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Depression and treatment adherence among HIV-positive young black men who have sex
with men in Atlanta, GA

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Depression and treatment adherence among HIV-positive young black men who have
sex with men in Atlanta, GA

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Bachelor of Science

Bachelor of Law

Peking University

2016

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An abstract of

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University

in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Health

2018

Abstract

Depression and treatment adherence among HIV-positive young black men who have sex with men in Atlanta, GA

By Yue Zhang

Background: In the past years, HIV positive young black men who have sex with men remained low level of medical adherence in Atlanta, GA. Based on previous studies, depression was supposed to be a main harmful factor to prevent patients from medical adherence. Moreover, Social Stigma, Education, Employment and Homelessness were also important factors to associate with adherence and depression.

Objective: The purpose of this project is to examine the relationship between depression and treatment adherence among HIV-positive YBMSM in Atlanta, after controlling for *Social Stigma, Education, Employment and Homelessness*.

Methods: 81 HIV-positive YBMSM were recruited from adolescent clinic of a large HIV specialty clinic in Atlanta, GA between November 2015 and July 2016. After sample characteristic analysis, bivariate analysis was conducted to evaluate crude association between *Adherence* and each independent variable. Then, based on Backward method, a multivariable logistic regression model was built to calculate adjust odds ratios of *Depression* and *Adherence* to evaluate their association after controlling other variables.

Results: The bivariable analysis showed that participants with depressive symptoms were more likely to miss medical appointments compare to those who did not have depressive symptoms (OR = 4.75, 95% CI = (1.55, 14.55)). After building multivariable logistic regression model, depression and adherence showed significant association and depression was a harmful factor for no missed appointment (OR = 4.35, 95% CI = (1.20, 15.72)), controlling for Social Stigma, Education, Employment and Homelessness.

Conclusions: Depression was a significant harmful factor for no missed appointment, controlling for Social Stigma, Education, Employment and Homelessness, for YBMSM in Atlanta, GA. And the conclusion of this study will give a more accurate understanding of the psychological interventions for HIV-positive YBMSM, who live in Atlanta.

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Depression and treatment adherence among HIV-positive young black men who have sex with men in Atlanta, GA

1 Introduction

1.1 Background

In the last ten years, the estimated number of annual new HIV infections declined 18 percent in the United States(Centers for Disease Control and Prevention, 2017c).

However, among black American gay and bisexual men, annual infections remained stable. The number of new infections in young black men who have sex with men (YBMSM) aged 16 to 24 even increased by 8 percent(Centers for Disease Control and Prevention, 2017b). Therefore, although the overall trend for HIV incidence is declining in the USA, the incidence of new HIV infections is still a big problem for the young black gay and bisexual men, who have the highest HIV incidence rates of any risk group in the United States (Prejean, et al. 2011).

Thanks to the coming of highly active antiretroviral therapy (HAART), AIDS-related disease and death can often be prevented (Palella et al., 2006), as long as patients can get consistent treatment. However, the problem is that, due to some psychological and social factors, it is difficult to make every HIV patient get involved into continuous treatment. Initial diagnosis and access to care is a more challenging problem for HIV-infected youth aged 16 to 24 in the US, with the estimated number that only 51% are aware of their diagnosis and 68% are then linked to care(Centers for Disease Control and Prevention, 2017c). Therefore, it is essential to research the factors that would affect treatment adherence for HIV patients, especially for young patients.

Depression is a common psychological disorder among people with HIV/AIDS. It has been estimated that about 36% of HIV patients are likely to be diagnosed with clinical depression (Bing et al., 2001). Moreover, in some cases, depressive symptoms do not necessarily meet criteria for a depressive disorder, but still impact the daily lives of individuals with HIV/AIDS. Depressive symptoms have been associated with negative HIV health outcomes, such as impaired immunological response or even death (Ironson et al., 2005). Treatment adherence may mediate the pathway between depression and negative HIV health outcomes. There are many studies that have examined the relationship between depression and non-adherence with HIV patients. One of the meta-analysis studies, conducted by Gonzalez, showed that depression was significantly ($P < 0.0001$) associated with non-adherence ($r = 0.19$; 95% confidence interval = 0.14 to 0.25) (Gonzalez, Batchelder, Psaros, & Safren, 2011), after analyzing 95 different studies.

Depression is not the only factor that correlates with non-adherence of HIV patients.

There are also several social factors that we should take into consideration. The threat of social stigma associated with HIV may prevent patients from accessing HIV treatment since they may be concerned about having to reveal their HIV status. One study showed that HIV patients with high stigma concerns are 3.3 times more likely to be non-adherent to persistent treatment than patients with low level concerns (Rintamaki, Davis, Skripkauskas, Bennett, & Wolf, 2006). The education level of a patient is also important for treatment adherence. Patients with less than a high school education are 53 percent less likely to adhere to treatment than their counterparts (Cunningham et al., 2005). In addition, employment has a direct influence on individual socio-economic status, which has also been related to nonadherence (Basavaraj, Navya, & Rashmi, 2010). Moreover,

homeless people with HIV/AIDS are at increased risk of negative health outcomes, and they are less likely to be adherent to continuous treatment than those with housing (Kidder, Wolitski, Campsmith, & Nakamura, 2007). All of the above factors are related to nonadherence of HIV patients and will therefore be included in our analysis.

1.2 Project Statement

The purpose of this project is to examine the relationship between depression and treatment adherence among HIV-positive YBMSM in Atlanta, Georgia. Although many studies have examined the significant relationship between depression and treatment adherence, few of them taken place in Atlanta. There is no doubt that Atlanta has a distinct HIV epidemic. In Atlanta, MSM and especially YBMSM face a high-incidence epidemic of HIV. Overall incidence among MSM in Atlanta was 3.8 percent, which was much higher than the HIV incidence for MSM in the United States overall (Sullivan et al., 2015). Therefore, it is essential to analyze the specific relationship between depression and adherence in Atlanta.

Since there are several other factors that would lead to HIV treatment adherence, they are also may act as confounders between exposure (depression) and outcome (treatment adherence). To adjust for the influence of confounders, a logistic regression model will be built, which will contain all these confounders. Then, with the model we build, we will calculate adjusted odds ratios between depression and treatment adherence, after controlling for all confounders.

1.3 Significance Statement

This research is important for the following reasons:

1. Although previous studies have shown a relationship between depression and treatment adherence for HIV patients, this study will focus on the effect only for HIV-positive YBMSM. Plus, this study will also concentrate on the population in Atlanta. Therefore, the outcome of this study will give a more accurate understanding of the psychological interventions for HIV-positive YBMSM, who live in Atlanta.

2. This study focus on not only the relationship between exposure (depression) and outcome (adherence), but also other factors as confounders. After building an epidemiological logistic model, which contains these factors, adjusted odds ratios of depression and adherence can be obtained. Therefore, after controlling for all other confounders, we will have a better understanding of the relationship between our exposure and outcome, which would help us determine whether there is a real association between them. It is very important since most of previous studies only got an unadjusted relationship between depression and adherence while our project will obtain an adjusted odds ratio, controlling for stigma, unemployment, education and homelessness.

1.4 Terminology

ART Antiretroviral Therapy

ARV Antiretroviral

MSM Men who have Sex with Men

HIV Human Immunodeficiency Virus

HS/GED High School or General Education Development (GED- high school equivalency)

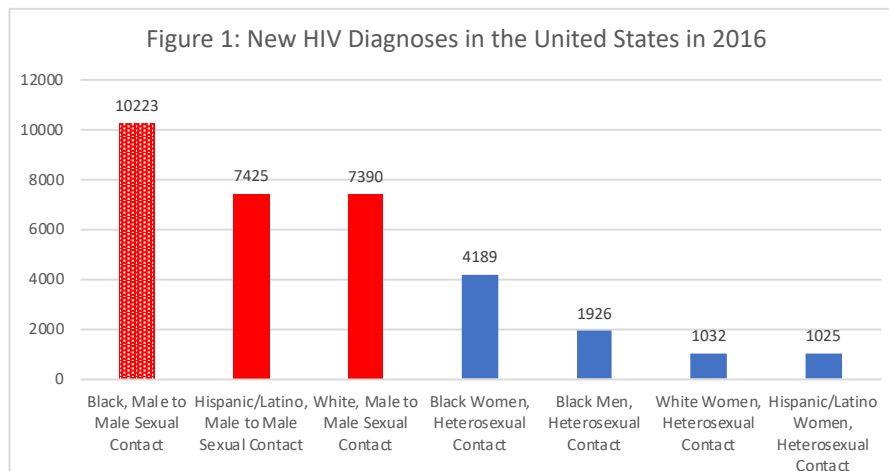
YBMSM Young Black Men who have Sex with Men

2 Literature Review

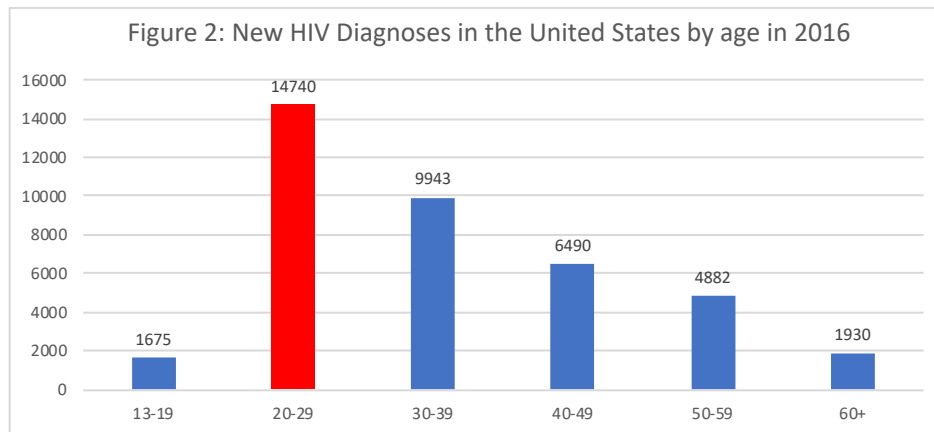
2.1 Epidemiology of HIV among the United States, Georgia and Atlanta cases

2.1.1 HIV in the United States

HIV diagnoses and infections have declined in the United States in the past 10 years, but progress has been uneven and the diagnoses and infections have increased among some groups. According to data published by CDC, there were 37600 new HIV infections in the United States in 2014, and about 26200 (70%) of new cases occurred in gay and bisexual men (Centers for Disease Control and Prevention, 2017c). Moreover, there are also some trends within the subgroup of gay and bisexual men. The Figure 1 (Centers for Disease Control and Prevention, 2017c) shows that black MSM accounted for the largest number of new HIV diagnoses.

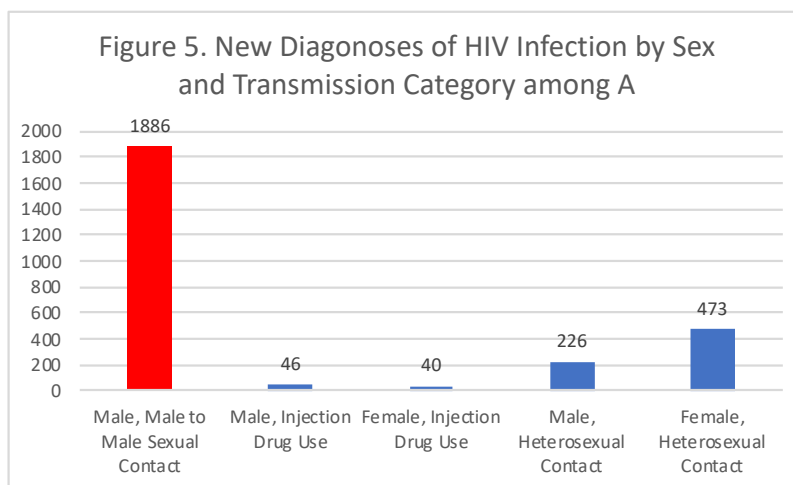
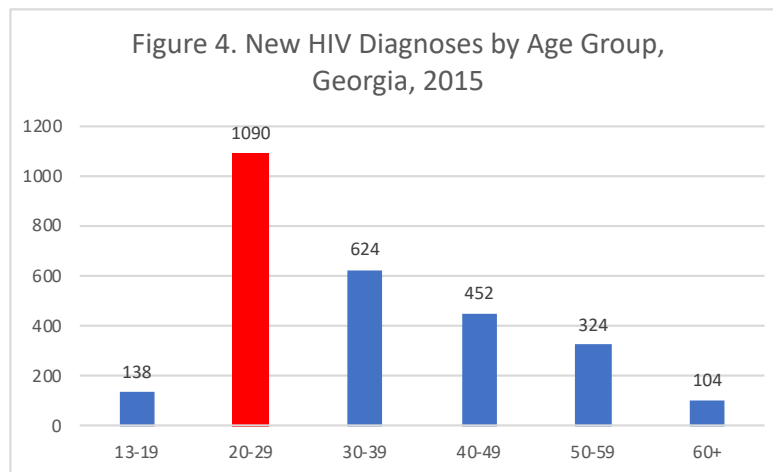
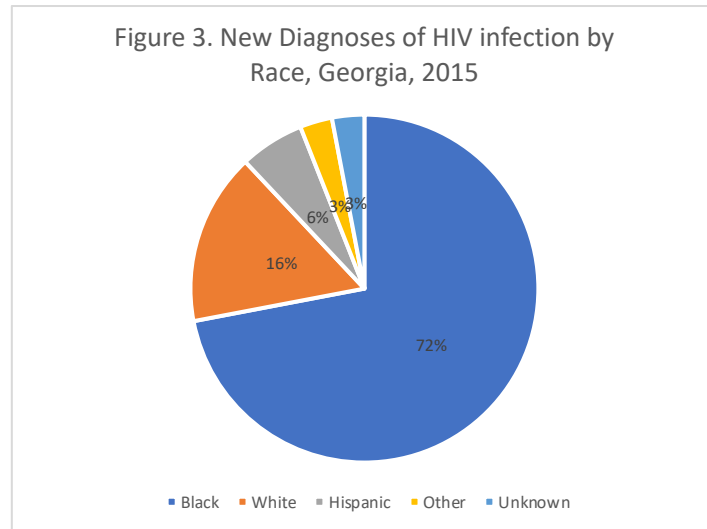


In addition to race discrepancies, age is also a considerable factor. Figure 2 (Centers for Disease Control and Prevention, 2017a) shows new HIV diagnoses in the United States in 2016 by age, and young people aged 20 to 29 accounted for the largest number of new infections.



2.1.2 HIV in Georgia

The situation of HIV cases in Georgia is similar to national HIV epidemiology. In 2015, Georgia was ranked fifth in the nation for total number of adults and adolescents living with HIV infection, with a total of 54,754 new cases. Moreover, according to data from the Georgia Department of Public Health, 72 percent of new diagnoses occurred in black individuals (Figure 3) (The Georgia Department of Public Health, 2016). When divided by age, the data from the Georgia Department of Public Health is also in accordance with national HIV trends (Figure 4) (The Georgia Department of Public Health, 2016). When the Georgia data is categorized by sex and transmission, male to male sexual contact accounts for the largest number of new HIV diagnoses (Figure 5) (The Georgia Department of Public Health, 2016).



2.1.3 HIV in Atlanta

A prospective observational cohort study was conducted by Sullivan et al. to research racial disparities in HIV infection in Atlanta. The results of the study were also in accordance with the epidemiology of the United States and Georgia. The study followed 260 black MSM and 302 white MSM for total 823 person-years (PY) and concluded that the incidence of HIV was higher among black MSM (6.5/100PY; 95% CI: 4.2, 9.7) than white MSM (1.7/100PY; CI: 0.7, 3.3). When the data was categorized by age, the HIV incidence was highest among young (18–24 years) black MSM (10.9/100PY; CI: 6.2, 17.6)(Sullivan et al., 2015). Based on the above data derived from national- and state-level HIV epidemiology, it is essential to do research on YBMSM, since the population accounts for a large number of total HIV cases.

2.2 HIV Adherence

For HIV patients taking antiretroviral therapy (ART), it is important to comply with medication adherence, because it is the key to sustained HIV suppression, reduced risk of drug resistance, improved overall health, quality of life, and survival (Chesney, 2006; World Health Organization (WHO), 2003), as well as decreased risk of HIV transmission (Cohen et al., 2011). Adherence rates close to 100 percent are necessary in order to achieve optimal viral suppression(Centers for Disease Control and Prevention, 2012). However, according to the data from the CDC, only 36% of HIV patients in the United States achieve optimal medication adherence, and among these patients, only 76% have suppressed viral loads (Centers for Disease Control and Prevention, 2012).

Moreover, non-adherence to HIV medication would result in some passive influence on future treatment. Non-adherence has also been associated with an increased rate of hospitalization and longer hospital stays (Meena et al., 2014; Paterson et al., 2000), which would result in loss of time and financial loss.

There are many factors leading to poor HIV medication adherence, such as depression, low literacy, young age, unstable housing, and competing priorities (e.g., work, family, housing)(U.S. Department of Health and Human Services, 2014). To deal with these passive factors, there are some strategies for improving adherence to ART. For example, providing mental health resources for the patient if needed and use of educational aids may improve adherence to ART(U.S. Department of Health and Human Services, 2014). Fortunately, these strategies have been playing their roles and adherence rates are increasing since 2010(Centers for Disease Control and Prevention, 2017c).

2.3 Depression and non-adherence

Depression is one of most common psychological disorders among people with HIV/AIDS. The prevalence of HIV patients who have a depression disorder has been estimated to range from 22% to 38% in the United States (Kelly et al., 1998). According to a study conducted by Bogart and colleagues, HIV-related symptoms, lack of stable employment, younger age, not having a partner, poor quality of social and family support, homelessness, and discrimination from peers were significant predictors of depression in one study, with data collected from 995 HIV positive patients who received care in a community of Boston between 2002 and 2003(Bogart et al., 2000).

A 2017 study conducted by Hightow-Weidman and colleagues, which recruited 193 HIV positive YBMSM, showed that those with depressive symptoms had 4.7 times the odds of reporting adherence less than 90% (95% CI: 1.65, 13.37)(Hightow-Weidman et al., 2017). One meta-analysis study conducted Gonzalez in 2013 best describes the relationship between depression and adherence. It showed that depression was significantly ($P < 0.0001$) associated with nonadherence ($r = 0.19$; 95% confidence interval = 0.14 to 0.25), after analyzing 95 different studies(Gonzalez et al., 2011). However, one quantitative analysis conducted by Chen, failed to find evidence that depressive syndromes lead to an increase in ART non-adherence (risk difference, RD: 27.9; 95% CI: -3.5, 59.3)(Chen & Raymond, 2017). Based on the hypothesis of our study, this non-relationship may result from a lack of controlling for confounders. Aside from depression, analysis of other factors that may be potentially related to non-adherence is essential to our study.

2.4 Other factors and non-adherence

2.4.1 Social Stigma

Many studies have shown that stigma may prevent HIV-patients from engaging in continuous treatment (Fortenberry et al., 2002; Rao, Kekwaletswe, Hosek, Martinez, & Rodriguez, 2007). Some explanations have been given to explain the association between stigma and medication adherence. HIV-positive patients may be concerned about inadvertent disclosure of HIV status and the passive attitude from family and friends (Sabin et al., 2008). Interestingly, stigma is also associated with depression and several

studies have demonstrated a relationship between stigma and depression (Lee, Kochman, & Sikkema; Onyebuchi-Iwudibia & Brown, 2014; Venable, Carey, Blair, & Littlewood, 2006). Moreover, a study conducted by Mitzel showed that depression would mediate the effect of HIV-related stigmatization on medication adherence among HIV-positive MSM (Mitzel et al., 2015). And the results showed that stigma was positively associated with depressive symptoms ($\beta = 0.49$, $t = 4.49$, $p < 0.01$) and negatively associated with medication adherence ($\beta = -0.34$, $t = -2.91$, $p < 0.01$) (Mitzel et al., 2015). This result is consistent with the hypothesis of our study, that stigma would confound the relationship between depression and adherence.

2.4.2 Education

Higher levels of education have been shown to promote individual health, since people with higher education levels may have more favorable attitudes and more knowledge about health issues. The same conclusion may be applied to HIV-related health problems. Hightow-Weidman and colleagues' study in YBMSM showed that those with a college degree were less likely to miss treatment (POR 9.1; 95% CI: 1.9, 45.2) (Hightow-Weidman et al., 2017). Furthermore, education is also related to many other factors. Greater education would also contribute to better employment and decrease the likelihood of homelessness.

2.4.3 Employment

The influence of employment status on treatment adherence is complex. A stable job contributes to a stable income, which would encourage HIV patients to adhere to treatment. On the other hand, a heavy work load may make patients exhausted and have

little time to get continuous treatment. However, most existing studies support the former interpretation. In a study of YBMSM, Hussen et al. reported that employment (OR=0.30; 95% CI 0.12–0.75) was positively associated with treatment adherence (Hussen, Harper, Bauermeister, & Hightow-Weidman, 2015).

Employment status is also associated with depression. Previous research has shown that unemployed individuals report more depression, anxiety, social isolation, and low self-esteem than employed individuals (Aro, Jallinoja, Henriksson, & Lonnqvist, 1994). In a study of psychosocial vulnerability in HIV-positive MSM, Dickey et al reported that younger men who lacked full-time employment were at greater risk for getting depression (Dickey, Dew, Becker, & Kingsley, 1999).

2.4.4 Homelessness

Homelessness may have multiple indirect influences on HIV treatment adherence. The ART treatment can be complex and often involve restrictions on when and how the medications should be taken and stored (Song, 1999). Moreover, most of ARV treatments have side effects, such as recurring diarrhea, which would pose a problem for homeless individuals (Wong MD, 2004). There are also many individual problems for different patients that are more common among homeless individuals, such as mental illness, limited financial resources, substance use disorders, mistrust of the health-care system, lack of transportation, insufficient health insurance, and food insecurity (Song, 1999; Thompson et al., 2012).

3 Methodology

3.1 Population and sample

81 HIV-positive YBMSM were recruited from adolescent clinic of a large HIV specialty clinic in Atlanta, GA between November 2015 and July 2016. Medical providers or other support staff in the clinic approached potential participants during their visits. Patients who self-identified as Black, male and endorsed a history of sex with men were invited to participate (Hussen et al., 2018).

3.2 Measures

Adherence

We assessed adherence to HIV medical appointment by self-reported number of missed visits in the past 12 months. Then, we dichotomized number of missed appointments into no missed HIV medical appointments and having one or more missed appointments in the past 12 months (Berg et al., 2005). Missed visits are a kind of directly measure of medical adherence and are associated with mortality (Mugavero et al., 2014). And no missed appointments represents that these people with “perfect attendance”, which is associated with a positive health behavior.

Depression

The Centers for Epidemiologic Studies-Depression Revised version (CESD) was used to assess depressive symptoms in this study. The CESD is a 20-item validated survey of clinically significant distress as a marker for clinical depression ($\alpha=0.91$) (Van Dam & Earleywine, 2011). The participants would be asked to characterize their frequency of depressive symptoms using a 4-point Likert scale ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). And a dichotomous depression variable was created

using a CESD-R score of ≥ 16 , which suggests clinically relevant depressive symptomology (Simoni et al., 2011).

Social Stigma

The level of social stigma was measured by Revised Stigma Scale for youth (Wright, Naar-King, Lam, Templin, & Frey, 2007). A total of 10 statements were asked to evaluate participants' agreements, and each statements had 4 choices (*strongly disagree=1; disagree=2; agree=3; strongly agree=4*). We measured social stigma by summing up total points. The higher Revised Stigma Scale points one participant got, the severe social stigma he suffered from.

Education

We assessed education level by asking question '*What is the highest level of education you have completed?*' The answer was categorized as 8 levels (*1=below 9th grade; 2=some HS/GED; 3=HS/GED; 4=some college; 5=technical/vocational school; 6=college graduate; 7=some post-graduate school; 8=post-graduate*). To ensure each category has more than 20 cases, we then divided 8 levels into 2 groups (*Group 1=below 9th grade, some HS/GED and HS/GED; Group 2=some college, technical/vocational school and college graduate*). Since no participants endorsed a 7 or 8, we did not group them into new groups.

Employment

Employment status was assessed by asking '*Are you currently employed?*'. And the answer was categorized as 'Yes' or 'No'.

Homelessness

Homeless status was assessed by asking ‘*Since the age of 15, have you ever considered yourself homeless?*’ And the answer was categorized as ‘Yes’ or ‘No’.

3.3 Data analysis

The data was analyzed by using *SAS 9.4 W32_10PRO platform*. After data cleaning checking for outliers, all 81 records were kept for further analysis.

Sample characteristics were described by calculating means and standard deviation for *Age* and *Social Stigma Points*, total number and frequencies for *Adherence*, *Depression*, *Education*, *Employment* and *Homelessness*.

Bivariate analysis between dichotomous *Adherence* and each categorical independent variables were assessed by a chi-square test or Fisher’s exact test. Crude odds ratios were calculated to evaluate association between *Adherence* and each independent variable.

An epidemiological multivariable logistic model was built to assess associations between *Adherence* (outcome) and *Depression* (main exposure), after controlling *Social Stigma*, *Education*, *Employment* and *Homeless* (potential confounders). Multicollinearity was first checked by calculating *Variance Inflation Factor (VIF)* to ensure that there was no strong associations between the independent variables. The *BACKWARD* method was used to select variables for the model, with cutoff p-value of 0.1 and significance (α) of 0.05.

Interactions for depression and other four variables were checked, but interaction terms were all deleted from the final model since they were not significant, based on *BACKWARD* method. The finished model was assessed for goodness of fit using the *Hosmer-Lemeshow Goodness of Fit Test*. After getting our final model, we calculated adjusted odds ratios of *Depression* and *Adherence* to evaluate their association after controlling other variables.

3.4 Sample Size Limitation

Our study has a small sample size, with 81 records. To get a better association between *Adherence* and *Depression*, the number of independent variables was controlled based on Sample Size Calculation Formula (Peduzzi, Concato, Kemper, Holford, & Feinstein, 1996). Based on the work of Peduzzi et al., there is a formula to calculate sample size or variables.

$$N = 10 k / p$$

p is the smallest of the proportions of negative or positive cases in the population and k the number of covariates.

To calculate reasonable number of independent variables of our study, we transformed the formula and calculated the number as 5.

$$K = N * p / 10 = 81 * 0.72 / 10 = 5.6 \text{ (5 or 6 variables)}$$

(p=0.72 got from frequency of 1 or more missed appointments in last year in Table 1)

In our study, the independent variables are *Depression*, *Social Stigma*, *Education*, *Employment* and *Homelessness*, which is accordance with reasonable number of independent variables.

4 Results

4.1 Sample Characteristic

A total of 81 records were included in our final analysis (*shown in Table 1.*). The age of all sample ranged from 18 to 24 years (mean=22.41, SD=1.56). Nearly 72 percent of participants reported that they had at least 1 missed appointment in last year and only 28 percent of participants had good adherence records. About half of participants showed depressive symptoms while another half did not. In terms of *Social Stigma Scale*, it ranged from 10 to 40, and the higher the scores one get, the more severe stigma he suffered from. And the average level of social stigma of samples were *lightly suffered from stigma* (mean=25.28, SD=6.89). Most (61.7%) participants got education degree higher than HS/GED and a large part (66.7%) of them were currently employed. And 37 percent of participants reported as homelessness while another 63 percent did not.

Table 1. Characteristic for HIV-positive young black men who have sex with men (n=81)

<i>Variable</i>	<i>Results</i>
Age (years) Mean (SD)	22.41 (1.56)
Adherence n (%)	
No missed appointments in last year	23 (28.4)
1 or more missed appointments in last year	58 (71.6)
Depression n (%)	
Do not have depressive symptoms (CESD-R < 16)	43 (53.1)
have depressive symptoms (CESD-R ≥ 16)	38 (46.9)
Social Stigma Mean (SD)	25.28 (6.89)
Education n (%)	
Complete or less than HS/GED	31 (38.3)
More than HS/GED	50 (61.7)
Employment n (%)	
Yes	54 (66.7)
No	27 (33.3)
Homelessness n (%)	
Yes	30 (37.0)
No	51 (63.0)

4.2 Bivariable analysis

The crude association between adherence and independent variables were assessed and shown in *Table 2*.

Participants with depressive symptoms were more likely to miss medical appointments compare to those who did not have depressive symptoms (Odds Ratio (OR) = 4.75, 95% CI = (1.55, 14.55)); this result was significant ($p=0.0063$) and in accordance with our study hypothesis.

For potential confounders, crude odds ratio and significance of association test varied among different variables. The odds of missing a least one appointment is 1.07 (95% CI= (1.00, 1.16)) times higher per 1 point increase in *Social Stigma Scale*. Since the odds ratio closed to 1 and the association test was not significant ($p=0.0639$), so we concluded that social stigma was not be associated with adherence. Education was also not associated with adherence (OR = 1.05, 95% CI= (0.39, 2.84)), and it was not a significant variable ($p=0.9200$). In terms of employment, we set having employment as reference and unemployment would be our research variable. And unemployment would be a protective confounder for adherence (OR = 0.54, 95% CI = (0.20, 1.47)), while this finding did not quite reach statistical significance ($p = 0.2256$). And homelessness was probably a harmful exposure (OR = 2.00, 95% CI), while it was also not significant ($p = 0.2031$).

Table 2. Crude odds ratio of variables potentially associated with Medical Adherence among YBMSM

Variable	Adherence		Crude Odds Ratio (95% CI)	p
	1 or more missed n=58	No missed n=23		
Depression				
Do not have depressive symptoms (CESD-R < 16)	25 (58.14%)	18 (41.86%)	<i>Reference</i>	
Have depressive symptoms (CESD-R ≥ 16)	33 (86.84%)	5 (13.16%)	4.75 (1.55, 14.55)	0.0063
Social Stigma	58 (71.60%)	23 (28.40%)	1.07 (1.00, 1.16)	0.0639
Education				
Complete or less than HS/GED	22 (70.97%)	9 (29.03%)	<i>Reference</i>	
More than HS/GED	36 (72.00%)	14 (28.00%)	1.05 (0.39, 2.84)	0.9200
Employment				
Yes	41 (75.93%)	13 (24.07%)	<i>Reference</i>	
No	17 (62.96%)	10 (37.04%)	0.54 (0.20, 1.47)	0.2256
Homelessness				
Yes	24 (80.00%)	6 (20.00%)	2.00 (0.69, 5.82)	0.2031
No	34 (66.67%)	17 (33.33%)	<i>Reference</i>	

4.3 Multivariable analysis

After building multivariable logistic regression model (*shown in Table 3.*), depression and adherence showed significant association and depression was a harmful factor for no missed appointment (OR = 4.35, 95% CI = (1.20, 15.72)), controlling for Social Stigma, Education, Employment and Homelessness.

Table 3. Multivariable logistic regression analysis of variables potentially associated with Medical Adherence among YBMSM

Variables	Reference Group	Estimate	SE	Adjusted OR (95% CI)	p
Depression	Do not have depressive symptoms (CESD-R < 16)	1.4695	0.6560	4.35 (1.20, 15.72)	0.0251
Social Stigma	/	0.0691	0.0473	1.07 (0.98, 1.18)	0.1441
Education	Complete or less than HS/GED	-0.1210	0.5804	0.89 (0.28, 2.76)	0.8349
Employment	Yes	-1.3707	0.6467	0.25 (0.07, 0.90)	0.0341
Homelessness	No	0.3817	0.6216	1.47 (0.43, 4.95)	0.5392
Intercept	/	-0.9005	1.1147	/	0.4192

5 Discussion

5.1 Strengthens

The study results were overall consistent with our expectation and other pertinent studies. Both crude OR (4.75, 95% CI = (1.55, 14.55)) and adjusted OR (4.35, 95% CI = (1.20, 15.72)) of depression and adherence showed that depressive symptoms was a significant harmful factor for medical adherence of YBMSM in Atlanta, GA. Compared to crude OR, adjusted OR would be more reliable since it was assessed by controlling four other variables.

There are several strengths for our study. First, our study got a significant and meaningful result to prove that depression was a harmful factor for medical adherence for YBMSM HIV patients in Atlanta, GA. Second, our study was the first to analyze association between depression and adherence, controlling for education, social stigma, employment and homelessness. It would be valuable for other multivariable logistic regression analysis to decide exposure and confounders in the future. Finally, the result is meaningful to improve adherence for YBMSM. Based on our study, depression was the most harmful factor among depression, education, social stigma, employment and homelessness. Therefore, psychological assessment should be given for YBMSM when health-care workers provide treatments. And depression intervention would be useful to improve YBMSM further adherence.

5.2 Limitations and recommendations

Although we contained reasonable number of variables in our multivariable logistic regression model based on 81 records (analyzed in Part 3.4), small sample size was still a problem for our study. For independent variables, *Depression*, *Education*, *Employment* and *Homelessness*, each one had two categories. And there were a total of 16 (2^4) subgroups in our samples. In average, there were only 5 samples in each subgroup. Therefore, it was hard for each subgroup to represent their corresponding population. To increase accuracy of results, more participants should be involved into our study in the future.

Since the sample size limited the numbers of independent variables, there is still likely some residual confounding to our study. Based on our sample size, we could only add 4 confounders in our logistic regression model, while there are some other factors that would be associated with adherence, such as social capital (Mukoswa, Charalambous, & Nelson, 2017) and so on. In our study, we measured social capital related factors while our sample size prohibit us from adding it into our model. Moreover, sample size would also affect significance of results. For example, the odds of missing a least one appointment is 1.07 (95% CI= (1.00, 1.16), $p=0.0639$) times higher per 1 point increase in *Social Stigma Scale*. Although it was not significant in our study, it may be significant in the further studies if we could recruit more participants in the future. Therefore, more participants should be recruited to our study to solve residual confounding and significant problem in the future.

There was a kind of selection bias in our study. The participants were recruited directly from the clinic medical appointments, making it easier to include those who were more

likely to engage in appointment adherence. YBMSM HIV patients who never had any appointment would be excluded from our study. Moreover, all participants were recruited in one clinical site, which would exclude YBMSM who have appointments in other clinics in Atlanta. To solve these limitation, a variety of recruitment methods should be considered in future studies, such as recruiting directly from community and sharing related data with other clinics in Atlanta.

Finally, information bias was also a kind of limitation to our study. The prevalence of depression in our sample was high, even compared with other studies of youth living with HIV (Brown, Whiteley, Harper, Nichols, & Nieves, 2015). The depression was assessed by CESD, which contained 20 questions and maximum 3 points for each question. Since the CESD was only assessed to participants for only one time, there would be some information bias. For example, during this assessment, the participants happened to feel unhappy and they were easily to express a kind of depression. Therefore, to minimize information limitation, official appointment records should be used to measure adherence, and more accurate methods should be used to assess depression.

6 Conclusion

Depression was a significant harmful factor for no missed appointment (OR = 4.35, 95% CI = (1.20, 15.72)), controlling for Social Stigma, Education, Employment and Homelessness, for YBMSM in Atlanta, GA.

7 Public Health Recommendations

In our study, we got a significant association between depression and medical adherence for YBMSM, which gives a new perspective to improve medical adherence for HIV positive patients. In the past, we cared more about external harmful factors for medical adherence, such as economic status, health-care insurance and accessibility to medical service(Kidder et al., 2007). However, based on our study, after controlling for some external confounders, an internal psychological factor, depression, was significantly associated with adherence. Therefore, psychological assessment should be given for YBMSM when clinical health-care workers provide treatments. And psychological intervention would be necessary for HIV patients with depressive symptoms to improve medical adherence.

Moreover, since our samples were all collected from Atlanta, GA, our results would be more meaningful for improvements of medical adherence in Atlanta. The prevalence of depression in our sample was higher than the average national level, which indicates a relatively high level of prevalence of depression for all YBMSM in Atlanta. Besides, from crude odds ratio analysis, depression was the most significant harmful factor among all potential confounders in our study. Therefore, to improve medical adherence of HIV positive YBMSM in Atlanta, public health specialists and workers should focus more on depression and provide timely psychological interventions.

8 Reference

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