIV-infected persons about their sex lives or lack thereof, as it may have a negative impact on self-rated health. HIV-related measures, $CD4^+$ T lymphocyte count and HIV-RNA level, affected SRH as previously described [1,24]. However, a limitation of this study was the large number of missing laboratory information. This could have excluded a population that are poorly linked to care and therefore may be sicker with poorer SRH, however the sensitivity analyses did not yield major differences in the demographics (see Supplementary Material for details, Table S1) nor the multivariable analyses (Figure 1) between those with complete laboratory information and those without. One notable difference was that the effect size of a positive PHQ-2 screen decreased when participants with missing information were removed from the analysis, suggesting that PHQ-2 is a weaker correlate with SRH in the presence of clinical information (Figure 1B). Another limitation of the study was the inclusion only of participants who were attending scheduled outpatient appointments, who were more likely to be female, non-white, and have less education than the eligible population that did not complete the study (Table S2). Though patients linked to care may be expected to have higher $CD4^+$ T lymphocyte counts and lower HIV-1 RNA levels, and therefore report better SRH, there were no differences between these two populations on these measures (Table S2). However, HIV-infected individuals that did not attend their outpatient appointments may be missing their appointments due to other social and behavioral variables that may negatively influence their self-rated health, such as drug and problematic alcohol use. In fact, the prevalence of drug and alcohol use was too small to stratify into occasional and severe users. It is possible that severe users would be more likely to report poor SRH than occasional users. While a nurse-administered questionnaire circumvents the exclusion of illiterate participants, participants may not have been comfortable responding to questions about alcohol, drugs, and sex. Therefore, there may be underreporting of these behaviors. However, the prevalence of sexual activity in the last 12 months in our sample (80.5%) was nearly identical to that of Brazilian population

(77.3%), which was assessed via ___. Additionally, this study did not address other chronic health diseases that may adversely affect SRH, such as cancer and heart disease. Finally, although results relating to SRH are similar to other Brazilian estimates, given the non-probabilistic nature of the sample, results may not be generalizable to all individuals in care for HIV in the country.

This study has identified several potential groups of HIV-infected individuals that are at risk for reporting poor SRH, and therefore may be at increased risk for mortality. Some of these groups, such as persons who reported no recent sexual activity and crack/cocaine users, may not be routinely identified in HIV care (Machado, et al. *under review*). Though research is substantially limited, identification and subsequent treatment of these behaviors may reduce mortality risk. Given the mortality implications for poor SRH and its correlation with not only clinical information but psychological and behavioral variables, we urge providers to assess psychosocial variables and drug and alcohol use in routine HIV care and manage them appropriately.

Conclusions

The proportion of HIV-infected adults in care that report poor SRH was lower in our sample than in other studies of HIV-infected Brazilians and the Brazilian general population, a result that deserves further investigation. Since participants presenting a positive screen for depression and use crack/cocaine were more likely to report poor SRH, it is important to incorporate mental health and substance use screening and treatment into the care of HIV-infected persons. Additional research is needed to elucidate the effect SRH may have on treatment adherence, morbidity, and mortality.

Authors' Statement of Conflict of Interest and Compliance with Ethical Standards:

This work was funded by the National Institutes of Health grants R25 MH087222 (South American Program in HIV Research) and K23 AI110532 in addition to the NIH-funded Caribbean, Central

and South America network for HIV epidemiology (CCASAnet), a member cohort of the International Epidemiologic Databases to Evaluate AIDS (IeDEA, U01AI069923), and the Conselho Nacional de Desenvolvimento Cientifico e Tecnologico (CNPq, 476024/2013-7).

All procedures performed in this study, including informed consent obtained from all individual participants included in the study, were in accordance with the ethical standards of the institutional and national research committees and with the 1964 Helsinki declaration and its later amendments.

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Table 1. Characteristics of study participants by self-rated health (SRH) status (good versus poor) and unadjusted odds ratios (OR) with 95% confidence intervals (95% CI), INI-Fiocruz from 2013-2015

	Total	Good SRH	Poor SRH	OR (95% CI)	p-value
Total	1029	828	201		
Age (years)					
median (IQR)	42.9 (34.7,50.6)	42.6 (34.7,50.2)	44.3 (34.8,52.3)	1.01 (1, 1.02)	0.128
<50	751 (73)	617 (74.5)	134 (66.7)	REF	
≥50	278 (27)	211 (25.5)	67 (33.3)	1.46 (1.05, 2.04)	0.025
Sex at Birth					
Male	661 (64.2)	551 (66.5)	110 (54.7)	REF	
Female	368 (35.8)	277 (33.5)	91 (45.3)	1.65 (1.2, 2.25)	0.002
Race*					
White	466 (45.6)	389 (47.3)	77 (38.3)	REF	
Black	196 (19.2)	151 (18.4)	45 (22.4)	1.51 (1, 2.28)	0.052
Mixed	361 (35.3)	282 (34.3)	79 (39.3)	1.42 (1, 2.01)	0.051
Education*					
<High school	479 (46.8)	411 (49.9)	68 (34.2)	REF	
≥High School	544 (53.2)	413 (50.1)	131 (65.8)	1.92 (1.39, 2.65)	<0.001
Sexual Orientation*					
Homosexual/Gay	309 (30.5)	269 (33)	40 (20)	REF	
Heterosexual	652 (64.3)	502 (61.7)	150 (75)	2.01 (1.38, 2.94)	<0.001
Bisexual	53 (5.2)	43 (5.3)	10 (5)	1.56 (0.73, 3.36)	0.251
Civil Status					
Married or living with partner	363 (35.3)	296 (35.7)	67 (33.3)	REF	
Single	666 (64.7)	532 (64.3)	134 (66.7)	1.11 (0.8, 1.54)	0.52
12-month Sexual Activity*					
Yes	830 (80.8)	683 (82.7)	147 (73.1)	REF	
None	197 (19.2)	143 (17.3)	54 (26.9)	1.75 (1.22, 2.52)	0.002
Years with HIV Diagnosis					
median(IQR)	8.2 (4.1,14.1)	8.1 (4.1,14.2)	8.9 (4.4,13.9)	1 (0.98, 1.03)	0.761
Years in HIV Care					
median(IQR)	6.1 (3.2,10)	6 (3.2,10)	6.4 (2.8,9.9)	0.99 (0.96, 1.02)	0.562
CD4 T-lymphocyte count (cells/mm^3)					
median(IQR)	599 (386,828.5)	610 (414,852)	468.5 (249.8,713.5)	1 (1, 1)	0.003
≥500	358 (34.8)	307 (37.1)	51 (25.4)	REF	
<200	60 (5.8)	38 (4.6)	22 (10.9)	3.49 (1.91, 6.37)	<0.001
200-500	169 (16.4)	132 (15.9)	37 (18.4)	1.69 (1.05, 2.7)	0.029
Missing	442 (43)	351 (42.4)	91 (45.3)	1.56 (1.07, 2.27)	0.02
HIV-1 RNA Level					
Undetectable	423 (41.1)	363 (43.8)	60 (29.9)	REF	
Detectable	177 (17.2)	125 (15.1)	52 (25.9)	2.52 (1.65, 3.84)	<0.001

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Missing	429 (41.7)	340 (41.1)	89 (44.3)	1.58 (1.11, 2.27)	0.012
Time on ART (days)					
median (IQR)	6.1 (2.7,12.8)	6 (2.7,13)	7 (2.9,12.4)	1 (1, 1)	0.948
Time on ART					
≥90 days	945 (91.8)	762 (92)	183 (91)	REF	
<90 days	84 (8.2)	66 (8)	18 (9)	1.14 (0.66,1.96)	0.648
Lifetime AIDS Related Disease					
None	610 (59.3)	508 (61.4)	102 (50.7)	REF	
1+	419 (40.7)	320 (38.6)	99 (49.3)	1.54 (1.13, 2.1)	0.006
Hepatitis B Infection					
No	982 (95.4)	789 (95.3)	193 (96)	REF	
Yes	47 (4.6)	39 (4.7)	8 (4)	0.84 (0.39, 1.82)	0.657
Hepatitis C Infection					
No	953 (92.6)	769 (92.9)	184 (91.5)	REF	
Yes	76 (7.4)	59 (7.1)	17 (8.5)	1.2 (0.69, 2.11)	0.518
Metabolic Variable					
No	435 (42.3)	354 (42.8)	81 (40.3)	REF	
Yes	594 (57.7)	474 (57.2)	120 (59.7)	1.11 (0.81, 1.51)	0.527
PHQ-2*					
Negative	938 (91.6)	775 (94.1)	163 (81.5)	REF	
Positive	86 (8.4)	49 (5.9)	37 (18.5)	3.59 (2.27, 5.68)	<0.001
90-day Tobacco Use*					
No	826 (80.5)	676 (81.8)	150 (75)	REF	
Yes	200 (19.5)	150 (18.2)	50 (25)	1.5 (1.04, 2.17)	0.029
90-day Alcohol Use*					
No	716 (69.9)	568 (68.8)	148 (74)	REF	
Yes	309 (30.1)	257 (31.2)	52 (26)	0.78 (0.55, 1.1)	0.155
90-day Marijuana Use					
No	989 (96.1)	800 (96.6)	189 (94)	REF	
Yes	40 (3.9)	28 (3.4)	12 (6)	1.81 (0.91, 3.63)	0.093
90-day Crack/Cocaine Use					
No	993 (96.5)	810 (97.8)	183 (91)	REF	
Yes	36 (3.5)	18 (2.2)	18 (9)	4.43 (2.26, 8.67)	<0.001
90-day Sedative Use					
No	1008 (98)	815 (98.4)	193 (96)	REF	
Yes	21 (2)	13 (1.6)	8 (4)	2.6 (1.06, 6.36)	0.036
90-day Binge Drinking*					
No	840 (82.6)	677 (82.8)	163 (81.9)	REF	
Yes	177 (17.4)	141 (17.2)	36 (18.1)	1.06 (0.71, 1.59)	0.776

Figure 1. Adjusted odds ratios (aOR) with 95% confidence intervals derived from multivariable regression analyses using statistically significant variables (p<0.1) associated with poor SRH from unadjusted logistic regression analysis. A) all study participants (N=1029), B) subset of study participants with recent CD4 count and HIV-1 RNA level (N=576).