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PREVALENCE OF DEPRESSION AND ASSOCIATED RISK FACTORS AMONG HIV-NEGATIVE MEN WHO HAVE SEX WITH MEN

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ABSTRACT

PREVALENCE OF DEPRESSION AND ASSOCIATED RISK FACTORS AMONG HIV-NEGATIVE MEN WHO HAVE SEX WITH MEN

By Sarah E. File

Background: High rates of depression have been observed among men who have sex with men (MSM) compared to the U.S. adult male population. Depression in MSM may be associated with risk behavior that increases risk for human immunodeficiency virus (HIV).

Methods: A cross-sectional analysis was conducted to examine demographic and behavioral characteristics associated with depression among HIV-negative black and white MSM in Atlanta. The data used for this analysis were collected from July 2010 through December 2011 in the Involve[men]t project. This project is investigating HIV and sexually transmitted infection prevalence and incidence differences between adult black and white MSM in Atlanta.

Results: Among 393 HIV-negative MSM at baseline, the prevalence of depression was 27.0%. Factors associated with depression included being 25 years of age and older compared to 18-24 years, non-injection drug use, an alcohol problem, unprotected anal intercourse (UAI), exchange sex, often being treated as if you were "stupid" or "talked down to" because of your race/ethnic group, agreeing that 'most people in my city think less of a person who is gay', and that 'my city is a bad place for me to live as a gay man'. Race was a significant effect modifier of the association between depression and non-injection drug use. Depression prevalence was not significantly different in black versus white men, though subsequent analyses revealed racial differences in factors associated with depression. Depression was associated with exchange sex in black MSM, and with UAI and substance use in white MSM.

Conclusions: The prevalence of depression among HIV-negative MSM is high compared to the general U.S. adult male population. The link between risk behavior and depression is strongest among white MSM; depression screening should be incorporated into behavioral interventions. Both racial and sexual stigma play a role in the mental health and possibly the behavior of black MSM.

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INTRODUCTION

Substantial disparities in new human immunodeficiency virus (HIV) infections exist based on race, gender, and sexual orientation across the United States (U.S.) population. Men who have sex with men (MSM) remain the largest risk group for HIV in the U.S. (1). Compared to other races, blacks continue to experience the most severe burden of HIV; young, black MSM were the only risk group in the U.S. to experience statistically significant increases in new HIV infections from 2006-2009 (1). Transmission of HIV among MSM is most likely due to risky sexual behavior; many factors have been associated with increased sexual risk taking, including psychological problems such as depression.

Depressive disorders are disabling conditions with tremendous public health and economic impact. Depression can impair everyday functioning, and may lead to decreased productivity and short-term disability (2). The World Health Organization estimates that 121 million people suffer from some form of depression worldwide (2). In 2000, depression was the fourth leading contributor to the global burden of disease as measured in Disability Adjusted Life Years (DALYs), and it is predicted it will be in second place in DALY ranking by 2020 across all ages and both sexes (2). In the U.S., the burden of depression is substantial. The prevalence of depression has been estimated to be 4.9-8.0% among U.S. adults males, according to data from the Behavioral Risk Factor Surveillance System and the National Health and Nutrition Examination Survey (3, 4).

Evidence has shown that MSM suffer from higher rates of depression and other psychosocial problems compared to the general adult male population. Depression in HIV negative MSM populations has been estimated to range from 14-26% (5-7). The prevalence of depression among HIV-positive MSM is often higher, as those men are under the additional stress of living with HIV (8-10); increasingly potent combination antiretroviral treatment (ART) regimens have dramatically reduced HIV-related morbidity and mortality in wealthy countries, thus HIV-infected persons contend with the stress of living with a chronic illness (9). Many

studies of depression among MSM do not exclude HIV-positive men; the prevalence of depression among populations in which the majority of MSM were HIV-negative has been estimated to be 18-47% (11-13).

There are many possible antecedents to depression among MSM. The social stress theory contends that social stressors – socioecological demands that put a strain on individuals' adaptive capacities – can be harmful to health, particularly mental health (14). Environmental adversity may lead to depression, alcoholism, substance use disorders, and other forms of mental distress. MSM are under high levels of environmental stress resulting from stigmatization as a sexual minority (12, 15). The stress theory as applied to minorities is the idea that minority populations are exposed to unique, additional stressors that create strains on individuals as they attempt to function in their everyday environments. Some of the stressors that MSM are routinely exposed to include victimization, harassment, fear of rejection from friends and family, and discrimination (6, 15-17). These additional stressors negatively affect well being, and may exacerbate the effect that other life stressors have on mental health (13, 14, 18).

MSM experiencing psychological problems such as depression may be more likely to engage in sexual risk taking that puts them at increased risk for HIV and other sexually transmitted infections (STIs) (13, 19, 20). The term syndemic was first applied by Singer to describe the connections between substance abuse, violence, and Acquired Immune Deficiency Syndrome (AIDS) among the urban poor (21). Stall and subsequent researchers have applied the syndemic framework to HIV risk among the U.S. MSM population, demonstrating that psychosocial health problems may increase the risk for HIV in this population (12, 13, 17, 19). Stall *et al.* measured the extent to which a set of psychosocial health problems (depression, polydrug use, intimate partner violence, childhood sexual abuse) have an additive effect on increasing HIV risk among urban MSM, and found that a greater number of psychological health problems are associated with higher rates of unprotected anal intercourse and HIV infection (17).

Mustanski *et al.* found the same additive association among psychosocial health problems (substance abuse, psychological distress in the past week, sexual assault, partner violence) and increased HIV risk among urban MSM 16-24 years of age. As the number of psychosocial health problems increased, the odds of sexual risk taking (having multiple anal sex partners, unprotected anal sex) and an HIV positive status increased significantly. Though psychological distress was not significantly independently associated with sexual risk taking, when psychosocial health problems were added each additional problem increased the odds of multiple anal sex partners by 24%, unprotected anal intercourse by 42%, and an HIV positive status by 42% (12).

Parsons and colleagues evaluated whether another psychosocial factor, sexual compulsivity, is part of the syndemic framework that may increase HIV risk among MSM. Sexual compulsivity is characterized by sexual fantasies and behaviors that increase in intensity and frequency over time, becoming more disruptive to life functions (13). The factor has been associated with sexual risk behaviors among MSM including unprotected anal intercourse and a greater number of sexual partners, as well as higher incidence of HIV and STIs. Parsons and colleagues found strong, significant bivariate associations between depression and the following: sexual compulsivity, childhood sexual abuse, intimate partner violence, unprotected anal intercourse with a non-primary partner, and HIV seropositivity. Men who were experiencing symptoms of sexual compulsivity had 3.95 higher odds of being depressed (95% CI: 2.56, 6.08) compared with men who were not sexually compulsive. In multivariate regression models, depression and partner violence were significantly associated with sexual compulsivity. When additive effects of the psychosocial problems were assessed, greater numbers of health problems were significantly and positively associated with HIV infection and unprotected anal intercourse (UAI).

In addition to stigmatization due to their sexual orientation, black MSM are under additional and perhaps different environmental stressors compared to their white counterparts – they experience racial discrimination on top of sexual discrimination (13, 15, 18). Black MSM

are at a higher risk for HIV compared to their white counterparts, and the general U.S. black population has higher rates of physical illness and mortality compared with whites (22). This may be due to the additive effect of psychological and environmental stressors. National estimates show depression prevalence to be significantly higher in non-Hispanic blacks than among non-Hispanic whites (9.7-12.9% versus 6.2-8.0%) in the general population, though racial differences in depression have not been found consistently between black and white MSM (3, 4, 22). Two studies found that the prevalence of depression among black MSM was 33%, which is no different than the prevalence among white MSM (10, 20); similarly, a longitudinal analysis of HIV-negative black and white MSM showed no difference in rates of depression between races (5).

Depression and sexual risk behavior may be associated with different stressors in black versus white men. Black MSM have been observed to have higher levels of internalized homophobia, less frequent disclosure of homosexual orientation, to self-identify as heterosexual more often than white MSM, and to perceive that their acquaintances disapprove of homosexuality (23, 24). Racism may also impact the behavior of black MSM, as black men have reported discrimination at gay bars, clubs, and social events (25). Contextual factors that affect black men may cause a lack of social support and access to health care and community-based HIV prevention (10, 15). Black MSM may not seek care over concerns about bias from providers or from the lack of services targeted to their specific needs (15, 26). A positive association has been described between black race and poverty, which has the potential to further limit access to care (15, 27).

Many individual studies have examined specific issues related to depression among populations of MSM, assessing either risk factors for depression or the outcomes and impact of depression. However, few studies have assessed sexual stigma and racial discrimination and their effects on depression in a population of both black and white MSM. This study is a cross-sectional analysis assessing the prevalence of and the demographic, behavioral, and psychosocial

factors associated with depression among HIV-negative MSM. The purpose is not to elucidate the causal mechanism of depression, but rather, to characterize HIV-negative MSM with current depression, and to determine if there are differences in prevalence and associated factors between black and white MSM. Such information may help inform future mental health diagnosis and treatment for MSM, thereby positively affecting HIV prevention interventions.

METHODS

Null Hypothesis

Among HIV-negative MSM in Atlanta, there is no association between having a depressed state and each of the following factors: race, sociodemographics, sexual risk behaviors, substance use, psychosocial factors, racial discrimination, and sexual stigma.

Study Design

The Involve[men]t project is investigating HIV and STI prevalence and incidence differences between black and white MSM in Atlanta. The project uses modified time location sampling from real-world venues and Facebook advertisements. Recruiters approached individuals systematically in specific venues and time periods where at least 30 MSM were expected to pass through in a 4-hour period. Eligible men were referred to the study for potential enrollment; they completed a computer-assisted survey and provided biological specimens for HIV and STI testing. To be eligible for Involve[men]t, participants had to be male, 18 years of age or older, non-Hispanic black or non-Hispanic white, have had at least one male sex partner in the past year, and not be in a monogamous relationship. All study procedures were approved by the Institutional Review Board (IRB) at Emory University (protocol number 42405).

Measures

The primary outcome of interest was clinically significant depressive symptoms, assessed with a shortened version of the original 20-item Center for Epidemiologic Studies Depression Scale (CES-D) (28). The 10-item version (CESD-10) developed by Andresen, *et al.* has shown good predictive accuracy when compared to the full-length 20-item scale (29, 30) (Appendix A). The 10 items were each scored on a four-point Likert scale from "0=Rarely or none of the time" to "3=Most or all of the time". Participants were asked to choose the answer that best fit how

they felt and behaved during the past week. Eight of 10 items were negatively worded so that a higher score equaled higher agreement with depressive symptoms; these items were scored as is. Two of the 10 items were positively worded; scores were reversed so that a higher score again equaled higher agreement with depressive symptoms. The 10 items were then summed to determine a total score. Scores could range from 0 to 30; a total score of 10 or greater is indicative of clinically significant depressive symptoms, referred to hereafter as depression (29). The mean total score is used to compare depression between independent groups. For 13 participants, data was imputed for 1 of 10 missing answers on the CESD-10 scale by imputing the mean of the other 9 items as the response for the missing item.

Other variables examined were potential risk factors for depression or were of behavioral interest among MSM, based on previous reports in the epidemiologic literature. Participants reported their race/ethnicity, age, highest education level completed (combined high school with some high school), current employment status, and current type of health insurance coverage (combined Medicaid, Medicare, and TRICARE into "public"). Participants were asked how often they have enough money to pay for their prescription drugs, and how often they have enough money to pay for healthcare provider office visits. For both variables, "most often" and "sometimes" were combined, and "not often" and "never" were combined. The non-applicable (N/A) response "I don't need to buy prescription drugs at this time" was an option for the prescription drug question.

Substance use was assessed by self-reported non-injection drug use in the previous 12 months, and by the CAGE questionnaire, a 4-question validated screening tool for a probable alcohol problem. Participants were asked to choose the answer that best described how they felt and behaved over their whole life. A "yes" indicated a positive response and was scored as 1; a "no" was scored as 0. A score of 2 or more indicated a likely problem with alcohol. The 4 items were: "Have you ever felt 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 (eye-opener)?" (31).

Sexual risk behaviors assessed included self-reported UAI with a male partner in the previous 12 months, exchange sex for money, drugs, food, or something else of value in the previous 12 months, and lab-confirmed STI including chlamydia, gonorrhea, syphilis, and trichomoniasis. Participants self-reported sexual identity, HIV testing history, and responded to the following questions assessing abuse: "As a child or an adult, have you ever been beaten, physically attacked, or physically abused?" and "As a child or an adult, have you ever been sexually attacked, raped, or sexually abused?"

Participants answered questions about racial discrimination experienced in the past 12 months. The response was coded positive if the participant answered "sometimes", "fairly often", or "very often"; the response was coded negative if the participant answered "rarely" or "never". Finally, participants responded to questions about perceived local sexual stigma by choosing their agreement with statements on a five-level scale ranging from "strongly disagree" to "strongly agree".

Statistical Analysis

In order to compare depression prevalence between black and white men, a two independent sample t-test was conducted using the total CESD-10 score for each race. For the bivariate analysis, chi-square tests of general association were used to assess whether the distribution of characteristics was different overall between men with and without depression, among black men, and among white men. If cell size was less than 5, Fisher's exact test was used to determine significance. For each of the money and sexual stigma variables with three or more categories, the category that resulted in a positive response was designated as the reference for comparison in bivariate calculations. For example, "always" having money to pay for prescription drugs (as opposed to "most often" or "not often" having money) was coded as the

reference category. A Breslow-Day test was used to test for the homogeneity of the odds ratios for each independent variable while stratifying on race.

Overall model building started with regressors that were associated with depression ($p<0.1$) in the bivariate analysis. Variables were simultaneously assessed by multivariate logistic regression with backward elimination. All possible 2-way interactions between the first-order regressors were evaluated, also using backward selection. For simplicity, only significant interaction terms between independent variables and race were retained during model building. Confounding was assessed in the final model for variables associated with depression at $p<0.1$. The final multivariate model controlled for race and age. In addition, the sexual stigma variables that consisted of five levels were treated as continuous in order to increase power.

In order to increase efficiency in modeling and develop the most parsimonious final models, race-specific multivariate models started with significant variables from the overall multivariate model and controlled for age; backward elimination was conducted for each model until only significant variables remained. Model fit statistics (Hosmer-Lemeshow goodness of fit test) and multicollinearity were assessed for each final model. Statistical analyses were carried out using SAS 9.3 (SAS Institute, Cary, NC); overall statistical significance of individual variables was determined at the $p<0.05$ level.

RESULTS

The analyses in this report were based on data collected from July 2010 through December 2011. A total of 556 men were enrolled during that period; of those, 395 (71%) were HIV-negative at baseline. Two of the 395 HIV-negative participants were excluded due to missing data for depression; analysis was thus conducted on 393 men. Of the 393 men, 223 were white non-Hispanic and 170 were black non-Hispanic (Table 1). The median age at enrollment was 25 years (range: 18-57 years, 25-75% quartiles: 22-31 years); 42% of the men were 18-24 years of age, and 58% were 25 years or older. The majority of men were employed and 45% had a college diploma or higher. Forty-six percent of the men had private health insurance, while 37% had no health insurance. Few men (3%) had public insurance. Most participants identified as homosexual (85%), with a small proportion identifying as bisexual (12%) and few identifying as heterosexual (0.5%). The majority of men (93%) reported being tested for HIV prior to the Involve[men]t study.

The overall prevalence of depression among the participants included in this report was 27.0%. CESD-10 scores ranged from 0 to 28, with a mean score of 7.61 (SD 4.86). Depression was not found to be significantly different between black and white men (t-test=1.24, p=0.21). Among white men the prevalence of depression was 26.5%, with a mean CESD-10 score of 7.88 (SD 5.11); among black men prevalence was 27.6%, with a mean CESD-10 score of 7.26 (SD 4.50). The prevalence of depression by demographic and behavioral characteristics of the participants is shown in Table 1.

In the bivariate analysis, depression was positively associated with the following demographic and behavioral characteristics (Table 2): not having money to pay for healthcare provider office visits as compared to always having money, most often having money to pay for prescription drugs as compared to always having money, non-injection drug use, an alcohol problem, UAI with a male partner, exchange sex, having been ever physically abused, having

ever been sexually abused**,** often feeling as though you have been treated as if you were "stupid" or "talked down to" because of your race/ethnic group, often feeling as though your civil rights have been violated, often feeling as though others reacted to you as if they were afraid or intimidated of you because of your race/ethnic group, strongly agreeing or agreeing with the idea that 'most people in my city think less of a person who is gay', strongly agreeing or agreeing with the sentence 'my city is a bad place for me to live as a gay man', and disagreeing with the statement 'I feel at home in my city's community'.

In the preliminary analysis, a statistically significant interaction was observed between non-injection drug use and race (Breslow-Day p=0.046); a term to control for the interaction was included in multivariate models. In the multivariate analysis, depression was positively associated with the following factors while controlling for race: being 25 years of age and older as compared to 18-24 years of age, non-injection drug use, an alcohol problem, UAI with a male partner, exchange sex, often feeling as though you have been treated as if you were "stupid" or "talked down to" because of your race/ethnic group, agreeing with the idea that 'most people in my city think less of a person who is gay', and agreeing with the sentence 'my city is a bad place for me to live as a gay man' (Table 2). The same interaction between non-injection drug use and race was significant in the final multivariate model. There was a significantly increased odds of depression among white men who reported non-injection drug use, but there was no significant association noted among black men. The final model achieved a good fit according to the Hosmer-Lemeshow goodness of fit test (p=0.99). Collinearity diagnostics showed no multicollinearity problems between predictors.

Among black MSM, depression was positively associated with the following factors while controlling for age: exchange sex, often feeling as though you have been treated as if you were "stupid" or "talked down to" because of your race/ethnic group, and agreeing with the idea that 'most people in my city think less of a person who is gay' (Table 3).

Among white MSM, depression was positively associated with the following factors: being 25 years of age and older as compared to 18-24 years of age, non-injection drug use, UAI with a male partner, agreeing with the idea that ‘most people in my city think less of a person who is gay’, and agreeing with the sentence ‘my city is a bad place for me to live as a gay man’ (Table 4).

DISCUSSION

The prevalence of clinically significant depressive symptoms (27.0%) is high in this population of HIV-negative MSM in Atlanta compared to the prevalence of depression in adult males aged 18 or older in the U.S. (4.9-8.0%) (3, 4). It is similar compared to previous estimates of depression in HIV-negative MSM populations in which prevalence ranged from 14-26% (5-7). The factors associated with depression among HIV-negative MSM in Atlanta included being 25 years of age and older compared to 18-24 years of age, substance use behaviors (non-injection drug use and alcohol), sexual risk behaviors (UAI with a male partner and exchange sex), sexual stigma, and racial discrimination. Prevalence of depression in black and white men was not significantly different, which is consistent with findings from previous studies (5, 10, 20, 22); however, the factors associated with depression differed by race. The patterns of factors associated with depression and differences between races demand special attention, as there are implications for the development of HIV interventions that target MSM populations.

In the U.S., depression prevalence is highest for younger adults compared with older adults (3, 16). According to data from the Behavioral Risk Factor Surveillance System, the prevalence of depression is 11.1% among persons aged 18-24 years, 9.3% among 25-34 year olds, and 8.7% among persons aged 35-44 years (3). As in the general population, the burden of depression was significantly different by age group in our study; however, depression prevalence was higher among men 25 years of age and older (31%) compared to men 18-24 years of age (22%). There are several possible explanations as to why MSM over 25 may have a higher prevalence of depression compared to their younger counterparts. It has been hypothesized that younger gay men may suffer from less depression because they disclosed their homosexual orientation in an environment that was more liberal towards homosexuality (6, 32). This study did not assess disclosure of sexual orientation, but in a survey of gay, lesbian, and bisexual men and women in New York City, Meyer *et al.* found that younger individuals suffered from a lower

prevalence of depression compared to older individuals (6). The authors determined that the difference was not due to an age bias related to a greater opportunity for older people to have had a psychological disorder at some point because of their longer life span, but likely due to publicly disclosing their homosexuality in a more prejudicial social environment compared to their younger counterparts.

Age was not associated with depression in the overall bivariate analysis, but was positively associated with depression in the multivariate analysis. This may be due to an interaction between age and race that was undetected in the overall model, possibly due to limited sample size. In the race-specific models, age was not associated with depression among black men, but was positively associated with depression among white MSM. It may be that black MSM of all ages experience high levels of social stress about revealing their sexual orientation, while younger white MSM are reaping the benefits of changing cultural attitudes towards homosexuality. Black MSM remain more involved in religious communities than white MSM and thus may be exposed to a greater number of messages that discourage homosexuality; this may result in greater secrecy of homosexual behavior among black MSM compared to white MSM (15).

Sexual risk behaviors that were associated with depression differed by race. MSM who had UAI with a male partner in the previous 12 months had a significantly higher prevalence of depression (31%) compared to MSM who did not have UAI (21%). In the race-specific models, UAI was not associated with depression among black men, but was positively associated with depression among white MSM. This supports the idea that there is an undetected interaction between race and UAI in the overall model. It is also possible that a higher percentage of white MSM engage in UAI with a male partner compared to black men, and that the interaction failed to show up due to sample size. Conversely, exchange sex was positively associated with depression in the overall model that controlled for race, and in the black-specific model; it was not associated with depression among white men. Men who had exchange sex in the previous 12

months had a higher prevalence of depression (55%) compared to MSM who did not have exchange sex (26%).

An alcohol problem was positively associated with depression in the overall bivariate and multivariate analyses. Forty-seven percent of MSM who had an alcohol problem exhibited depressive symptoms compared to 24% who did not have an alcohol problem. An alcohol problem was not associated with depression among black men; it was positively associated with depression among white MSM in bivariate, but was not significant in the race-specific multivariate model for white men. Excessive alcohol use is associated with depression in the general population (33), and it has been found to be associated with HIV risk among MSM (5). Thus, it is important to consider substance-use treatment interventions in conjunction with sexual-risk reduction programs for MSM.

Non-injection drug use in the last 12 months was positively associated with depression in the overall bivariate and multivariate analyses. There was a significant interaction term between race and non-injection drug use in both overall analyses. These overall results were supported in the race-specific models, which showed no association between non-injection drug use and depression among black MSM, but a strong positive association among white MSM. This is likely due to the fact that in white MSM have been shown to use more non-injection drugs compared to black MSM (34). Given these results, it seems as though white MSM should be targeted for substance-use treatment interventions in the context of depression and HIV risk.

The only common factor associated with depressive symptoms in both the black and white race-specific models was sexual stigma, which indicates that community-level determinants may play a significant role in the mental health status of MSM populations. In addition, depressive symptoms were positively associated with racial stigma among black MSM. Race-specific mental health care may be important, as sexual discrimination stress experiences may be compounded by additional minority stress among black MSM, as hypothesized by the social stress theory (14). Though depression in black MSM is positively associated with both sexual

stigma and racial discrimination, black MSM did not show a higher prevalence of depression compared to white MSM. These results support the idea that social-support systems may be less important for black MSM compared to white MSM. Some evidence suggests that black MSM may have better coping mechanisms compared to white MSM that prevents an increase in risk-taking despite an increase in stigma (1). Alternatively, stigma may not be additive, and experiencing both types of stigma versus only one may not increase the stress felt by black MSM.

The design of this study has several strengths that contribute to the understanding of depression prevalence and associated risk factors among populations of MSM. The Involve[men]t project recruited both white and black MSM and allows for a direct comparison between races while taking individual and community factors into account. Both HIV and STI infections were lab confirmed, thus determination of infection was more precise than estimates based on self-report. The Involve[men]t survey was a computer-assisted self-interview; other research suggests this technique may reduce reporting bias and minimize under-reporting of risk behaviors (35).

The findings in this report are subject to several limitations that must be considered when interpreting the results. First, the directionality of associations cannot be established and causal inferences cannot be made. Second, though the CES-D scale is widely used to evaluate the psychological health of survey populations, it cannot be used reliably to make clinical diagnoses of depression, but is rather used as a screening tool for depressive symptoms (29). Third, the MSM in this population were recruited in the urban city of Atlanta, Georgia, and the findings cannot be generalized to MSM elsewhere. The men were mostly recruited from public venues at which they had to disclose male-male sex during a brief recruitment encounter, and participants may be more open about their sexuality than other MSM in Atlanta. Thus, results cannot be generalized to other MSM in Atlanta. Finally, the race-specific models may be limited by small sample size.

These findings have implications for HIV behavior interventions, as depression has the potential to interfere with the ability of HIV-negative MSM to benefit from HIV reduction programs. Intervention risk-reduction programs that target individual behaviors have been shown to lower sexual risk-taking among MSM (36). However, ongoing HIV infections are still being detected in this population (1). Thus, HIV prevention strategies that rely on efforts to manipulate individual behaviors alone may not be effective as a long-term strategy. Current interventions fail to address all the prevention challenges that MSM are facing (37); multiple mechanisms of support for behavior change should be considered. These include taking into account the demographic diversity within the MSM population, and addressing the multiple psychosocial health problems that drive risk among gay men, including depression.

Among black MSM, depression is only associated with one risk behavior, thus the hypothesis that depression contributes to the high HIV burden among black MSM in the U.S. is not as well supported. Additional race-specific issues may have more of an impact on risk behavior than depressive symptoms. It has been postulated that racism may impact the risk behavior of black MSM and thus the HIV risk in the population. For example, racism may lead black MSM to select partners within predominately black networks with high HIV prevalence (5).

Though depressive symptoms are seemingly unrelated to HIV risk, the prevalence of depressive symptoms are high among black MSM and demand attention as they likely impact other health outcomes in the population. Race-specific mental health care may be necessary in order to address the stigma to which black MSM are subject, and to improve mental and physical health across the black MSM population. Increasing awareness of coping mechanisms for dealing with stigma would surely be beneficial for MSM regardless of race. In addition, efforts should be undertaken to support a broader environmental movement within MSM communities, such as working with organizations to address mental health, violence, and equal rights for the gay population (15, 17). This will require a variety of providers to work together in order to

address and disrupt these additive health problems that occur at both the individual and community levels.

More than one quarter of the men in this MSM population exhibited depressive symptoms. Depression was associated with risk behaviors for HIV, including UAI with a male partner and exchange sex. In addition, depression is associated with sexual and racial stigma, and being 25 years of age and older as compared to 18-24 years of age. Factors associated with depression differed significantly by race; the link between risk taking and depression is strongest among white MSM. In order to develop programs that can effectively address the syndemic of HIV, sexual risk behaviors, substance use, and psychosocial problems among MSM, we need to better understand how these interplay, particularly where they may differ between MSM of different races.

REFERENCES

1. Centers for Disease Control and Prevention. HIV surveillance report, 2010. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, 2012.
2. World Health Organization. Mental health management: Depression. 2012. (http://www.who.int/mental_health/management/depression/definition/en/). (Accessed 2012).
3. Centers for Disease Control and Prevention. Current depression among adults - United States, 2006 and 2008. *MMWR* 2010;59(38):1229-35.
4. Centers for Disease Control and Prevention. Mental illness surveillance among adults in the United States. *MMWR* 2011;60(Suppl):1-29.
5. Koblin BA, Husnik MJ, Colfax G, et al. Risk factors for HIV infection among men who have sex with men. *AIDS* 2006;20(5):731-9.
6. Meyer IH, Dietrich J, Schwartz S. Lifetime prevalence of mental disorders and suicide attempts in diverse lesbian, gay, and bisexual populations. *Am J Public Health* 2008;98(6):1004-6.
7. Perdue T, Hagan H, Thiede H, et al. Depression and HIV risk behavior among Seattle-area injection drug users and young men who have sex with men. *AIDS Educ Prev* 2003;15(1):81-92.
8. DeLorenze GN, Satre DD, Quesenberry CP, et al. Mortality after diagnosis of psychiatric disorders and co-occurring substance use disorders among HIV-infected patients. *Aids Patient Care STDS* 2010;24(11):705-12.
9. Pence BW. The impact of mental health and traumatic life experiences on antiretroviral treatment outcomes for people living with HIV/AIDS. *J Antimicrob Chemother* 2009;63(4):636-40.

10. Cochran SD, Mays VM. Depressive distress among homosexually active African American men and women. *Am J Psychiatry* 1994;151(4):524-9.

11. Hirshfield S, Wolitski RJ, Chiasson MA, et al. Screening for depressive symptoms in an online sample of men who have sex with men. *AIDS Care* 2008;20(8):904-10.

12. Mustanski B, Garofalo R, Herrick A, et al. Psychosocial health problems increase risk for HIV among urban young men who have sex with men: preliminary evidence of a syndemic in need of attention. *Ann Behav Med* 2007;34(1):37-45.

13. Parsons JT, Grov C, Golub SA. Sexual compulsivity, co-occurring psychosocial health problems, and HIV risk among gay and bisexual men: further evidence of a syndemic. *Am J Public Health* 2012;102(1):156-62.

14. Wight RG, LeBlanc AJ, de Vries B, et al. Stress and mental health among midlife and older gay-identified men. *Am J Public Health* 2012;102(3):503-10.

15. Peterson JL, Jones KT. HIV prevention for black men who have sex with men in the United States. *Am J Public Health* 2009;99(6):976-80.

16. Salomon EA, Mimiaga MJ, Husnik MJ, et al. Depressive symptoms, utilization of mental health care, substance use and sexual risk among young men who have sex with men in EXPLORE: implications for age-specific interventions. *AIDS Behav* 2009;13(4):811-21.

17. Stall R, Mills TC, Williamson J, et al. Association of co-occurring psychosocial health problems and increased vulnerability to HIV/AIDS among urban men who have sex with men. *Am J Public Health* 2003;93(6):939-42.

18. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. *Psychol Bull* 2003;129(5):674-97.

19. Safren SA, Reisner SL, Herrick A, et al. Mental health and HIV risk in men who have sex with men. *J Acquir Immune Defic Syndr* 2010;55 Suppl 2:S74-7.

20. Reisner SL, Mimiaga MJ, Skeer M, et al. Clinically significant depressive symptoms as a risk factor for HIV infection among black MSM in Massachusetts. *AIDS Behav* 2009;13(4):798-810.

21. Singer M. AIDS and the health crisis of the U.S. urban poor; the perspective of critical medical anthropology. *Soc Sci Med* 1994;39(7):931-48.

22. Keyes KM, Barnes DM, Bates LM. Stress, coping, and depression: testing a new hypothesis in a prospectively studied general population sample of U.S.-born Whites and Blacks. *Soc Sci Med* 2011;72(5):650-9.

23. Kennamer JD, Honnold J, Bradford J, et al. Differences in disclosure of sexuality among African American and White gay/bisexual men: implications for HIV/AIDS prevention. *AIDS Educ Prev* 2000;12(6):519-31.

24. Stokes JP, Vanable PA, McKirnan DJ. Ethnic differences in sexual behavior, condom use, and psychosocial variables among black and white men who have sex with men. *J Sex Res* 1996;33:373-81.

25. Icard L. Black gay men and conflicting social identities: Sexual orientation versus racial identity. *J Soc Work Hum Sex* 1986;4:83-93.

26. Malebranche DJ, Peterson JL, Fullilove RE, et al. Race and sexual identity: perceptions about medical culture and healthcare among Black men who have sex with men. *J Natl Med Assoc* 2004;96(1):97-107.

27. U.S. Census Bureau. Income, poverty, and health insurance coverage in the United States: 2010. Washington, DC: U.S. Government Printing Office, 2011:Table B.

28. Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385-401.

29. Andresen EM, Malmgren JA, Carter WB, et al. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am J Prev Med* 1994;10(2):77-84.

30. Grzywacz JG, Hovey JD, Seligman LD, et al. Evaluating short-form versions of the CES-D for measuring depressive symptoms among immigrants from Mexico. *Hispanic Journal of Behavioral Sciences* 2006;28(3):404-23.

31. Ewing JA. Detecting alcoholism. The CAGE questionnaire. *JAMA* 1984;252(14):1905-7.

32. Floyd FJ, Bakeman R. Coming-out across the life course: implications of age and historical context. *Arch Sex Behav* 2006;35(3):287-96.

33. Grant BF, Harford TC. Comorbidity between DSM-IV alcohol use disorders and major depression: results of a national survey. *Drug Alcohol Depend* 1995;39(3):197-206.

34. Centers for Disease Control and Prevention. HIV risk, prevention, and testing behaviors among men who have sex with men --- National HIV Behavioral Surveillance system, 21 U.S. cities, United States, 2008. *MMWR* 2011;60 (SS14):1-34.

35. Kissinger P, Rice J, Farley T, et al. Application of computer-assisted interviews to sexual behavior research. *Am J Epidemiol* 1999;149(10):950-4.

36. Herbst JH, Beeker C, Mathew A, et al. The effectiveness of individual-, group-, and community-level HIV behavioral risk-reduction interventions for adult men who have sex with men: a systematic review. *Am J Prev Med* 2007;32(4 Suppl):S38-67.

37. Stall R, Herrick A, Guadamuz TE, et al. Updating HIV prevention with gay men: current challenges and opportunities to advance health among gay men. In: Mayer KH, H.F. P, eds. *HIV Prevention: A Comprehensive Approach*. Cambridge, MA: Elsevier, 2009:267-80.

Table 1. Characteristics of an HIV-negative population of men who have sex with men in Atlanta by depression status, July 2010 - December 2011 (n=393)

Characteristic	Overall (*n* = 393)	Depressed[a] (*n* = 106)
	N[b]	N[b] (%)
Sociodemographics		
Race		
White	223	59 (27)
Black	170	47 (28)
Age		
18-24	164	36 (22)
25 and over	229	70 (31)
Education level completed		
High school diploma or less	64	17 (27)
Some college or technical school	153	47 (31)
College diploma or higher	176	42 (24)
Currently employed		
No	82	29 (35)
Yes	310	76 (25)
Current health insurance status		
Private	180	45 (25)
Public	12	5 (42)
Other	39	9 (23)
No insurance	144	41 (29)
Don't know/refused	18	6 (33)
Money to pay for prescription drugs		
Always	189	37 (20)
Most often	100	36 (36)
Not often	42	11 (26)
N/A[c]	61	21 (34)
Money to pay for healthcare provider office visits		
Always	189	40 (21)
Most often	122	38 (31)
Not often	69	24 (35)

Behaviors		
Non-injection drug use, last 12 mo		
No	229	49 (21)
Yes	164	57 (35)
Alcohol problem over lifetime		
No	317	76 (24)
Yes	49	23 (47)
Unprotected anal intercourse with male partner, last 12 mo		
No	111	18 (16)
Yes	278	86 (31)
Exchange sex, last 12 mo		
No	373	95 (26)
Yes	20	11 (55)
STI Infection		
No	344	90 (26)
Yes	49	16 (33)
Psychosocial factors		
Sexual identity		
Homosexual	335	88 (26)
Heterosexual	2	1 (50)
Bisexual	47	15 (32)
Other	8	1 (13)
Ever physically abused		
No	252	55 (22)
Yes	141	51 (36)
Ever sexually abused		
No	285	66 (23)
Yes	108	40 (37)
Ever tested for HIV		
No	28	4 (14)
Yes	365	102 (28)

Racial discrimination, last 12 mo		
How often have you been treated as if you were "stupid" or "talked down to" because of your race/ethnic group?		
Often	75	32 (43)
Rarely/Never	318	74 (23)
How often have your civil rights been violated?		
Often	58	25 (43)
Rarely/Never	332	81 (24)
How often have others reacted to you as if they were afraid or intimidated of you because of your race/ ethnic group?		
Often	81	32 (40)
Rarely/Never	308	73 (24)
Sexual stigma		
Most people in my city think less of a person who is gay		
Strongly agree	32	15 (47)
Agree	78	27 (35)
Neutral	83	26 (31)
Disagree	146	29 (20)
Strongly disagree	45	6 (13)
My city is a bad place for me to live as a gay man		
Strongly agree	14	6 (43)
Agree	16	9 (56)
Neutral	52	16 (31)
Disagree	169	54 (32)
Strongly disagree	140	21 (15)
I feel at home in my city's gay community		
Strongly agree	106	17 (16)
Agree	144	47 (33)
Neutral	84	18 (21)
Disagree	31	16 (52)
Strongly disagree	19	3 (16)

[a] A total score of 10 or greater on the 10-item Andresen version of the Center for Epidemiologic Studies Depression Scale (CES-D)

[b] Numbers may not sum to total because of missing values

[c] Participant does not need to buy prescription drugs at this time

Table 2. Factors associated with depression among HIV-negative men who have sex with men in Atlanta, July 2010 - December 2011 (n=393)

Characteristic	Bivariate		Multivariate	
	Odds Ratio (95% C.I.[a])	p-value[b]	Odds Ratio (95% C.I.[a])	p-value
Sociodemographics				
Race				
White	Reference	-	Reference	-
Black	1.1 (0.7-1.7)	0.792	1.7 (0.8-3.8)	0.205
Age				
18-24	Reference	-	Reference	-
25 and over	1.6 (1.0-2.5)	0.058	2.1 (1.2-3.6)	0.012
Education level completed				
High school diploma or less	Reference	-	-	-
Some college or technical school	1.2 (0.6-2.4)	0.540	-	-
College diploma or higher	0.9 (0.5-1.7)	0.668	-	-
Currently employed				
No	Reference	-	-	-
Yes	0.6 (0.4-1.0)	0.049	-	-
Current health insurance status				
Private	0.8 (0.5-1.4)	0.482	-	-
Public	1.8 (0.5-6.0)	0.336	-	-
Other	0.8 (0.3-1.7)	0.502	-	-
No insurance	Reference	-	-	-
Don't know/refused	1.3 (0.4-3.6)	0.668	-	-

Money to pay for prescription drugs				
Always	Reference	-	-	-
Most often	2.3 (1.3-4.0)	0.002	-	-
Not often	1.5 (0.7-3.2)	0.339	-	-
N/A[c]	2.2 (1.1-4.1)	0.017	-	-
Money to pay for healthcare provider office visits				
Always	Reference	-	-	-
Most often	1.7 (1.0-2.8)	0.047	-	-
Not often	2.0 (1.1-3.6)	0.025	-	-
Behaviors				
Non-injection drug use, last 12 mo				
No	Reference	-	Reference	-
Yes	2.0 (1.3-3.1)	0.003	3.2 (1.5-6.9)	0.003
Alcohol problem over lifetime				
No	Reference	-	Reference	-
Yes	2.8 (1.5-5.2)	<0.001	2.7 (1.3-5.6)	0.009
Unprotected anal intercourse with male partner, last 12 mo				
No	Reference	-	Reference	-
Yes	2.3 (1.3-4.1)	0.003	2.7 (1.4-5.2)	0.004
Exchange sex, last 12 mo				
No	Reference	-	Reference	-
Yes	3.6 (1.4-8.9)	0.004	4.1 (1.4-12.2)	0.013
STI Infection				
No	Reference	-	-	-
Yes	1.4 (0.7-2.6)	0.338	-	-

Psychosocial factors				
Sexual identity			-	-
Homosexual	Reference	-	-	-
Heterosexual	2.8 (0.2-45.4)	0.918	-	-
Bisexual	1.3 (0.7-2.5)	0.414	-	-
Other	0.4 (0.1-3.3)	0.682	-	-
Ever physically abused				
No	Reference	-	-	-
Yes	2.0 (1.3-3.2)	0.002	-	-
Ever sexually abused				
No	Reference	-	-	-
Yes	2.0 (1.2-3.2)	0.006	-	-
Ever tested for HIV				
No	Reference	-	-	-
Yes	2.3 (0.8-6.9)	0.117	-	-
Racial discrimination, last 12 mo				
How often have you been treated as if you were "stupid" or "talked down to" because of your race/ethnic group?				
Often	2.5 (1.5-4.2)	<0.001	3.0 (1.5-6.0)	0.002
Rarely/Never	Reference	-	Reference	-
How often have your civil rights been violated?				
Often	2.4 (1.3-4.2)	0.003	-	-
Rarely/Never	Reference	-	-	-

How often have others reacted to you as if they were afraid or intimidated of you because of your race/ethnic group?				
Often	2.1 (1.3-3.5)	0.004	-	-
Rarely/Never	Reference	-	-	-
Sexual stigma				
Most people in my city think less of a person who is gay			1.5 (1.2-1.9)	0.002
Strongly agree	5.7 (1.9-17.3)	0.001		
Agree	3.4 (1.3-9.2)	0.010		
Neutral	3.0 (1.1-7.9)	0.025		
Disagree	1.6 (0.6-4.2)	0.322		
Strongly disagree	Reference	-		
My city is a bad place for me to live as a gay man			1.4 (1.0-1.8)	0.028
Strongly agree	4.3 (1.3-13.5)	0.009		
Agree	7.3 (2.5-21.7)	<0.001		
Neutral	2.5 (1.2-5.3)	0.014		
Disagree	2.7 (1.5-4.7)	<0.001		
Strongly disagree	Reference	-		
I feel at home in my city's gay community				
Strongly agree	Reference	-	-	-
Agree	2.5 (1.4-4.7)	0.003	-	-
Neutral	1.4 (0.7-3.0)	0.341	-	-
Disagree	5.6 (2.3-13.4)	<0.001	-	-
Strongly disagree	1.0 (0.3-3.7)	0.983	-	-

Noninjection drug use, last 12 mo:				
by race:				
White	3.2 (1.7-6.0)	<0.001	3.2 (1.5-6.9)	0.003
Black	1.2 (0.6-2.4)	0.658	0.9 (0.4-2.2)	0.786

[a]C.I. = Confidence Interval
[b]If cell size < 5, Fisher's exact test used to determine significance
[c]Participant does not need to buy prescription drugs at this time

Table 3. Factors associated with depression among black HIV-negative men who have sex with men in Atlanta, July 2010 - December 2011 (n=170)

Characteristic	Total (*n*=170) N[a]	Depressed (*n*=47) N[a] (%)	Bivariate		Multivariate	
			Odds Ratio (95% C.I.[b])	p-value[c]	Odds Ratio (95% C.I.[b])	p-value
Age						
18-24	84	21 (25)	Reference	-	Reference	-
25 and over	86	26 (30)	1.3 (0.7-2.6)	0.446	1.5 (0.7-3.3)	0.265
Non-injection drug use, last 12 mo						
No	120	32 (27)	Reference	-	-	-
Yes	50	15 (30)	1.2 (0.6-2.4)	0.658	-	-
Alcohol problem over lifetime						
No	145	37 (26)	Reference	-	-	-
Yes	9	5 (56)	3.7 (0.9-14.3)	0.063	-	-
Unprotected anal intercourse with male partner, last 12 mo						
No	62	11 (18)	Reference	-	-	-
Yes	106	34 (32)	2.2 (1.0-4.7)	0.043	-	-
Exchange sex, last 12 mo						
No	161	41 (26)	Reference	-	Reference	-
Yes	9	6 (67)	5.9 (1.4-24.5)	0.014	6.4 (1.4-29.3)	0.017

How often have you been treated as if you were "stupid" or "talked down to" because of your race/ethnic group?						
Often	59	24 (41)	2.6 (1.3-5.3)	0.006	3.0 (1.4-6.4)	0.005
Rarely/Never	111	23 (21)	Reference	-	Reference	-
Most people in my city think less of a person who is gay					1.6 (1.1-2.2)	0.007
Strongly agree	17	7 (41)	2.8 (0.6-13.8)	0.317		
Agree	40	14 (35)	2.2 (0.5-8.9)	0.015		
Neutral	41	14 (34)	2.1 (0.5-8.6)	0.441		
Disagree	50	6 (12)	0.6 (0.1-2.5)	0.137		
Strongly disagree	15	3 (20)	Reference	-		
My city is a bad place for me to live as a gay man						
Strongly agree	7	3 (43)	3.3 (0.6-16.8)	0.365	-	-
Agree	7	5 (71)	10.9 (1.9-63.8)	0.463	-	-
Neutral	27	7 (26)	1.5 (0.5-4.5)	0.498	-	-
Disagree	70	21 (30)	1.9 (0.8-4.3)	0.683	-	-
Strongly disagree	59	11 (19)	Reference	-	-	-

[a]Numbers may not sum to total because of missing values
[b]C.I. = Confidence Interval
[c]If cell size < 5, Fisher's exact test used to determine significance

Table 4. Factors associated with depression among white HIV-negative men who have sex with men in Atlanta, July 2010 - December 2011 (n=223)

Characteristic	Total (*n*=223) N[a]	Depressed (*n*=59) N[a] (%)	Bivariate		Multivariate	
			Odds Ratio (95% C.I.[b])	p-value[c]	Odds Ratio (95% C.I.[b])	p-value
Age						
18-24	80	15 (19)	Reference	-	Reference	-
25 and over	143	44 (31)	1.9 (1.0-3.7)	0.051	2.7 (1.3-5.8)	0.009
Non-injection drug use, last 12 mo						
No	109	17 (16)	Reference	-	Reference	-
Yes	114	42 (37)	3.2 (1.7-6.0)	<0.001	4.0 (2.0-8.0)	<0.001
Alcohol problem over lifetime						
No	172	39 (23)	Reference	-	-	-
Yes	40	18 (45)	2.8 (1.4-5.7)	0.004	-	-
Unprotected anal intercourse with male partner, last 12 mo						
No	49	7 (14)	Reference	-	Reference	-
Yes	172	52 (30)	2.6 (1.1-6.2)	0.026	3.0 (1.1-7.7)	0.026
Exchange sex, last 12 mo						
No	212	54 (26)	Reference	-	-	-
Yes	11	5 (46)	2.4 (0.7-8.3)	0.165	-	-

How often have you been treated as if you were "stupid" or "talked down to" because of your race/ethnic group?						
Often	16	8 (50)	3.1 (1.1-8.6)	0.038	-	-
Rarely/Never	207	51 (25)	Reference	-	-	-
Most people in my city think less of a person who is gay					1.4 (1.1-2.0)	0.025
Strongly agree	15	8 (53)	10.3 (2.2-49.2)	0.006		
Agree	38	13 (34)	4.7 (1.2-18.4)	0.036		
Neutral	42	12 (29)	3.6 (0.9-14.1)	0.100		
Disagree	96	23 (24)	2.8 (0.8-10.2)	0.154		
Strongly disagree	30	3 (10)	Reference	-		
My city is a bad place for me to live as a gay man					1.6 (1.1-2.3)	0.009
Strongly agree	7	3 (43)	5.3 (1.0-27.4)	0.029		
Agree	9	4 (44)	5.7 (1.3-24.8)	0.012		
Neutral	25	9 (36)	4.0 (1.4-11.4)	0.007		
Disagree	99	33 (33)	3.6 (1.6-7.8)	0.001		
Strongly disagree	81	10 (12)	Reference	-		

[a]Numbers may not sum to total because of missing values
[b]C.I. = Confidence Interval
[c]If cell size < 5, Fisher's exact test used to determine significance

APPENDIX A: Andresen Short-Form (CESD-10) of the Center for Epidemiologic Studies Depression (CES-D) Scale

I was bothered by things that usually don't bother me.
I had trouble keeping my mind on what I was doing.
I felt depressed.
I felt that everything I did was an effort.
I felt hopeful about the future.[a]
I felt fearful.
My sleep was restless.
I was happy.[a]
I felt lonely.
I could not get "going."

[a]Indicates positive item.

APPENDIX B: SAS CODE

```
*****************************************************************;
* Date: 02/01/12                                                *;
* Programmer: Sarah File                                        *;
*                                                               *;
* Purpose: This program creates the involvement dataset used for *;
* thesis analysis.                                              *;
*****************************************************************;

/* Three datasets (status.sas7bdat,
   participants_survey_baseline.sas7bdat,
   sti_baseline.sas7bdat)need to be copied to local drive, sorted,
   merged, and linked to formats.  Datasets will be sorted and merged
   by study_id.

   Note: 2 observations will be excluded from the analysis dataset
   because they do not meet the behavioral requirements for study
   participation.  The variable met_behav_crit indicates which
   participants to include (1) and exclude (0).

   The analysis dataset (thesisdata.sas7bdat) will have 556
   observations.  */


libname involve 'H:\THESIS';
libname library 'H:\THESIS';
*Link datasets to formats;


*Copy datasets in SAS to local computer to remove write-password
protection;
data work.status;
      set involve.status;
run;

data work.participants_survey_baseline;
      set involve.participants_survey_baseline;
run;

data work.sti_baseline;
      set involve.sti_baseline;
run;


*Sort datasets prior to merging;
proc sort data = work.status;
      by study_id;
run;

proc sort data = work.participants_survey_baseline;
      by study_id;
run;

proc sort data = work.sti_baseline;
```

```
      by study_id;
run;

*Merge datasets and exclude disqualified observations.
 This creates the permanent analysis dataset;
data involve.thesisdata;
            merge       work.status (in = in_frozen)
                        work.participants_survey_baseline
                        (in = in_frozen)
                        work.sti_baseline
                        ;
            by study_id;

            if not (in_frozen=1) then delete;

            *Include only 556/558 obs who met behavioral criteria;
            if (met_behav_crit = 1) then output;
run;




*************************************************************************;
* Program: H:\THESIS\thesisdata.sas7bdat                                 *;
* Date: 02/01/12                                                         *;
* Programmer: Sarah File                                                 *;
*                                                                        *;
* Purpose: This program explores the involvement dataset used for        *;
* thesis analysis.                                                       *;
*************************************************************************;

libname explore 'H:\THESIS';
libname library 'H:\THESIS';


*Create a temporary dataset involve identical to the existing permanent
dataset thesisdata;
data work.involve;
            set explore.thesisdata;

            *Limit dataset to HIV- population - limits data to 395 obs;
            if baseline_hiv=1;


            *Recode scoring of positive CES-D items - reversed scoring;
            if cesd_hopeful=3 then cesd_hopefulp=0;
            if cesd_hopeful=2 then cesd_hopefulp=1;
            if cesd_hopeful=1 then cesd_hopefulp=2;
            if cesd_hopeful=0 then cesd_hopefulp=3;

            if cesd_happy=3 then cesd_happyp=0;
            if cesd_happy=2 then cesd_happyp=1;
            if cesd_happy=1 then cesd_happyp=2;
            if cesd_happy=0 then cesd_happyp=3;

            *Impute values for missing cesd items (13 obs);
```

```
if study_id eq 0100301 then cesd_getgoing=0.6667;
if study_id eq 0101371 then cesd_concentrate=0.2222;
if study_id eq 0101871 then cesd_fearful=1.4444;
if study_id eq 0200021 then cesd_bother=2.1111;
if study_id eq 0200321 then cesd_bother=1.1111;
if study_id eq 0200711 then cesd_getgoing=0.8889;
if study_id eq 0200821 then cesd_depressed=0.6667;
if study_id eq 0200931 then cesd_depressed=0.6667;
if study_id eq 0202221 then cesd_concentrate=0.6667;
if study_id eq 0202291 then cesd_effort=1.3333;
if study_id eq 0300091 then cesd_happyp=0.3333;
if study_id eq 0300741 then cesd_depressed=0.7778;
if study_id eq 0301441 then cesd_lonely=0.5556;

*Create var for total response for CES-D scale;
cesd_total=0;
cesd_total=cesd_bother+cesd_concentrate+cesd_depressed+
cesd_effort+cesd_hopefulp+cesd_fearful+cesd_badsleep
+cesd_happyp+cesd_lonely+cesd_getgoing;

*Create binary outcome for CES-D scale.  The cutoff is 10;
if cesd_total gt . and cesd_total lt 10 then cesd=0;
if cesd_total ge 10 then cesd=1;

*Drop observation that is missing CES-D variables
(study_id 0200091);
if study_id eq 0200091 then delete;
*Drop observation that is missing 2/10 questions on CES-D
scale;
if study_id eq 0100601 then delete;


*Create binary outcome for presence (at baseline) of STI;
sti_total=0;
if syphilis_rpr=1 then sti_total=1;
if chlamydia=1 then sti_total=1;
if gc=1 then sti_total=1;
if tvaginalis=1 then sti_total=1;
if chlamydia_rectal=1 then sti_total=1;
if gc_rectal=1 then sti_total=1;


*Create var for total response for CAGE scale questions;
cage=0;
if drink_cut=. then cage=.;
if drink_critic=. then cage=.;
if drink_guilt=. then cage=.;
if drink_morning=. then cage=.;
if drink_cut=1 then cage=cage+1;
if drink_critic=1 then cage=cage+1;
if drink_guilt=1 then cage=cage+1;
if drink_morning=1 then cage=cage+1;

*Create binary var for CAGE outcome.  3-4 indicates
problematic alcohol use;
if cage gt . and cage le 2 then drink=0;
if cage gt 2 then drink=1;
```

```
*Create categorized variable for age;
if age_baseline lt 25 then age_25=0;
if age_baseline ge 25 then age_25=1;


*Recode race var as 0,1 var - set white race as referent;
if race_inc eq 1 then race_inc=1;
if race_inc eq 4 then race_inc=0;
if race_inc eq 7 then race_inc=.;


*Fix coding for injection drug use - reverse original
coding;
if inject eq . then inject=.;
else if inject eq 1 then inject=0;
else inject=1;

*Combine drug use variables;
druguse=0;
if noninjection=1 then druguse=1;
if inject=1 then druguse=1;


*Create var for total number of exchange partners, p12m;
exchangep12m=0;
if male_exchangep12m=1 then exchangep12m=1;
if female_exchangep12m=1 then exchangep12m=1;
if mtf_exchangep12m=1 then exchangep12m=1;
if ftm_exchangep12m=1 then exchangep12m=1;


*Combine var for sexual abuse;
abuse_sexual=0;
if abuse_child_sexabuse=1 then abuse_sexual=1;
if abuse_adult_sexabuse=1 then abuse_sexual=1;

*Combine var for physical abuse;
abuse_physical=0;
if abuse_child_physabuse=1 then abuse_physical=1;
if abuse_adult_physabuse=1 then abuse_physical=1;


*Collapse var levels for income;
if income eq 01 then income=00;
if income eq 02 then income=00;
if income eq 04 then income=03;
if income eq 05 then income=03;
if income eq 07 then income=06;
if income eq 08 then income=06;

*Collapse var levels for health insurance;
if insurance_status eq 3 then insurance_status=2;
if insurance_status eq 4 then insurance_status=2;
if insurance_status eq 11 then insurance_status=7;
if insurance_status eq 12 then insurance_status=6;
```

```
*Set 'don't know' responses to missing;
if living eq 5 then living=.;
if homeless eq 9 then homeless=.;
if income eq 99 then income=.;
if money4health eq 7 then money4health=.;

*Collapse variable levels;
if educ eq 4 then educ=3;
if living eq 3 then living=1;
if money4meds eq 0 then money4meds=1;
if money4meds eq 2 then money4meds=3;
if money4health eq 0 then money4health=1;
if money4health eq 2 then money4health=3;


*Set N/A to missing - community support/racism var;
if comm_trust eq 8 then comm_trust=.;
if comm_hire eq 8 then comm_hire=.;
if comm_opinion eq 8 then comm_opinion=.;
if comm_member eq 8 then comm_member=.;
if comm_badplace eq 8 then comm_badplace=.;
if comm_athome eq 8 then comm_athome=.;
if racism_service eq 7 then racism_service=.;


*Label new variables;
label cage="CAGE Questionnaire"
        drink="Alcohol Problem"
        age_25="Age Group";



*Create a dichotomas insurance var to examine OR output;
insurance2=0;
if insurance_status eq 7 then insurance2=0;
if insurance_status eq 0 then insurance2=0;
if insurance_status eq 1 then insurance2=1;
if insurance_status eq 2 then insurance2=1;
if insurance_status eq 6 then insurance2=1;

/*Create a dichotomas income var to examine OR output -
had to white out previous recoding of income!!!!!;
if income eq 00 then income2=0;
if income eq 01 then income2=0;
if income eq 02 then income2=0;
if income eq 03 then income2=0;
if income eq 04 then income2=0;
if income eq 05 then income2=1;
if income eq 06 then income2=1;
if income eq 07 then income2=1;
if income eq 08 thne income2=1;*/


*Creat dichotomas racism var;
if racism_rights=. then racism_rights2=.;
if racism_rights eq 1 then racism_rights2=0;
```

```
            if racism_rights eq 2 then racism_rights2=0;
            if racism_rights eq 3 then racism_rights2=1;
            if racism_rights eq 4 then racism_rights2=1;
            if racism_rights eq 5 then racism_rights2=1;

            if racism_fear=. then racism_fear2=.;
            if racism_fear eq 1 then racism_fear2=0;
            if racism_fear eq 2 then racism_fear2=0;
            if racism_fear eq 3 then racism_fear2=1;
            if racism_fear eq 4 then racism_fear2=1;
            if racism_fear eq 5 then racism_fear2=1;

            if racism_stupid=. then racism_stupid2=.;
            if racism_stupid eq 1 then racism_stupid2=0;
            if racism_stupid eq 2 then racism_stupid2=0;
            if racism_stupid eq 3 then racism_stupid2=1;
            if racism_stupid eq 4 then racism_stupid2=1;
            if racism_stupid eq 5 then racism_stupid2=1;

            *Create dichotomas var to examine OR output for comm_trust;
            if comm_trust=. then comm_trust2=.;
            if comm_trust eq 1 then comm_trust2=0;
            if comm_trust eq 2 then comm_trust2=0;
            if comm_trust eq 3 then comm_trust2=0;
            if comm_trust eq 4 then comm_trust2=1;
            if comm_trust eq 5 then comm_trust2=1;


            *Categorize #sexpartners into quartiles;
            if anysex_howmanyp12m gt . and anysex_howmanyp12m le 3 then
            nsexpart=0;
            else if anysex_howmanyp12m gt 3 and anysex_howmanyp12m le 5
            then nsexpart=1;
            else if anysex_howmanyp12m gt 5 and anysex_howmanyp12m le
            10 then nsexpart=2;
            else if anysex_howmanyp12m gt 10 then nsexpart=3;

            *Dichotomize #sexpartners;
            if anysex_howmanyp12m gt . and anysex_howmanyp12m le 5 then
            nsexpartd=0;
            else if anysex_howmanyp12m gt 5 then nsexpartd=1;

run;



*Examine variables in dataset.  Compare with variables in data
dictionary;
proc contents data=work.involve;
run;



*Print all the observations in the dataset to get to know data;
```

```
*Examine all HIVneg obs: if obs is missing answers for majority of
ques,
remove obs - limit to var that you are interested in!!!;
data work.temp;
      set work.involve;

      keep Chlamydia  Chlamydia_rectal  GC  GC_rectal  RACE_INC
STUDY_ID  Syphilis_IgG  Syphilis_RPR  Syphilis_Titer  Tvaginalis
URINESTI  abuse_adult_physabuse  abuse_adult_sexabuse
abuse_child_physabuse  abuse_child_sexabuse  age_25  age_baseline
anysex_howmanyp12m  arrested_ever  arrested_p12m_final  baseline_hiv
bdi_disappointed0  bdi_disappointed1  bdi_disappointed2
bdi_disappointed3  bdi_failure0  bdi_failure1
bdi_failure2  bdi_failure3  bdi_faults0  bdi_faults1  bdi_faults2
bdi_faults3  bdi_future0  bdi_future1  bdi_future2  bdi_future3
bdi_sad0  bdi_sad1  bdi_sad2  bdi_sad3  bdi_satisfaction0
bdi_satisfaction1  bdi_satisfaction2  bdi_satisfaction3  bdi_suicide0
bdi_suicide1  bdi_suicide2  bdi_suicide3  cage  cesd_badsleep
cesd_bother  cesd_concentrate  cesd_depressed  cesd_effort
cesd_fearful  cesd_getgoing  cesd_happy  cesd_hopeful
cesd_lonely  cesd_total  comm_athome  comm_badplace  comm_bettercom
comm_child  comm_enjoy  comm_events  comm_failure  comm_friend
comm_gayfriends  comm_hire  comm_lesbian  comm_member
comm_opinion  comm_stay  comm_treat  comm_trust  drink  drink_critic
drink_cut  drink_guilt  drink_morning  educ  employed_now
female_exchangep12m  female_howmanyp12m  ftm_exchangep12m
ftm_howmanyp12m  homeless  income  insurance_status  living  mUAIp12m
male_UAIp12m_final  male_exchangep12m  male_howmanyp12m
male_howmanyp12m_final  met_behav_crit  money4health
money4meds  mtf_exchangep12m  mtf_howmanyp12m  noninjection
nopay_disable  nopay_fullstu  nopay_home  nopay_nojob_less12m
nopay_nojob_more12m  nopay_partstu  nopay_vol  orient
paid_disable  paid_fullstu  paid_fulltime  paid_home  paid_ill
paid_nojob_less12m  paid_nojob_more12m  paid_partstu  paid_parttime
paid_vol  paid_work_before  poverty  racism_another  racism_fear
racism_ignored  racism_insensitive  racism_mistaken
racism_paranoid  racism_rights  racism_service  racism_stared
racism_stupid  racism_witness  work_type;

run;

proc print data=work.temp;
run;

proc print data=work.involve;
      var study_id anysex_howmanyp12m;
run;

proc print data=work.invovle;
      var study_id cesd_total;
      where cesd_total=.;
run;



*Examine HIV status: limit dataset to HIV negative obs;
```

```
proc freq data=work.involve;
      tables baseline_hiv;
run;

*Examine race variable;
proc freq data=work.involve;
      tables race_inc;
run;

*Check recoding of race var;
proc freq data=work.involve;
      tables race_inc/list missing;
run;


*Check coding for new cage variables;
proc freq data=work.involve;
      tables cage*drink_cut*drink_critic*drink_guilt*drink_morning/list
      missing;
run;

proc freq data=work.involve;
      tables cage*drink/list missing;
run;


*Check coding for new age variable;
proc freq data=work.involve;
      tables age_baseline*age_25/list missing;
run;


*CES-D var;
*Check coding for recoded CES-D positive var;
proc freq data=work.involve;
      tables cesd_hopeful*cesd_hopefulp cesd_happy*cesd_happyp/missing;
run;

*Check coding for total response on CES-D;
proc freq data=work.involve;
      tables cesd_total*cesd_bother*cesd_concentrate*cesd_depressed*
      cesd_effort*cesd_hopefulp*cesd_fearful*cesd_badsleep*cesd_happyp*
      cesd_lonely*cesd_getgoing/list missing;
run;

*Check coding for CES-D binary outcome;
proc freq data=work.involve;
      tables cesd_total*cesd/list missing;
run;


*Check coding of sti_total var;
proc freq data=work.involve;
      tables sti_total*syphilis_rpr*chlamydia*gc*tvaginalis*
      chlamydia_rectal*gc_rectal/list missing;
run;
```

```
*Check coding of drug use var;
proc freq data=work.involve;
      tables inject/list missing;
run;

proc freq data=work.involve;
      tables druguse*noninjection*inject/list missing;
run;


*Check freq of sti_total var;
proc freq data=work.involve;
      tables sti_total/list missing;
run;


*Check coding of exchange partner var;
proc freq data=work.involve;
      tables exchangep12m*male_exchangep12m*female_exchangep12m*
      mtf_exchangep12m*ftm_exchangep12m/
      list missing;
run;


*Check coding of abuse var;
proc freq data=work.involve;
      tables abuse_physical*abuse_adult_physabuse*abuse_child_physabuse
      abuse_sexual*abuse_adult_sexabuse*abuse_child_sexabuse/list
      missing;
run;


*Check coding of var that had 'don't know' responses recoded as
missing;
proc freq data=work.involve;
      tables living homeless income/list missing;
run;


*Check coding of var after collapsing levels;
proc freq data=work.involve;
      tables educ living money4meds money4health/list missing;
run;


*Check coding of var after collapsing levels - income, insurance;
proc freq data=work.involve;
      tables income insurance_status/list missing;
run;


*Check coding of dichotomized insurance var (insurance2);
proc freq data=work.involve;
      tables insurance_status*insurance2/list missing;
run;
```

```
*Check coding of dichotomized income var (income2);
proc freq data=work.involve;
      tables income*income2/list missing;
run;

*Check coding of dichotomized racism and comm var;
proc freq data=work.involve;
      tables racism_rights*racism_rights2 racism_fear*racism_fear2
      racism_stupid*racism_stupid2/list missing;
run;

proc freq data=work.involve;
      tables comm_trust*comm_trust2/list missing;
run;


*Check coding of new categorized #sexpartners var;
proc freq data=work.involve;
      tables anysex_howmanyp12m*nsexpart/list missing;
run;

proc freq data=work.involve;
      tables anysex_howmanyp12m*nsexpartd/list missing;
run;




*------------------------------------------------------------------------;
* Univariate analysis of continuous variables                            ;
*------------------------------------------------------------------------;
*Age at baseline;
proc univariate data=work.involve;
      var age_baseline;
      class race_inc;
      histogram age_baseline;
      inset mean;
run;
*Extreme ages above 39 - keep or delete?;


*Number of sex partners, last 12 mo;
proc univariate data=work.involve;
      var anysex_howmanyp12m;
      class race_inc;
      histogram anysex_howmanyp12m;
      inset mean;
run;
*Not normal!  Very skewed;
*Outlier:  475 partners (study_id: 0201311) - keep or delete?;

*Examine #of sex partners further to ensure correct variable being
used;
proc univariate data=work.involve;
      var male_howmanyp12m;
run;
*In total dataset (HIV - and +): mean 13.4/ median 6.0;
```

```
*Among HIV-: mean 11.5/ median 6.0;

proc univariate data=work.involve;
      var male_howmanyp12m_final anysex_howmanyp12m;
run;



*-------------------------------------------------------------------------;
* Univariate analysis of categorical variables                           ;
*-------------------------------------------------------------------------;
*Check distributions, implausible values, missings for drink variables;
proc freq data=work.involve;
      tables drink_cut drink_critic drink_guilt drink_morning/list
      missing;
run;
*Number missing:  drink_cut 22, drink_critic 25, drink_guilt 27,
drink_morning 26;


*Check exchange variables - possibly combine;
proc freq data=work.involve;
      tables male_exchangep12m female_exchangep12m mtf_exchangep12m
      ftm_exchangep12m;
run;


*Check abuse variables - possibly combine;
proc freq data=work.involve;
      tables abuse_child_physabuse abuse_child_sexabuse
      abuse_adult_physabuse abuse_adult_sexabuse/list missing;
run;


*STI variables;
proc freq data=work.involve;
      tables chlamydia gc tvaginalis syphilis_rpr syphilis_titer
      syphilis_IgG chlamydia_rectal gc_rectal/list missing;
run;

*STI variables to be used for creating binomial STI variable;
proc freq data=work.involve;
      tables chlamydia gc tvaginalis syphilis_rpr chlamydia_rectal
      gc_rectal/list missing;
run;


*Check coding of derived varibale - total #sex partners p12m;
proc freq data=work.involve;
      tables anysex_howmanyp12m*male_howmanyp12m*female_howmanyp12m*
      mtf_howmanyp12m*ftm_howmanyp12m/list missing;
run;


*Determine when data collection started;
proc freq data=work.involve;
```

```
      tables dt_enroll/list missing;
run;
*For total dataset, enrollment from 7/24/10 to 12/01/11;



*-------------------------------------------------------------------------;
* Bivariate analysis of continuous variables - logit plots               ;
*-------------------------------------------------------------------------;
%include 'H:\THESIS\logit_plot_macro.sas';

*Call the macro;
%logitplot(work.involve, cesd, age_baseline, NumBins=5);
run;



*-------------------------------------------------------------------------;
* Bivariate analysis of categorical variables                            ;
*-------------------------------------------------------------------------;
*-------------------------------------------------------------------------;
* Output data for Table 1: Categorical var                               ;
*-------------------------------------------------------------------------;
proc freq data=work.involve;
      tables sexp12m_f poverty age_25
           orient money4meds money4health mUAIp12m homeless income
           living insurance_status employed_now educ arrested_ever
           arrested_p12m_final HIVtest_ever exchangep12m abuse_physical
           abuse_sexual noninjection inject sti_total druguse drink/
            list missing;
run;
*** Lots of missing data: annual income 9 + don't know 10,
      health insurance status 20 no answer/don't know/did not specify,
      poverty 52;

proc freq data=work.involve;
      tables insurance2/list missing;
run;



*Fill in table 1 stratified columns;
proc freq data=work.involve;
      tables race_inc*cesd*age_25/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*arrested_ever/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*arrested_p12m_final/chisq relrisk cmh;
run;
```

```
proc freq data=work.involve;
      tables race_inc*cesd*educ/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*employed_now/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*HIVtest_ever/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*homeless/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*income/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*insurance_status/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*living/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*exchangep12m/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*mUAIp12m/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*money4meds/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*money4health/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*orient/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*poverty/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*sexp12m_f/chisq relrisk cmh;
run;

proc freq data=work.involve;
```

```
      tables race_inc*cesd*abuse_physical/chisq relrisk cmh;
run;
proc freq data=work.involve;
      tables race_inc*cesd*abuse_sexual/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*noninjection/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*inject/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*sti_total/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*druguse/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*nsexpart/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*nsexpartd/chisq relrisk cmh;
run;


*Examine dichotomized var (re:obtain OR);
proc freq data=work.involve;
      tables race_inc*cesd*insurance2/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*income2/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*comm_trust2/chisq relrisk cmh;
run;



*Fill in table 1 overall (crude) column;
proc freq data=work.involve;
      tables cesd*race_inc/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*age_25/chisq relrisk cmh;
run;

proc freq data=work.involve;
```

```
      tables cesd*arrested_ever/chisq relrisk cmh;
run;
proc freq data=work.involve;
      tables cesd*arrested_p12m_final/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*educ/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*employed_now/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*HIVtest_ever/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*homeless/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*income/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*insurance_status/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*living/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*exchangep12m/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*mUAIp12m/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*money4meds/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*money4health/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*orient/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*poverty/chisq relrisk cmh;
run;
```

```
proc freq data=work.involve;
      tables cesd*sexp12m_f/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*abuse_physical/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*abuse_sexual/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*noninjection/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*inject/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*sti_total/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*druguse/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*nsexpart/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*nsexpartd/chisq relrisk cmh;
run;


*Examine dichotomized var (re:obtain OR);
proc freq data=work.involve;
      tables cesd*insurance2/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*income2/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*comm_trust2/chisq relrisk cmh;
run;


*-------------------------------------------------------------------------;
* Output data for Table 1: Continuous var                                 ;
*-------------------------------------------------------------------------;
proc univariate data=work.involve;
      var age_baseline anysex_howmanyp12m cesd_total;
```

```
run;

*Outcome frequency;
proc freq data=work.involve;
      tables cesd/list missing;
run;

*Outcome by race;
proc freq data=work.involve;
      tables cesd*race_inc/chisq relrisk cmh;
run;

*Determine mean age;
proc univariate data=work.involve;
      var age_baseline;
      where race_inc eq 1;
run;

proc univariate data=work.involve;
      var age_baseline;
      where race_inc eq 0;
run;


*Determine mean of outcome (cesd_total) by race;
proc univariate data=work.involve;
      var cesd_total;
      where race_inc eq 1 and cesd eq 1;
run;

proc univariate data=work.involve;
      var cesd_total;
      where race_inc eq 1 and cesd eq 0;
run;

proc univariate data=work.involve;
      var cesd_total;
      where race_inc eq 0 and cesd eq 1;
run;

proc univariate data=work.involve;
      var cesd_total;
      where race_inc eq 0 and cesd eq 0;
run;


proc univariate data=work.involve;
      var cesd_total;
      where cesd eq 0;
run;

proc univariate data=work.involve;
      var cesd_total;
      where cesd eq 1;
run;

proc univariate data=work.involve;
```

```
      var cesd_total;
      where race_inc eq 1;
run;

proc univariate data=work.involve;
      var cesd_total;
      where race_inc eq 0;
run;


*Determine mean number of sex partners, by race;
proc univariate data=work.involve;
      var anysex_howmanyp12m;
      where race_inc eq 1 and cesd eq 1;
run;

proc univariate data=work.involve;
      var anysex_howmanyp12m;
      where race_inc eq 1 and cesd eq 0;
run;

proc univariate data=work.involve;
      var anysex_howmanyp12m;
      where race_inc eq 4 and cesd eq 1;
run;

proc univariate data=work.involve;
      var anysex_howmanyp12m;
      where race_inc eq 4 and cesd eq 0;
run;



*Determine overall signif of #sexpartners - ttest;
proc ttest data=work.involve alpha=0.05;
      var anysex_howmanyp12m;
      class cesd;
run;
*Conclusion: not significant by depression status;

*Determine signif of #sexpartners vs race - ttest;
proc ttest data=work.involve alpha=0.05;
      var anysex_howmanyp12m;
      class race_inc;
run;
*Conclusion: #sexpartners is signif by race;

*Determine overall signif of #sexpartners - Wilcoxon Rank Sum;
proc npar1way data=work.involve wilcoxon;
      class cesd;
      var anysex_howmanyp12m;
run;
*Conclusion: significant;

*Determine signif of #sexpartners vs race - Wilcoxon Rank Sum;
proc npar1way data=work.involve wilcoxon;
      class race_inc;
```

```
      var anysex_howmanyp12m;
run;
*Conclusion: highly significant;

*Determine significance of stratified continuous variables: 2 way
ANOVA;



*Determine overall signif of mean cesd score (cesd_total) by race;
proc ttest data=work.involve alpha=0.05;
      var cesd_total;
      class race_inc;
run;
*There is not a significant difference by race p=0.21;
*somewhat different variance;



*-------------------------------------------------------------------;
* Work with CAGE scale/alcohol data                                 ;
*-------------------------------------------------------------------;
*Check distributions, implausible values, missings for drink variables;
proc freq data=work.involve;
      tables drink_cut drink_critic drink_guilt drink_morning/list
      missing;
run;
*Number missing:  drink_cut 22, drink_critic 25, drink_guilt 27,
drink_morning 26;

proc freq data=work.involve;
      tables cage*drink_cut*drink_critic*drink_guilt*drink_morning/list
      missing;
run;

proc freq data=work.involve;
      tables cage*drink/list missing;
run;

proc freq data=work.involve;
      tables drink/list missing;
run;
*There are 28 obs with missing data for any or all CAGE variables - set
to missing;


*Dataset has 366 obs;
data work.cage;
      set work.involve;

      if drink_cut=. then delete;
      if drink_critic=. then delete;
      if drink_guilt=. then delete;
      if drink_morning=. then delete;
```

```
      *Create var for total response for CAGE scale questions;
      cage=0;
      if drink_cut=1 then cage=cage+1;
      if drink_critic=1 then cage=cage+1;
      if drink_guilt=1 then cage=cage+1;
      if drink_morning=1 then cage=cage+1;

      *Create binary var for CAGE outcome.  3-4 indicates problematic
      alcohol use;
      if cage gt . and cage le 2 then drink=0;
      if cage gt 2 then drink=1;

run;


*Check coding and frequencies in new CAGE dataset;
proc freq data=work.cage;
      tables cage*drink_cut*drink_critic*drink_guilt*drink_morning/list
      missing;
run;

proc freq data=work.cage;
      tables cage*drink/list missing;
run;

proc freq data=work.cage;
      tables drink/list missing;
run;


*Table 1 output;
proc freq data=work.cage;
      tables race_inc*cesd*drink/chisq relrisk cmh;
run;

proc freq data=work.cage;
      tables cesd*drink/chisq relrisk cmh;
run;

proc freq data=work.cage;
      tables drink/list missing;
run;




*-------------------------------------------------------------------------;
* Examine var that have to do with racial or gay stigma                   ;
*-------------------------------------------------------------------------;
proc freq data=work.involve;
      tables comm_trust comm_hire comm_opinion comm_member
             comm_badplace comm_athome racism_rights racism_witness
             racism_fear racism_stupid racism_service
             /list missing;
run;
```

```
*Stratified;
proc freq data=work.involve;
      tables race_inc*cesd*comm_trust/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*comm_hire/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*comm_opinion/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*comm_member/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*comm_badplace/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*comm_athome/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*racism_rights/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*racism_witness/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*racism_fear/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*racism_stupid/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*racism_service/chisq relrisk cmh;
run;


*Dichotomized racism var;
proc freq data=work.involve;
      tables race_inc*cesd*racism_rights2/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*racism_fear2/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables race_inc*cesd*racism_stupid2/chisq relrisk cmh;
```

```
run;

*Not stratified;
proc freq data=work.involve;
      tables cesd*comm_trust/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*comm_hire/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*comm_opinion/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*comm_member/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*comm_badplace/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*comm_athome/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*racism_rights/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*racism_witness/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*racism_fear/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*racism_stupid/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*racism_service/chisq relrisk cmh;
run;


*Dichotomized racism var;
proc freq data=work.involve;
      tables cesd*racism_rights2/chisq relrisk cmh;
run;

proc freq data=work.involve;
      tables cesd*racism_fear2/chisq relrisk cmh;
run;
```

```
proc freq data=work.involve;
      tables cesd*racism_stupid2/chisq relrisk cmh;
run;



*-------------------------------------------------------------------------;
* Impute cesd score (cesd) for obs with missing cesd_total (13 obs)   ;
*-------------------------------------------------------------------------;
proc print data=work.involve noobs;
      where cesd_total=.;
      var study_id cesd_total cesd_bother cesd_concentrate
      cesd_depressed cesd_effort cesd_hopefulp
      cesd_fearful cesd_badsleep cesd_happyp cesd_lonely cesd_getgoing;
run;
*Obs missing cesd_total:
0100301 0101371 0101871 0200021 0200321 0200711 0200821
0200931 0202221 0202291 0300091 0300741 0301441;


data work.imputation;
      set work.involve;

      if cesd_total ne . then delete;

      if cesd_bother eq . then cesd_bother=0;
      if cesd_concentrate eq . then cesd_concentrate=0;
      if cesd_depressed eq . then cesd_depressed=0;
      if cesd_effort eq . then cesd_effort=0;
      if cesd_hopefulp eq . then cesd_hopefulp=0;
      if cesd_fearful eq . then cesd_fearful=0;
      if cesd_badsleep eq . then cesd_badsleep=0;
      if cesd_happyp eq . then cesd_happyp=0;
      if cesd_lonely eq . then cesd_lonely=0;
      if cesd_getgoing eq . then cesd_getgoing=0;

      cesd_total=0;
      cesd_total=cesd_bother+cesd_concentrate+cesd_depressed+
      cesd_effort+cesd_hopefulp+
      cesd_fearful+cesd_badsleep+cesd_happyp+cesd_lonely+cesd_getgoing;

run;


proc print data=work.imputation noobs;
      var study_id cesd_total cesd_bother cesd_concentrate
      cesd_depressed cesd_effort
      cesd_hopefulp cesd_fearful cesd_badsleep cesd_happyp cesd_lonely
      cesd_getgoing;
run;


*Check recoding;
proc print data=work.involve noobs;
      var study_id cesd_total cesd_bother cesd_concentrate
      cesd_depressed cesd_effort
```

```
      cesd_hopefulp cesd_fearful cesd_badsleep cesd_happyp cesd_lonely
      cesd_getgoing;
run;



*------------------------------------------------------------------------;
* Modeling: not stratified (race as covariate), age categorical         ;
*------------------------------------------------------------------------;
data work.model;
      set work.involve;
run;


*Starting model for backwards elimination;
***add race interaction terms - make sure model is hierarchically well
formulated***;
proc logistic data=work.model descending;
      model cesd = race_inc age_25 noninjection drink mUAIp12m
      abuse_physical abuse_sexual
      exchangep12m m4hoften m4halway m4moften m4malway m4mna
      racism_rights2 racism_fear2
      racism_stupid2 comopdis comopneu comopagr comopsta combpdis
      combpneu combpagr combpsta
      comahdis comahneu comahagr comahsta nsexpartd noninjrace;
run;


*Model I with automatic process: backward elimination;
*18 covariates and 1 interaction term;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 nsexpartd noninjection drink
                  mUAIp12m employed_now money4meds money4health
                  abuse_physical abuse_sexual exchangep12m
                  racism_rights2 racism_fear2 racism_stupid2
                  comm_opinion comm_badplace comm_athome
                  race_inc|noninjection
```

```
                  /selection=backward slstay=0.05 include=2 lackfit
rsq;
run;


*Model II:  10 covariates and additional possible (two-way) interaction
terms, backward;
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
            employed_now abuse_physical exchangep12m racism_stupid2
            comm_athome

            race_inc|age_25|noninjection|drink|mUAIp12m|employed_now|

            abuse_physical|exchangep12m|racism_stupid2|comm_athome
            @2/selection=backward slstay=0.05 include=2 lackfit rsq;
run;


*Model III: all 18 covariates plus all possible (two-way) interaction
terms, backward;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc|age_25|nsexpartd|noninjection|drink|
      mUAIp12m|employed_now|money4meds|money4health|abuse_physical|
      abuse_sexual|exchangep12m|racism_rights2|racism_fear2|
```

```
      racism_stupid2|comm_opinion|comm_badplace|comm_athome
      @2/selection=backward slstay=0.05 include=2 lackfit rsq;
run;
*Model IV: all 18 covariates plus (two-way) interaction terms w/race,
backward;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 nsexpartd noninjection drink
            mUAIp12m employed_now money4meds money4health
            abuse_physical abuse_sexual exchangep12m racism_rights2
            racism_fear2 racism_stupid2 comm_opinion comm_badplace
            comm_athome

                        race_inc|age_25
                        race_inc|nsexpartd
                        race_inc|noninjection
                        race_inc|drink
                        race_inc|mUAIp12m
                        race_inc|employed_now
                        race_inc|money4meds
                        race_inc|money4health
                        race_inc|abuse_physical
                        race_inc|abuse_sexual
                        race_inc|exchangep12m
                        race_inc|racism_rights2
                        race_inc|racism_fear2
                        race_inc|racism_stupid2
                        race_inc|comm_opinion
                        race_inc|comm_badplace
                        race_inc|comm_athome
                        /selection=backward slstay=0.05 include=2
      lackfit rsq;

run;


*Model V: all 18 covariates plus (two-way) interaction terms w/race,
backward
***#sexp12m as continuous var***;
```

```
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 anysex_howmanyp12m noninjection
            drink mUAIp12m employed_now money4meds money4health
            abuse_physical abuse_sexual exchangep12m
            racism_rights2 racism_fear2 racism_stupid2
            comm_opinion comm_badplace comm_athome

                        race_inc|age_25
                        race_inc|anysex_howmanyp12m
                        race_inc|noninjection
                        race_inc|drink
                        race_inc|mUAIp12m
                        race_inc|employed_now
                        race_inc|money4meds
                        race_inc|money4health
                        race_inc|abuse_physical
                        race_inc|abuse_sexual
                        race_inc|exchangep12m
                        race_inc|racism_rights2
                        race_inc|racism_fear2
                        race_inc|racism_stupid2
                        race_inc|comm_opinion
                        race_inc|comm_badplace
                        race_inc|comm_athome
                        /selection=backward slstay=0.05 include=2
      lackfit rsq;

run;


*Model VI: 9 significant variables, 2 interactions with race +
comm_opinion (HWF), backward;
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
```

```
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  comm_opinion (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
            employed_now abuse_physical racism_stupid2 comm_athome
            comm_opinion race_inc|noninjection race_inc|comm_opinion

            /selection=backward slstay=0.05 include=2 lackfit rsq;

run;


*Model VIII: 9 significant variables + comm_opinion, backward  (droped
interaction terms);
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  comm_opinion (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
            employed_now abuse_physical racism_stupid2 comm_athome
            comm_opinion

            /selection=backward slstay=0.05 include=2 lackfit rsq;

run;


*Model IX:  10 covariates + exchangep12m, backward;
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  comm_opinion (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
                  employed_now abuse_physical racism_stupid2
                  comm_athome comm_opinion exchangep12m
```

```
            /selection=backward slstay=0.05 include=2 lackfit rsq;

run;

*Model X:  10 covariates + money4meds, backward;
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  money4meds (param=ref ref='Not often')
                  comm_opinion (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
                  employed_now abuse_physical racism_stupid2
                  comm_athome comm_opinion money4meds

            /selection=backward slstay=0.05 include=2 lackfit rsq;

run;


*Model XI: all 18 covariates, backward;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 nsexpartd noninjection drink
                  mUAIp12m employed_now money4meds money4health
                  abuse_physical abuse_sexual exchangep12m
                  racism_rights2 racism_fear2 racism_stupid2
                  comm_opinion comm_badplace
                  comm_athome
```

```
                  /selection=backward slstay=0.05 include=2 lackfit
      rsq;

run;
*Model XII: 8 SIGNIF var from Model XI, add exchangep12m/test for
confounding, backward;
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
                  employed_now abuse_physical exchangep12m
                  racism_stupid2 comm_athome
                  /selection=backward slstay=0.05 include=2 lackfit
      rsq;

run;


*Model XIII: 8 SIGNIF var from Model XI, add money4meds/test for
confounding, backward;
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  money4meds (param=ref ref='Not often')
                  racism_stupid2 (param=ref ref='0')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
                  employed_now abuse_physical money4meds racism_stupid2
                  comm_athome
                  /selection=backward slstay=0.05 include=2 lackfit
      rsq;

run;


*Model XIV: 8 SIGNIF var from Model XI, add comm_opinion/test for
confounding, backward;
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
```

```
                    age_25 (param=ref ref='0')
                    noninjection (param=ref ref='No')
                    drink (param=ref ref='0')
                    mUAIp12m (param=ref ref='No')
                    employed_now (param=ref ref='No')
                    abuse_physical (param=ref ref='0')
                    comm_opinion (param=ref ref='Strongly disagree')
                    racism_stupid2 (param=ref ref='0')
                    comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
                    employed_now abuse_physical comm_opinion
                    racism_stupid2 comm_athome
                    /selection=backward slstay=0.05 include=2 lackfit
      rsq;

run;


*Model XV:  final model 4/19/12, backward 0.05;
*NOT USING THIS ANYMORE;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
                  employed_now abuse_physical racism_stupid2
                  comm_athome
                  /selection=backward slstay=0.05 include=2 lackfit
      rsq;

run;


*Model XVI: NEW FINAL MODEL - race, age, 7 signif covariates +
interaction term;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 noninjection drink mUAIp12m
                  exchangep12m racism_stupid2 comm_opinion
                  comm_badplace race_inc*noninjection
```

```
                  /selection=backward slstay=0.05 include=2 lackfit
      rsq;

contrast 'race=1 noninj=1 r*n=1 vs reference' race_inc 1 noninjection 1
race_inc*noninjection 1/est=exp;
contrast 'race=1 noninj=0 vs reference' race_inc 1/est=exp;
contrast 'race=0 noninj=1 vs reference' noninjection 1/est=exp;

contrast 'among black' race_inc 0 noninjection 1 race_inc*noninjection
1/est=exp;
contrast 'among white' race_inc 0 noninjection 1 race_inc*noninjection
0/est=exp;

run;


*Model XVII: Is employed_now a confounder in the above model?;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  employed_now (param=ref ref='No')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 employed_now noninjection drink
                  mUAIp12m exchangep12m
                  racism_stupid2 comm_opinion comm_badplace
                  race_inc*noninjection
                  /selection=backward slstay=0.05 include=3 lackfit
      rsq;

contrast 'race=1 noninj=1 r*n=1 vs reference' race_inc 1 noninjection 1
race_inc*noninjection 1/est=exp;
contrast 'race=1 noninj=0 vs reference' race_inc 1/est=exp;
contrast 'race=0 noninj=1 vs reference' noninjection 1/est=exp;

contrast 'among black' race_inc 0 noninjection 1 race_inc*noninjection
1/est=exp;
contrast 'among white' race_inc 0 noninjection 1 race_inc*noninjection
0/est=exp;

run;
*Conclusion:  employed_now not a confounder;


*Model XVIII: Is abuse_physical a confounder in the above model?;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  abuse_physical (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
```

```
                    mUAIp12m (param=ref ref='No')
                    exchangep12m (param=ref ref='0')
                    racism_stupid2 (param=ref ref='0')
                    /*comm_opinion (param=ref ref='Strongly disagree')
                    comm_badplace (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 abuse_physical noninjection drink
                    mUAIp12m exchangep12m
                    racism_stupid2 comm_opinion comm_badplace
                    race_inc*noninjection
                    /selection=backward slstay=0.05 include=3 lackfit
      rsq;

contrast 'race=1 noninj=1 r*n=1 vs reference' race_inc 1 noninjection 1
race_inc*noninjection 1/est=exp;
contrast 'race=1 noninj=0 vs reference' race_inc 1/est=exp;
contrast 'race=0 noninj=1 vs reference' noninjection 1/est=exp;

contrast 'among black' race_inc 0 noninjection 1 race_inc*noninjection
1/est=exp;
contrast 'among white' race_inc 0 noninjection 1 race_inc*noninjection
0/est=exp;

run;
*Conclusion:  abuse_physical not a confounder;


*Model XIX: Is money4meds a confounder in the above model?;
proc logistic data=work.model descending;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  money4meds (param=ref ref='Not often')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 money4meds noninjection drink
                  mUAIp12m exchangep12m
                  racism_stupid2 comm_opinion comm_badplace
                  race_inc*noninjection
                  /selection=backward slstay=0.05 include=3 lackfit
      rsq;

contrast 'race=1 noninj=1 r*n=1 vs reference' race_inc 1 noninjection 1
race_inc*noninjection 1/est=exp;
contrast 'race=1 noninj=0 vs reference' race_inc 1/est=exp;
contrast 'race=0 noninj=1 vs reference' noninjection 1/est=exp;

contrast 'among black' race_inc 0 noninjection 1 race_inc*noninjection
1/est=exp;
contrast 'among white' race_inc 0 noninjection 1 race_inc*noninjection
0/est=exp;
```

```
run;
*Conclusion:  money4meds not signif, not a confounder;

***no race interaction terms when stratifying on race + take race out
of model***;
*-------------------------------------------------------------------------;
* Modeling: stratified (black race)                                       ;
*-------------------------------------------------------------------------;
data work.modelblack;
      set work.model (where=(race_inc=1));
run;


*Model A: 17 covariates backward selection;
proc logistic data=work.modelblack descending;
      class       age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 nsexpartd noninjection drink mUAIp12m
                  employed_now money4meds money4health abuse_physical
                  abuse_sexual exchangep12m racism_rights2 racism_fear2
                  racism_stupid2 comm_opinion comm_badplace
                  comm_athome/selection=backward slstay=0.05 include=1
lackfit rsq;
run;


*Model E: 17 covariates forward selection;
proc logistic data=work.modelblack descending;
      class       age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
```

```
                racism_stupid2 (param=ref ref='0')
                /*comm_opinion (param=ref ref='Strongly disagree')
                comm_badplace (param=ref ref='Strongly disagree')
                comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 nsexpartd noninjection drink mUAIp12m
                employed_now money4meds money4health abuse_physical
                abuse_sexual exchangep12m racism_rights2 racism_fear2
                racism_stupid2 comm_opinion comm_badplace
                comm_athome/selection=forward slstay=0.05 include=1
lackfit rsq;
run;


*Model F: 17 covariates stepwise selection;
proc logistic data=work.modelblack descending;
      class       age_25 (param=ref ref='0')
                nsexpartd (param=ref ref='0')
                noninjection (param=ref ref='No')
                drink (param=ref ref='0')
                mUAIp12m (param=ref ref='No')
                employed_now (param=ref ref='No')
                money4meds (param=ref ref='Not often')
                money4health (param=ref ref='Not often')
                abuse_physical (param=ref ref='0')
                abuse_sexual (param=ref ref='0')
                exchangep12m (param=ref ref='0')
                racism_rights2 (param=ref ref='0')
                racism_fear2 (param=ref ref='0')
                racism_stupid2 (param=ref ref='0')
                /*comm_opinion (param=ref ref='Strongly disagree')
                comm_badplace (param=ref ref='Strongly disagree')
                comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 nsexpartd noninjection drink mUAIp12m
                employed_now money4meds money4health abuse_physical
                abuse_sexual exchangep12m racism_rights2 racism_fear2
                racism_stupid2 comm_opinion comm_badplace
                comm_athome/selection=stepwise slstay=0.05 include=1
lackfit rsq;
run;


*Model J:  FINAL BLACK MODEL;
*NOT USING THIS ANYMORE;
proc logistic data=work.modelblack descending;
      class       age_25 (param=ref ref='0')
                drink (param=ref ref='0')
                exchangep12m (param=ref ref='0')
                racism_stupid2 (param=ref ref='0');

      model cesd = age_25 drink exchangep12m racism_stupid2
            /selection=backward slstay=0.05 include=1 lackfit rsq;
run;


*Model K:  black model with 4 signif covariates - FINAL BLACK MODEL;
```

```
proc logistic data=work.modelblack descending;
      class       age_25 (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0');

      model cesd = age_25 comm_opinion exchangep12m racism_stupid2
            /selection=backward slstay=0.05 include=1 lackfit rsq;
run;


*Model L:  4 signif var + drink forced into model - check for
confounding
and look at model fit statistics;
proc logistic data=work.modelblack descending;
      class       age_25 (param=ref ref='0')
                  drink (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0');

      model cesd = age_25 drink comm_opinion exchangep12m
            racism_stupid2
            /selection=backward slstay=0.05 include=2 lackfit rsq;
run;
*Conclusion:  drink not a confounder and not signif, but model fit
better;


*Model M:  4 signif var + mUAIp12m forced into model - check for
confounding
and look at model fit statistics;
proc logistic data=work.modelblack descending;
      class       age_25 (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0');

      model cesd = age_25 mUAIp12m comm_opinion exchangep12m
            racism_stupid2
            /selection=backward slstay=0.05 include=2 lackfit rsq;
run;
*Conclusion:  mUAIp12m not a confounder and not signif;


*Model N:  Start over - only use covariates that were significant in
overall model;
proc logistic data=work.modelblack descending;
      class   age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 noninjection drink mUAIp12m exchangep12m
                  racism_stupid2 comm_opinion comm_badplace
```

```
                  /selection=backward slstay=0.05 include=1 lackfit
rsq;
run;
*-------------------------------------------------------------------------;
* Modeling: stratified (white race)                                       ;
*-------------------------------------------------------------------------;
data work.modelwhite;
      set work.model (where=(race_inc=0));
run;


*Model B: 17 covariates backward selection;
proc logistic data=work.modelwhite descending;
      class       age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 nsexpartd noninjection drink mUAIp12m
                  employed_now money4meds money4health abuse_physical
                  abuse_sexual exchangep12m racism_rights2 racism_fear2
                  racism_stupid2 comm_opinion comm_badplace
                  comm_athome/selection=backward slstay=0.05 include=1
lackfit rsq;
run;


*Model C: 17 covariates forward selection;
proc logistic data=work.modelwhite descending;
      class       age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
```

```
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 nsexpartd noninjection drink mUAIp12m
                  employed_now money4meds money4health abuse_physical
                  abuse_sexual exchangep12m racism_rights2 racism_fear2
                  racism_stupid2 comm_opinion comm_badplace
                  comm_athome/selection=forward slstay=0.05 include=1
lackfit rsq;
run;


*Model D: 17 covariates stepwise selection;
proc logistic data=work.modelwhite descending;
      class       age_25 (param=ref ref='0')
                  nsexpartd (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  money4meds (param=ref ref='Not often')
                  money4health (param=ref ref='Not often')
                  abuse_physical (param=ref ref='0')
                  abuse_sexual (param=ref ref='0')
                  exchangep12m (param=ref ref='0')
                  racism_rights2 (param=ref ref='0')
                  racism_fear2 (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')
                  comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 nsexpartd noninjection drink mUAIp12m
                  employed_now money4meds money4health abuse_physical
                  abuse_sexual exchangep12m racism_rights2 racism_fear2
                  racism_stupid2 comm_opinion comm_badplace
                  comm_athome/selection=stepwise slstay=0.05 include=1
lackfit rsq;
run;


*Model G - final white model (4 covariates);
*NOT USING THIS ANYMORE;
proc logistic data=work.modelwhite descending;
      class       age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  /*comm_athome (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 noninjection abuse_physical comm_athome
                        /selection=backward slstay=0.05 include=1
lackfit rsq;

run;


*Model H - final white model + mUAIp12m/test for confounding;
```

```
*NOT USING THIS ANYMORE;
proc logistic data=work.modelwhite descending;
      class       age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  mUAIp12m (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  /*comm_athome (param=ref ref='Strongly disagree')*/
                  money4meds (param=ref ref='Not often');

      model cesd = age_25 noninjection mUAIp12m abuse_physical
      comm_athome money4meds
      /selection=backward slstay=0.05 include=1 lackfit rsq;

run;

*Model O - Start over - only use covariates that were significant in
overall model;
proc logistic data=work.modelwhite descending;
      class   age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 noninjection drink mUAIp12m exchangep12m
                  racism_stupid2 comm_opinion comm_badplace
                  /selection=backward slstay=0.05 include=1 lackfit
      rsq;
run;


*Model P - white model with 5 signif var: FINAL WHITE MODEL;
proc logistic data=work.modelwhite descending;
      class   age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  mUAIp12m (param=ref ref='No')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')*/;

      model cesd = age_25 noninjection mUAIp12m comm_opinion
            comm_badplace
                  /selection=backward slstay=0.05 include=1 lackfit
      rsq;
run;




*-------------------------------------------------------------------------;
* Collinearity diagnostics for final models                              ;
*-------------------------------------------------------------------------;

*Final Model XV - not using this anymore;
%include 'H:\THESIS\collin_2011.sas';
```

```
proc logistic data=work.model covout outest=info;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  employed_now (param=ref ref='No')
                  abuse_physical (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  comm_athome (param=ref ref='Strongly disagree');

      model cesd = race_inc age_25 noninjection drink mUAIp12m
            employed_now abuse_physical racism_stupid2 comm_athome
            /selection=forward slstay=0.05 include=2 lackfit rsq;

run;

%collin(covdsn=info, output=info2);
run;



*Model XVI: NEW FINAL MODEL - race, age, 7 signif covariates +
interaction term;
%include 'H:\THESIS\collin_2011.sas';

proc logistic data=work.model descending covout outest=info;
      class       race_inc (param=ref ref='0')
                  age_25 (param=ref ref='0')
                  noninjection (param=ref ref='No')
                  drink (param=ref ref='0')
                  mUAIp12m (param=ref ref='No')
                  exchangep12m (param=ref ref='0')
                  racism_stupid2 (param=ref ref='0')
                  /*comm_opinion (param=ref ref='Strongly disagree')
                  comm_badplace (param=ref ref='Strongly disagree')*/;

      model cesd = race_inc age_25 noninjection drink mUAIp12m
                  exchangep12m racism_stupid2 comm_opinion
                  comm_badplace race_inc*noninjection
                  /selection=backward slstay=0.05 include=2 lackfit
      rsq;

run;

%collin(covdsn=info, output=info2);
run;
```