

Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

Mulugeta Bekele

Date

Factors Associated with Depressive Symptoms of HIV Positive Individuals
Obtaining
Anal Cancer Screening at Ponce De Leon Center, Atlanta, Georgia

By

Mulugeta Kifle Bekele
Master of Public Health
Hubert Department of Global Health

Vincent Marconi, MD
Committee Chair

Factors Associated with Depressive Symptoms of HIV Positive Individuals

Obtaining

Anal Cancer Screening at Ponce De Leon Center, Atlanta, Georgia

By

Mulugeta Kifle Bekele
Doctor of Medicine (M.D)
Jimma University college of Public Health and Medical Sciences
2003

Thesis Committee Chair: Vincent Marconi, MD

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

Factors Associated with Depressive Symptoms of HIV Positive Individuals

Obtaining Anal Cancer Screening at Ponce De Leon Center, Atlanta, Georgia

By Mulugeta Kifle Bekele

ABSTRACT

Introductions: Depression is the most common comorbid illness associated with HIV. The prevalence of depression among HIV positive individuals is four times greater than among the general US population. Depression is associated with a decrease in working productivity, greater social isolation, a decline physical activity, risky sexual behavior and suboptimal adherence to Antiretroviral Treatment (ART).

Purpose: The purpose of this study was to determine the prevalence of depressive symptoms and examine which factors were associated with depressive symptoms among HIV positive individuals.

Methods: A total of one hundred patients were included in this project. Depressive symptoms were measured with the CES-D scale, perceived social support was captured with the MOS-SSS questionnaire and internalized AIDS-related stigma were quantified with internalized AIDS-related stigma scale (IA-RSS). Chi-square and t-test was used for groups comparison. Bivariate and multivariate analyses were employed to predict depressive symptoms.

Results: The prevalence of depressive symptoms was 38% in our study sample. Depressive symptoms were positively associated with internalized AIDS related stigma ($R=0.335$, $P\text{-value}=0.0007$), and current cigarette smoking status ($R=0.245$, $P\text{-value}=0.015$). Depressive symptoms and overall perceived social support were negatively associated with each other ($R=0.379$, $P\text{-value}=0.0001$). The subscale of perceived social support i.e.; emotional and informational support ($R=0.391$, $p\text{-value}<0.0001$), affectionate support ($R=0.363$, $P\text{-value}=0.0002$), Tangible support ($R=0.271$, $P\text{-value}=0.0063$), and positive social support ($R=0.354$, $P\text{-value}=0.0003$) was also negatively correlated with depressive symptoms. The odds of developing depressive symptoms increases 1.36 times for each self-reported internalized AIDS-related stigma ($OR=$, 95% CI (1.09, 1.71), $p\text{-value}=0.007$) and 3.1 time for current smokers ($OR=3.1$, 95% CI (1.17, 8.24), $p\text{-value}=0.023$).

Recommendation: Screening of HIV positive patients for internalized AIDS-related stigma and tobacco consumption is recommended. Individuals with self-reported internalized AIDS-related stigma or smokers need further screening for depressive symptoms with short-form screening tools. Those showing depressive symptoms should be referred to mental health service providers.

Key words: HIV positive, depressive symptoms, MOS-SSS, CESD, and IA-RSS

Factors Associated with Depressive Symptoms of HIV Positive Individuals

Obtaining

Anal Cancer Screening at Ponce De Leon Center, Atlanta, Georgia

By

Mulugeta Bekele
Master of Public Health
Hubert Department of Global Health

Thesis Committee Chair: Vincent Marconi, MD

This 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

Acknowledgments

I would like to express a deep gratitude towards Dr. Vincent Marconi, my thesis advisor, for his expert advice, suggestions, and support throughout this project. His willingness to provide his precious time generously to the project is much appreciated. I would also like to thank Dr. Jessica Wells for giving me the opportunity to work on this project and her invaluable advice. I appreciate the participants involved in the data collection process for their time and dedication.

I would also like to thank my family for encouraging me in all of my pursuits and letting me chase my dreams.

Table of Contents

Chapter I: INTRODUCTION	1
1.1 Introduction	1
1.2 Problem Statement	1
1.3 Purpose Statement	2
1.4 Significance	3
1.5 Definition of Terms and abbreviation	3
Chapter II: LITERATURE REVIEW	5
2.1. Introduction – What does the Global and Local HIV Data Tell Us?	5
2.2. Depression and in HIV positive individuals	6
2.3 Possible mechanism of depression in HIV positive Individuals	8
I. Biological factors.....	8
II. Psycho-social Model	8
2.4 The Relationship between depression and HIV	10
2.5 How depression affect HIV positive individuals?	11
2.5.1 Depression and risky sexual behavior	11
2.5.2 Depression and Antiretroviral Treatment(ART)	12
2.5.3 Treatment of depression in HIV positive individuals.....	13
2.6 Depression Measurement instrument	14
2.7 Literature gap and why this study	15
Chapter III:METHODS	16

2.1 Introduction	16
2.2 Population and Sample	16
2.3 Procedure.....	17
2.4 Research Design and Instrument.....	17
2.4.1 Independent Variables	17
2.4.2 Dependent variable.....	18
2.5 Statistical Analysis.....	19
2.6 Ethical consideration.....	19
2.7 Limitation.....	19
 Chapter IV: RESULT.....	 20
 Study participants.....	 20
Table 2. Correlation between Depressive symptoms with different key variables in HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	23
 Depressive symptoms.	 23
 Bivariate Analysis.....	 24
 Multivariate Analysis	 25
Table 3. The odds of developing Depressive symptoms for each risk factors for HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	26
Figure 1. The relationship between depressive symptoms (CESD score) and Internalized AIDS-related stigma among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	27

Figure 2. Scatter plot describing the relationship between depressive symptoms (CESD score) and perceived social support (MOS-SSS) among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	28
Figure 3. Scatterplots with regression line between depressive symptoms (CESD score) and Affectionate social support among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	29
Figure 4. Scatterplots with regression line between depressive symptoms and tangible social support among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	30
Figure 5. Scatterplots with regression line between depressive symptoms and Emotional and informational social support among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	31
Figure 5. Scatterplots with regression line between depressive symptoms and positive social interaction social support among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	32
Figure 6. Scatterplots with regression line between depressive symptoms (CESD score) and smoking status among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	33
Table 4. Multivariate analysis of key factors with depressive symptoms after including all statistically significant variables in the model.....	33
Figure 6. Predicted probability of presence of depressive symptoms (CESD score >16) by Internalized AIDS related stigma and smoking status among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.	34
Chapter V: DISCUSSION	35
Conclusion	38

Limitation of the study.....	39
Recommendation	40
<i>Reference</i>	<i>41</i>
APPENDICES	45
CES-D	45
MOS-SSS (perceived social support) questionnaire.....	46
Positive social interaction	46

Chapter I: INTRODUCTION

1.1 Introduction

The study was conducted at Grady Hospital Ponce De Leon center in Atlanta, Georgia. The Ponce De Leon Center was founded in 1986 and is a comprehensive facility dedicated to the treatment of advanced HIV/AIDS in Atlanta, Georgia. The center provides various medical and support services such as women's health, oral health, pediatric/adolescent health, dermatology, mental health/substance abuse treatment, and ophthalmology.

The data for this study was collected by principal investigator (PI), Jessica Wells, RN, PhD. for an ongoing research project titled "Follow Up After Anal Cancer Screening (FACS) in HIV-Infected Individuals" (K01NR015733-01A1). The purpose of this study was to examine individual (depression, HIV-related stigma, health beliefs, substance/drug abuse), interpersonal (social support and marital or partner status), and neighborhood-level (% poverty and racial/ethnic composition) factors that best predict adherence to anal cancer screening follow up.

For the thesis, we used data collected for the FACS study and the same strategies also implemented. We assessed individual level factor such as HIV-related stigma and substance/drug abuse, social support and marital status on depressive symptoms in HIV positive individuals.

1.2 Problem Statement

In 2017, 20.9 million HIV positive individuals accessed antiretroviral therapy (UNAIDS, 2017) (UNAIDS, 2017) that helped HIV positive individuals to live longer and

survive with different comorbid conditions the same as HIV negative population. Depression is the most common comorbid medical condition in HIV positive individuals. The odds of having depression symptoms 1.38 times more likely among HIV positive individuals compared with HIV negative (OR= 1.38, and CI (1.18, 1.62)). Depression is associated with decreased medication adherence to Antiretroviral therapy (ART), reduced quality of life, and reduced survival time (Sueoka et al., 2010). The majority of patients with depression are not treated for the condition. Sueoka et al. study among HIV positive and negative veterans showed only 38% depressed individuals treated with selective serotonin receptor inhibitors (SSRI) and 28% of the patients received mental health counseling and HIV positive with depression less likely to receive mental health counseling. The same paper reported 48% depressed individuals received either SSRI or psychological treatment (Sueoka et al., 2010).

1.3 Purpose Statement

The purpose of the project was to determine the prevalence of depressive symptoms and identify elements associated with depressive symptoms among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center. We examined four null hypotheses to determine factors associated with depressive symptoms among HIV positive individuals.

1. Socio-demographic characteristics of HIV positive individuals have no association with depressive symptoms of individuals obtaining anal cancer screening.
2. Perceived social support for HIV positive individuals has no association with depressive symptoms for individuals obtaining anal cancer screening.

3. Internalized AIDS-related stigma has no association with depressive symptoms for HIV positive individuals receiving anal cancer screening.

4. Medical condition and substance abuse have no association with depressive symptoms for HIV positive individuals.

The goal of this thesis project was to advance our understanding of depression for HIV positive individuals obtaining anal cancer screening and provide recommendations for providers treating HIV positive patients for how to identify patients who are more likely to develop depressive symptoms.

1.4 Significance

Depression is typically assessed in HIV positive individuals who are at high risk of developing depressive symptomology such as substance users, individuals with excessive alcohol consumption, etc. To date, there is a scarcity of data on depressive symptoms among HIV positive individuals obtaining anal cancer screening. This study would help identify contributing factors to depressive symptomatology among HIV positive individuals receiving preventive cancer screening. This study would also identify factors contributing to depressive symptomatology in a general HIV positive population. These findings could assist providers in identifying which HIV positive individuals are at risk of depression in this setting and ultimately improve mental health referral.

1.5 Definition of Terms and abbreviation

AIDS- Acquired immunodeficiency syndrome

ART- Antiretroviral therapy

BDI- Beck's Depression Inventory

CESD- Center for Epidemiologic Depression Scale

Depressive symptoms defined CES-D score greater than sixteen

EHR- Electronic Health Records

EPIC- Epic healthcare software

FACS- Follow Up After Anal Cancer Screening

HIPAA- Health Insurance Portability Accountability Act

HIV- Human Immunodeficiency Virus

HSCL-D-Hopkins Symptom Checklist

IRB- Institutional review board

K-10-Kessler Psychological Distress Scale

MOS-SSS- Medical Outcomes Study Social Support Survey

PEP- Post-exposure prophylaxis

PHQ-9- Patient Health Questionnaire

PI- Principal Investigator

PreP- pre-exposure prophylaxis

UNAIDS- United Nations Program on HIV/AIDS

VACS- veterans aging cohort study

WHO- World Health Organization

Chapter II: LITERATURE REVIEW

2.1. Introduction – What does the Global and Local HIV Data Tell Us?

Since the 1980s, the Human Immunodeficiency Virus (HIV) epidemic continue to be a serious, global public health threat. According to the United Nations Program on HIV/AIDS (UNAIDS) and the World Health Organization (WHO), Acquired immunodeficiency syndrome (AIDS) epidemics claimed 35 million lives worldwide since the start of the epidemic (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2017). In 2016, a total of 36.7 million peoples were living with HIV. This figure includes 1.8 million new infections (UNAIDS, 05/31/2016, 2017). During the same period, one million people died of AIDS-related illnesses.

Conversely, the increased use of antiretroviral therapy (ART) has promoted a decrease in new infection rates. As of June 2017, 20.9 million people living with HIV were accessing antiretroviral treatment. This figure is up from 17.1 million in 2015 and 7.7 million in 2010. As result of the ART, new infection rates decreased by 11% in 2016 (UNAIDS, 2017).

In the US, an estimated 1,122,900 adults and adolescents were living with HIV at the end of 2015. There were 39,782 new cases in 2016. The annual number of new HIV cases declined 5% from 2011 to 2015. The rate of HIV is highest in the southern regions of the U.S. (16.8 per 100,000) and lowest in mid-west (7.5 per 100,000) (Centers for Disease Control and Prevention, 2017). In 2016, male-to-male sexual contacts accounted for 70% of HIV transmission in the USA; in contrast, heterosexual contact accounted for only 24% (Centers for Disease Control and Prevention, 2017). The majority (94%) of undiagnosed HIV cases in the

U.S. attributed to heterosexual contact (Centers for Disease Control and Prevention, 2017). Persons unaware of HIV infection represent 14.5% of the total HIV positive population. 50.5% of undiagnosed HIV positive individuals were residing the southern United States but contribute 40% of virus transmission (Dailey et al., 2017).

In Georgia, HIV is one of the notifiable diseases that must be reported to Public health department within seven days. The surveillance of these diseases is not subject to Health Insurance Portability and Accountability Act (HIPAA) restriction. The state requires dual reporting systems, meaning that both the testing laboratory and health care providers must report the incidence of an HIV case (Georgia department of public health).

In 2015, Georgia had the fifth rank for the total number of people living HIV positive results. However, as result of effective treatment the number people living with HIV increase steadily. As of December 31, 2015, the total number was 54,754. Of these, 53% had stage 3 or AIDS.

About two-thirds of the total of HIV positive individuals in Georgia reside at Atlanta metropolitan station. There were 2,741 new cases of HIV, and eighty-one percent were male, out of which, 83% attributed to Men have Sex with Men; females constitute nineteen percent of new diagnoses and 90% of HIV diagnoses associated with a heterosexual activity. The state of Georgia rate of HIV per 100,000 populations is 77.5 for blacks, 26.7 for Hispanic and 9.3 for white race groups. (Georgia Department of Public Health)

2.2. Depression and in HIV positive individuals

Depression is the most common neuropsychiatric complication in HIV positive individuals globally. It may occur in all phases of HIV infection. The prevalence depression

higher in HIV positive individuals than the general populations (Nanni, Caruso, Mitchell, Meggiolaro, & Grassi, 2015). A meta-analysis by Uthman et al. showed that the rate of depressive symptoms ranges from 12.8% to 78% for people living with HIV. The wide variation in the prevalence of depressive symptom is due to variability in measurement tools to assess depressive symptoms among PLHIV and variability in the clinical cut-offs points used across studies. However, there was no significant difference in depressive symptoms for people living with HIV by country income group. The overall pool rate of depression symptoms in people living with HIV was 39.5 % (Uthman, Magidson, Safren, & Nachega, 2014). In the US, the prevalence of depression for HIV-positive individuals receiving medical care was 12.4 % for major depression and 25.6 % for any current depression. The rate of major depression was higher among the following groups: female (17.0%), transgender (17.5%), individuals between the age of 35 and 44 years, below high school education (16.2%), and annual income less than 10,000 dollars (16.5%). However, no association observed between major depression and race/ethnicity, time since HIV diagnosis, and sexual orientation (Do et al., 2014).

Several factors affect the prevalence of depression in people living with HIV; some of the factors are ART side effects, inflammatory processes, stigma/discrimination related to HIV/AIDS and fear of premature death. (Hellmuth et al., 2017). Depression in HIV positive individuals caused a decrease in working abilities, alteration of economic productivity, social isolation, declined physical activity, diminished problem-solving ability, and non-adherence to ART medication (Bernard, Dabis, & de Rekeneire, 2017). It also affected the overall health status of the patients with minimal weight gain, low CD4 progression, faster progression to AIDS and increased mortality (Bernard et al., 2017; Hellmuth et al., 2017).

The depressive symptom in HIV positive individuals is the same as in the general populations. The symptoms include persistent sadness, loss of interest, decreased appetite, low concentration, sleep problems, guilt/ worthlessness feelings, reduced energy, psychomotor retardation and suicidal ideation (Olatunji, Mimiaga, O'Cleirigh, & Safren, 2006). HIV positive individuals have significantly more problems in making decisions, frequent sleep and appetite disorders, and cognitive impairment compared to HIV negative individuals (Arseniou, Arvaniti, & Samakouri, 2014).

2.3 Possible mechanism of depression in HIV positive Individuals

The mechanism of developing depression in HIV positive individuals involves both biological mechanisms and social factors.

I. Biological factors

HIV causes depression by inducing inflammation by directly infecting brain cell or HIV proteins including glycoprotein 120 and tat proteins. It activates the glial cells that are the immune cells of the brain and involved in inflammatory responses. The other factors involved are elevated inflammatory cytokine especially tumor necrosis factor alpha (TNF- α), interferon gamma (INF- γ), interleukin-1 (IL-1), and IL-6, produced as a result of HIV infection(Arseniou et al., 2014).

II. Psycho-social Model

HIV-positive patients suffer from isolation, lack of support, discrimination, violence, hopelessness, and drug abuse, all of which can contribute to higher episodes of depression (Arseniou et al., 2014).

There are many factors increase the risk of depression in HIV positive individuals and here are some;

1. Gender: The prevalence of depression in the general population is more significant for women. Depressive symptoms are common among HIV positive women (19.4%) as compared to HIV negative (4.8%) individuals controlling for age (Arseniou et al., 2014).

2. Age of the patient: Among HIV-positive individuals, the age group of 13- 19 years and individuals more than 50 years old have high rates of depressive symptoms. One study showed a depression rate of 20% in older HIV positive groups compared to 12% in younger groups. HIV positive teenagers were at a fourfold higher risk of developing depression than their peers (Arseniou et al., 2014).

3. History of depression before HIV: The relapse of depressive symptoms can occur in individuals with recent infection due to stigmatization and emotional consequences of the diagnosis (Arseniou et al., 2014).

4. HIV-related stigma: Weiss et al. define health-related stigma as “social disqualification of individuals and populations who are identified with particular health problems’. Social rejection could be due poverty, ethnicity, sexual preference and other factors that may contribute to social disadvantage or discrimination. Stigma adds the burden of the psychological, physical and social well-being of individuals (Weiss, Ramakrishna, & Somma, 2006).

A study examined the differences in HIV stigma versus MSM stigma and the role of these stigmas in depression among HIV-positive Latino and African American living in Los Angeles. The research found Latino had higher HIV stigma but lower MSM stigma score compared with African American and both stigmas associated with depression. Moreover, HIV stigma associated with less social support and stress (Wohl et al., 2013). Correspondingly similar result observed with HIV related stigma and depression in majority study participants

heterosexual (Chan et al., 2017). Internalized stigma was also associated with not disclosing HIV status to the partner and family members (Overstreet, Earnshaw, Kalichman, & Quinn, 2013).

5. Smoking and depression: A twenty-six-population based study assessed smoking and risk of depression was conducted from the Copenhagen city heart study. The risk of depression increases as the amount of cigarette consumption increase for females and males smoking more than 20 grams per day. None smokers and former smokers have almost the same risk of depression (Flensburg-Madsen et al., 2011). Balfour et al. study, the majority of study participants were Caucasian (96%), showed a tailored of smoking cessation and depression intervention in HIV positive individuals linked with reduction of depressive symptoms (CES-D score 15.2 at baseline vs. 13.4 after 24 weeks) and the quit rate of was 28%. The cigarette quit rate was not statistically different with depression symptoms (Balfour et al., 2017).

2.4 The Relationship between depression and HIV

Scientific evidence suggested a bidirectional relation between depression and HIV. The rate of depression is higher in symptomatic AIDS group compared with asymptomatic groups. (Arseniou et al., 2014). Depression negatively impacted disease progression in HIV positive patients. Immune cells CD4, CD8, and Natural Killer(NK) are most commonly affected in a patient with depression. These cells are involved in inhibiting viral cell replication by destroying the infected cells and producing cytokines. Depression causes a decrease in number and activity of Natural Killer cells, lower CD4 counts, and an increase CD8 T cell activity. As result of these effects, depression causes an increase in the viral load. Depression facilitates progression of the disease, resulting in higher mortality (Arseniou et al., 2014).

According to a study done in South Africa, the symptoms of depression and anxiety are common in individuals seeking HIV testing. More than a third (38.4%) of the individuals

suffered mild to severe depression , and 80% participants reported anxiety (Kagee, Saal, & Bantjes, 2017). However, there was no significant association between the positive test result and depression (Stahlman et al., 2015).

2.5 How depression affect HIV positive individuals?

2.5.1 Depression and risky sexual behavior

A study among HIV positive young men who have sex with men (MSM) and serodiscordant partners showed that depressive symptoms were a significant predictor of engaging in unprotected anal intercourse (UAI) (Cook, Valera, & Wilson, 2015). The result from a US study that included HIV negative gay and bisexual men showed that there was an association between depression and receptive condomless anal sex with recent casual partners. However, there was no association between depression and the number of partners in past 90 days, controlling for age, race/ethnicity, education, and relationship status. (Millar, Starks, Grov, & Parsons, 2017).

A study performed in Nepal showed that female sex workers who were involved in at least one HIV risk behavior were six times more likely to be in a high category of depression (adjusted OR=6.03, 95% CI (2.09, 17.36)). (Sagtani et al., 2013). In Southwest China study, female sex workers' willingness to use pre-exposure prophylaxis (PreP) was predicted by a high level of trust in the physician, perceived stigma, and self-efficacy of PreP but not on depression (Jackson et al., 2013).

Another prospective cohort study was done in Kinshasa, the Democratic Republic of Congo asserted that prenatal (before pregnancy) depression is not a predictor for loss of follow

up for prevention of mother to child transmission service among newly diagnosed HIV positive women. (Yotebieng, Fokong, & Yotebieng, 2017).

A randomized clinical trial of telephone motivational interview in five U.S. metropolitan areas in Eastern and Midwestern states examined 100 HIV positive individuals late middle and older age adults found that a four-session telephone motivational interview produced a more significant reduction in sexual risk behavior in a participant with lower depressive symptoms groups. (Lovejoy & Heckman, 2014).

According to a Cochrane systemic review, after reviewing published and unpublished reports from 1988 through December 2007 a total of 18,585 participants behavioral intervention design to promote sexual risk reduction. The intervention reduced unprotected anal sex among men sex with men by 27% compared with non-intervention or minimal intervention groups and a 17% reduction compared with other interventions. The most considerable reductions (40% to 54% decreases) occurred in the number of partners or episodes of unprotected anal sex among community-level interventions (Johnson et al., 2008).

2.5.2 Depression and Antiretroviral Treatment (ART)

The likelihood of achieving optimal ART adherence was 42% lower in the depressed group compared with the non-depressed group. (Uthman et al., 2014) A meta-analysis investigated the associations between depressive symptoms and adherence to antiretroviral therapy (ART) among people living with HIV and examined 111 studies published 1993 through 2013 and a total 42,366 across low income, middle income, and high-income countries. The prevalence of depression was not significantly different, based on countries' income level. However, the proportion of people living with HIV who achieved good adherence was

significantly higher in lower income countries compared to high-income countries. The pooled adherence rate of low-income nations 86% vs. 67.5% for high-income countries. The same meta-analysis showed that the likelihood of achieving optimal adherence was 42% lower among those with depressive symptoms compared to those without depression (a pooled OR = 0.58, 95% CI (0.55 to 0.62), n=112)(Uthman et al., 2014). Moreover, another meta-analysis performed from 29 articles published between 2001 and 2012 with a total of 12,243 HIV positive individuals included to examine whether treatment of depression and psychological distress improves with antiretroviral therapy adherence. The study found individuals treated for depression were 83% better ART adherence compared untreated individuals. ART adherence was higher for individuals with lower CD4 counts or more severe depression for interventions explicitly targeting depression versus addressing mental health as a secondary objective, more extended treatments, and observational studies (Sin & DiMatteo, 2014).

2.5.3 Treatment of depression in HIV positive individuals

A retrospective study examined 132 HIV positive individuals. The study found that depression treatment response rate was 36.4 % complete remission and 51% achieved greater than fifty percent reduction in depression symptoms. The treatments utilized were psychotherapy (54%), psychotherapy (20%), and a combination of antidepressant and psychotherapy. Individuals living with HIV respond the same as the general population to depression treatment (Primeau, Avellaneda, Musselman, St Jean, & Illa, 2013).

Sueoka et al. compared depression treatment using veterans aging cohort study (VACS). This prospective cohort study found no difference in the combined outcome of prescription of a

Selective Serotonin Receptor Inhibitors (SSRI) and mental health counseling by HIV-status [HIV negative 49% vs. HIV positive 48%](Sueoka et al., 2010) .

2.6 Depression Measurement instrument

The most common tools used to detect depression in HIV-positive individuals is the Center for Epidemiologic Depression Scale (CES-D). Bernard et al. executed a systemic review and found that CESD used in 31.1% of published studies in sub-Saharan African countries for depression screening. The same report showed the Patient Health Questionnaire (PHQ-9), and the Hopkins Symptom Checklist (HSCL-D) utilized at the same rate of (17.8%). And Beck depression index (BDI) used in 13.3% of the studies (Bernard et al., 2017). The Ontario HIV Treatment Network Cohort Study performed a validation study of depression screening instruments (the -CESD, the Kessler Psychological Distress Scale= or K10, and the PHQ9) and their short forms. The instruments showed 86-100% sensitivity and 81-87% specificity for detecting depression, > 90% negative predictive value, and 49-58 % positive predictive value at their optimal cut-points. The depression measurement instruments and their short forms identified depression equally and accurately. As result of this, it is more comfortable to use the shorter form of depression screening tools in a clinical setting. The same study showed a sensitivity of 86% and specificity of 82% for the CESD instrument. (Choi et al., 2015). The pooled sensitivity for CES-D was 82% and combined specificity 73% in a systematic review done in sub-Saharan African countries (Tsai, 2014).

2.7 Literature gap and why this study

The prevalence of Depression is significantly high in HIV positive individuals compared to the general population. Most studies examined depression in a sub-segment of HIV positive individuals (such as smokers, substance users, based on sexual orientation, and individual socioeconomic conditions) but to date, there has been no study conducted in a general HIV positive population obtaining cancer screening. This project would help us to increase scientific understanding regarding depressive symptoms of the HIV positive patients utilizing preventive health services. For this thesis, we described and compared sociodemographic, HIV related stigma scores, substance use, social support, and sexual behaviors as they relate to depressive symptoms among HIV positive individuals undergoing anal cancer screening in an urban, Infection Disease clinic. This study would help us to identify factors contributing to depressive symptomatology in a general HIV positive population obtaining screening services. These findings could assist HIV providers in determining which HIV positive individuals are at risk of depression in this setting and ultimately improve mental health referral.

Chapter III: METHODS

2.1 Introduction

The objective of this thesis is to understand the impact of socioeconomic status, social support, AIDS-related stigma and substance abuse on depressive symptoms among HIV positive individuals obtaining anal cancer screening. The study was conducted at Grady Hospital Ponce De Leon center in Atlanta, Georgia. The data for this study were collected during an ongoing research project titled “Follow Up After Anal Cancer Screening (FACS) in HIV-positive Individuals” (K01NR015733-01A1).

2.2 Population and Sample

Study approval was obtained from the Emory University’s Institutional review board (IRB) and Grady Research Oversight Committee. The participants were HIV positive men and women actively receiving outpatient care at Grady Hospital’s Ponce De Leon Center in Atlanta, Georgia. Additional inclusion criteria were as follows: 21 years of age or above; having an abnormal anal Pap test before study enrollment; able to read, write and understand English; and living in the metropolitan Atlanta area. A total of 100 patients were interviewed for this study. Active recruitment involved having the Principal Investigator (PI) approach patients who had an abnormal anal Pap Test after reviewing the Electronic Health Records (EHR). Passive recruitment involved having patients approach the PI or research assistant after reading a flyer posted at the clinic. Data collected from one hundred study participants included for this analysis.

2.3 Procedure

Research interviewers (RI) were trained for two days at the clinical research center of Emory University to recruit and obtain information from the participants. The RIs also completed Health Insurance Portability Accountability Act (HIPAA) and epic healthcare software (EPIC) online training. The identification of eligible patients for recruitment was done utilizing the Grady Hospital electronic health record (EPIC). The qualified individuals were asked if they were interested in participating in the study during a visit to the clinic. The informed consent document was read and explained aloud to interested individuals in an isolated room. The communication was open to any lingering questions or queries. The patients were given time to consider participation and were asked if they understood the consent process. Interested participants signed the informed consent document and were enrolled in the study. All participants were compensated for their time required for the study visit.

2.4 Research Design and Instrument

The study design was cross-sectional and included a structured questionnaire. The PI obtained information about participants' medical condition and biopsy results from the EHR.

2.4.1 Independent Variables

Sociodemographic information such as age, sex, ethnicity, education status, housing condition, employment and income status, marital status as well as smoking status, sexual orientation, and type of health insurance.

The internalized AIDS-related stigma scale (IA-RSS) was also included which is a seven-item instrument to measure negative perceptions of PLHIV. The participants answered “agree” or “disagree” to each items response.

The Medical Outcomes Study Social Support Survey (MOS-SSS) a 20-item scale which measures the functional aspects of perceived social support. The response for each item was a five-point Likert scale (ranging from 1=none of the time to 5= all of the time). A higher score indicates patients perceived more social support compared to lower scores. The information about the survey questionnaire can be found in the appendix section.

2.4.2 Dependent variable

The Center for Epidemiologic Studies for depression (CES-D) scale was used to measure depressive symptoms. CES-D measures depressive symptoms on a scale of 0 to 60. It categorizes depressive symptoms as absent (<16 CES-D), mild (16-21), moderate (21-25) and severe (26-60) (Marando et al., 2016). We used greater than 16 to define depressive symptoms. There are 20 items in total, the participants’ answer for each item ranged from 0 to 3. It represents: 0= rarely or none of the time (< 1 day in the past week), 1=some or little of the time (1-2 days), 2=occasionally or a moderate amount of time (3-4 days), and 3=most or all the time (5-7 days). The respondent with greater than or equal to sixteen on the CES-D will have their primary care provider notified for further evaluation. We used greater than sixteen to delineate positive depressive symptoms. The CES-D has demonstrated excellent internal consistency with (Cronbach’s alpha=.88) (Siddaway, Wood, & Taylor, 2017) The CES-D form can be seen in the appendix section.

2.5 Statistical Analysis

We used SAS software for data analysis. We calculated means and standard deviations for quantitative data and the number and percentage for categorical variables. We also used T-test, and chi-square to calculate a p-value for quantitative and categorical data respectively. Correlation analyses were performed with the Pearson correlation test. Bivariate analysis performed and variable with statistically significant association with dependent variables identified. Those variables (AIDS-related stigma, smoking status, and MOS-SSS) identified in bivariate analysis included to multiple regression examinations and variables selected with backward elimination at the alpha level less than 0.05. A logistic regression model was used to determine associated risk factors.

2.6 Ethical consideration

Emory University's Institutional review board (IRB) and Grady Research Oversight Committee approved the FACS study, and the PI of FACS study shared the data after removing all Protected Health Information (PHI). Only the PI has access to the data and the code that links any identifiers to the participants.

2.7 Limitation

The study participants were selected using convenience sampling. The sampling methods could have affected the external validity of the study. Moreover, Ponce De Leon center also accepts only patients with a history of an AIDS diagnosis or had a previous documented CD4 cell count below 200 cells/ μ L. As result of these limitations, the study may not be representative of the population.

Chapter IV: RESULT

Study participants

A total of one hundred HIV positive individuals obtaining anal cancer screening included in this study. A self-reported race or ethnic group study participants were, African-American 79 (79.8%), 14 (14%) Caucasian, 5 (5.1%) Hispanic or Latino, and one other ethnic group. The mean age of study participants was 45.2 years (SD= 9.0 years) and the age range from 23 to 64 years. The gender distribution as follows, 85 (85%) males, 12 (12%) females, two transgender females and one choose not to answer. Seventy-six percent of participants had some form of health insurance (i.e., private health insurance, Medicare, Medicaid, other government health program or a military health plan). Regarding employment 55% employed and 45% were unemployed. In terms of monthly income, 37 (37%) less than 1000 dollars/month, 27 (27%) from 1001 to 1500 dollars/month, 13 (13%) from 1501 to 2000 dollars/month, and 23 (23%) earned more than 2000 dollars per month. The educational status of study participants as follows, 14 (14%) did not complete high school, 63 (63%) completed high school, and 23 (23%) completed university educations.

The sexual orientation of study participants were 65 (67.0%) homosexual (Gay or lesbian), 16 (16.5%) bisexuals and 15 (15.5%) heterosexual. About marital status, 76 (76.0%) were single or never married, 16 (16.0%) were married or had a partner, and the remaining were separated, divorced or widowed. There was no significant difference in sociodemographic

factors between symptomatic depression and non-symptomatic depression groups using the alpha level of 0.05. Sociodemographic characteristics by depressive symptoms are provided in Table 1.

Table 1. Sociodemographic characteristics and depressive symptoms of the HIV positive individuals – FAC study (2017-2018)

Characteristics	Overall (n =100) Mean (SD)¹ or n (%)	No Depressive symptom (n =62) Mean (SD) or n (%)	Depressive symptoms (n =38) Mean (SD) or n (%)	p-value
Age (years)	45.2 (9.0)	45.0 (9.5)	45.7 (8.3)	0.72
Min -Max (years)	23-64	23-64	23-56	
Gender				0.32
Male	85 (85.0)	55 (88.7)	30 (78.9)	
Female	12 (12.0)	5 (8.1)	7 (18.4)	
Other	3 (3.0)	2 (3.2)	1 (2.6)	
Race*				0.17
African-American	79 (79.8)	49 (79.0)	30 (81.1)	
Caucasians/white	14 (14.1)	8 (12.9)	6 (16.2)	
Hispanic/Other	6 (6.1)	5 (8.1)	1(2.6)	
Marital status*				0.85
Single /never married	73 (73.0)	46 (74.2)	27 (71.1)	
Married/domestic partner	16 (16.0)	10 (16.1)	6 (15.8)	
Separated/widowed/divorced	11 (11.0)	6 (9.7)	5 (13.2)	
Household income				0.90
<1000 dollars/month	37 (37.0)	22 (35.5)	15 (39.5)	
1001 -1500 dollars /month	27 (27.0)	16 (25.8)	11 (29.0)	
1501-2000 dollars /month	13 (13.0)	9 (14.5)	4 (10.5)	
>2001 dollars /month	23 (23.0)	15 (24.2)	8 (21.1)	
Educational status				0.58
Did not complete high school	14 (14.0)	8 (12.9)	6 (15.8)	
Complete high school	63 (63.0)	38 (62.3)	25 (65.8)	
Completed University	23 (23.0)	16 (25.8)	7 (18.4)	
Sexual Orientation				0.57
Heterosexual	15 (15.5)	8 (13.6)	7 (18.4)	
Bisexual	16 (16.5)	8 (13.6)	8 (21.1)	
Gay/Lesbian	65 (67.0)	42 (71.2)	23 (60.5)	
Other	1 (1.0)	1 (1.7)		

Health insurance				
Yes	76 (76.0)	46 (74.2)	30 (78.9)	0.64
No	24 (24.0)	16 (25.8)	8 (21.1)	

Residence type

Own house/ apartment	70 (70.0)	46 (65.7)	24 (34.3)	0.27
Live with parent	6 (6.0)	4 (66.7)	2 (33.3)	
Someone else apartment	19 (19.0)	10 (52.6)	9 (47.4)	
In rooming boarding/ or half way housing	1 (1.0)	0	1 (100.0)	
Shelter /welfare	2 (2.0)	0	2 (100.0)	
On the street/ other places	2 (2.0)	2 (100.0)	0	

¹ SD Standard deviation * missing values **of one**

The mean score of internalized stigma was 2.5 (SD=2.0) for the overall sample, 3.2 (SD=2.3) with depressive symptoms, and 2.03 (SD=1.7) for those with no symptoms p-value 0.0049. The mean score of perceived social support was 75.5 (SD=17.3) for the overall sample, 70.6 (SD=18.8) having depressive symptoms, and 78.5 (SD=15.7) for those without symptoms p-value 0.0253.

Table 2. Correlation between Depressive symptoms with different key variables among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

Pearson correlation	Depressive symptoms	Smoking status	Gender Identity	PSS	Residence	IA-RS
P -value						
Smoking status	-0.245 0.015					
Gender Identity	0.061 0.545	-0.064 0.534				
PSS	-0.379 0.0001	0.193 0.057	0.185 0.065			
Residence type	0.335 0.093	-0.056 0.586	-0.0237 0.815	-0.278 0.005		
IA-RS	0.335 0.0007	0.006 0.956	0.231 0.021	-0.302 0.002	0.105 0.299	
Insurance type	0.077 0.447	-0.133 0.192	0.060 0.557	-0.209 0.038	-0.034 0.783	
Adults in house	0.005 0.961	0.039 0.71	-0.021 0.837	0.085 0.413	-0.009 0.928	0.206 0.045

Footnotes: PSS – Perceived social support
IA-RS – Internalized AIDS related stigma

Depressive symptoms.

In our study population, the maximum and mean score for CES-D was 45 and 14.3 respectively. The interquartile range [IQR 12 (6.0, 19.5)] and 38 (38.0%) of the population categorized as positive depressive symptoms based on CES-D score of 16 and above. Of the total sample with depressive symptoms, 30 (81.1%) were African-American, and 8 (18.9%) belonged to (Caucasian, Hispanic, and Other) groups the p-value for the race or ethnicity (0.1742).

Depressive symptoms based on mean age, gender identity, marital status, household income,

educational status, sexual orientation and health insurance well described in table 1. Substance abuse reported by only three study participants and no statistical analysis performed due to a small number of participants with substance use.

Bivariate Analysis

Depressive symptoms negatively correlated with overall perceived social support [$R=-0.379$, $p\text{-value}=0.0001$] the perceived social support further subdivided into four subscales Emotional/Informational support (expressions of positive affect, emphatic understating and encouragement of feeling, providing advice, information, guidance or feedback), Tangible support (material aid or behavioral assistance), Positive social interaction (availability of other people to do fun things with), and affectionate support (expression of love and affection) (Sherbourne & Stewart, 1991) and correlate with depression [$R=-0.391$, $p\text{-value}<0.0001$], [$R=-0.271$, $p\text{-value}=0.0063$], [$R=-0.354$, $p\text{-value}=0.0003$], and [$R=-0.363$, $p\text{-value}=0.0002$] respectively. Depression negatively correlated as the person moves from smoker to non-smoking status [$R=-0.245$, $p\text{-value}=0.015$]; and also, positively correlated with AIDS-related stigma [$R=0.335$, $p\text{-value}=0.0007$]. There were no other significant correlations between depressive symptoms with other variables. There was significant correlation observed between internalized AIDS stigma and gender identity ($R=0.231$, $p\text{-value}=0.0208$), number of adult in the household ($R=0.206$, $p\text{-value}=0.0449$), and perceived social support ($R=-0.379$, $P\text{-value}=0.0001$). Perceived social support significantly correlated with the type of residence (as the person moves from single occupant house to group shelter) ($R=-0.278$, $P\text{-value}=0.005$), type of health insurance (the individuals move from private insurance to not having any insurance) ($R=-0.209$, $P\text{-}$

value=0.0378), and AIDS related stigma ($R=-0.302$, $P\text{-value}=0.0022$). The correlation coefficients of different variables with depression and each other are shown in Table 2.

The odds of developing depression increased 1.34 times for every one-point increment of self-reported AIDS-related stigma symptom ($OR=1.34$, 95% CI (1.08,1.66), $p\text{-value}=0.007$). The odds of developing depression 0.97 times for one-point increase in overall perceived social support ($OR=0.97$, 95% CI (0.95,99), $P\text{-value}=0.0289$). The odds of developing depressive symptoms statistically significant reduction for Emotional and informational support ($OR=0.93$, 95% CI (0.88, 0.99), $P\text{-value}=0.0226$) and Affectionate support ($OR=0.86$, 95% CI (0.76, 0.97), $P\text{-value}=0.0169$). The odds ratios were not statistically significant for Tangible and positive social supports. The odds of depression 0.6 times as the participants changing from current smokers to non-smoker and non-smoker to a former smoker ($OR=0.60$, 95% CI (0.38, 0.94), $p\text{-value}=0.0268$). Table 3. Showed the odds of developing depressive symptoms with the different variable.

Multivariate Analysis

In the final models only, Internalized AIDS-related stigma and current smoking status were statistically significant. The odds of developing depressive symptoms 1.36 time for each self-reported AIDS related stigma symptoms ($OR=1.36$, 95% CI (1.09, 1.71), $p\text{-value}=0.007$) and 3.10 times for current smokers ($OR=3.1$, 95% CI (1.17,8.24), $P\text{-value}=0.023$). There was no difference between former smokers and Never- smokers. Tables 4. Showed the odds ratio for the final model. Figure X showed the probability of prediction depression using AIDS related stigma and current smoking status (where 1= current smoker, 2= former- smoked, and 3= Never-smoker).

Table 3. The odds of developing Depressive symptoms for each risk factors for HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

Risk factors	Odds ratio (95% CI)	p-value
Sociodemographic and Health characteristics		
Age	1.01 (0.96,1.06)	0.72
More-than one adult in household (ref=yes)	1.05 (0.44,2.54)	0.91
Employment status (ref=yes)	1.64 (0.73,3.71)	0.23
Seeking employment (ref=yes)	0.87 (.034,2.22)	0.77
Smoking status (ref=Never)	2.79 (1.11,7.01)	0.03*
Perceived social support		
Emotional and information support	0.97 (0.95,0.99)	0.038*
Tangible support	0.93 (0.88,0.99)	0.02*
Positive support	0.94 (0.85,1.03)	0.15
Affectionate support	0.91 (0.82,1.00)	0.057
History of cancer(ref=no)	0.86 (0.76,0.97)	0.017*
AIDS related stigma	0.89 (0.28,2.89)	0.85
	1.34 (1.08,1.66)	0.007*

Footnotes: * P-value < 0.05

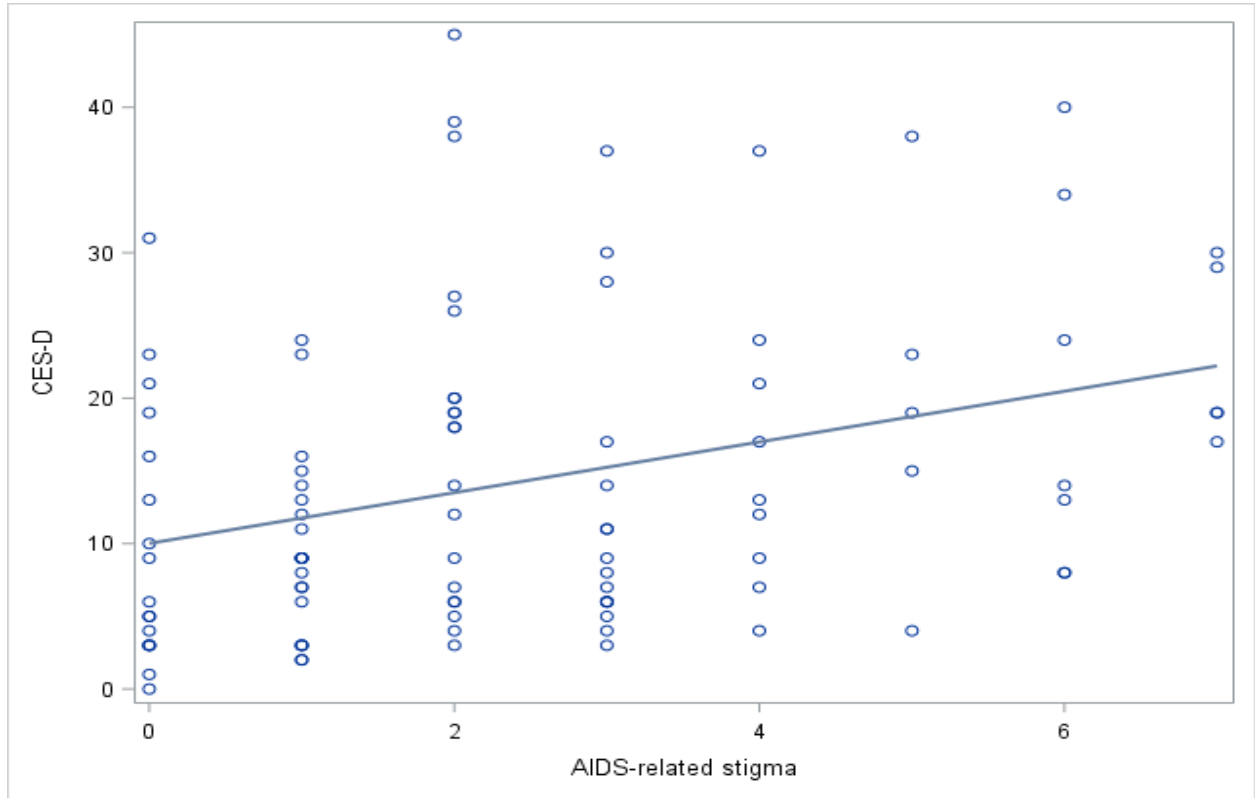


Figure 1. The relationship between depressive symptoms (CESD score) and internalized AIDS-related stigma among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

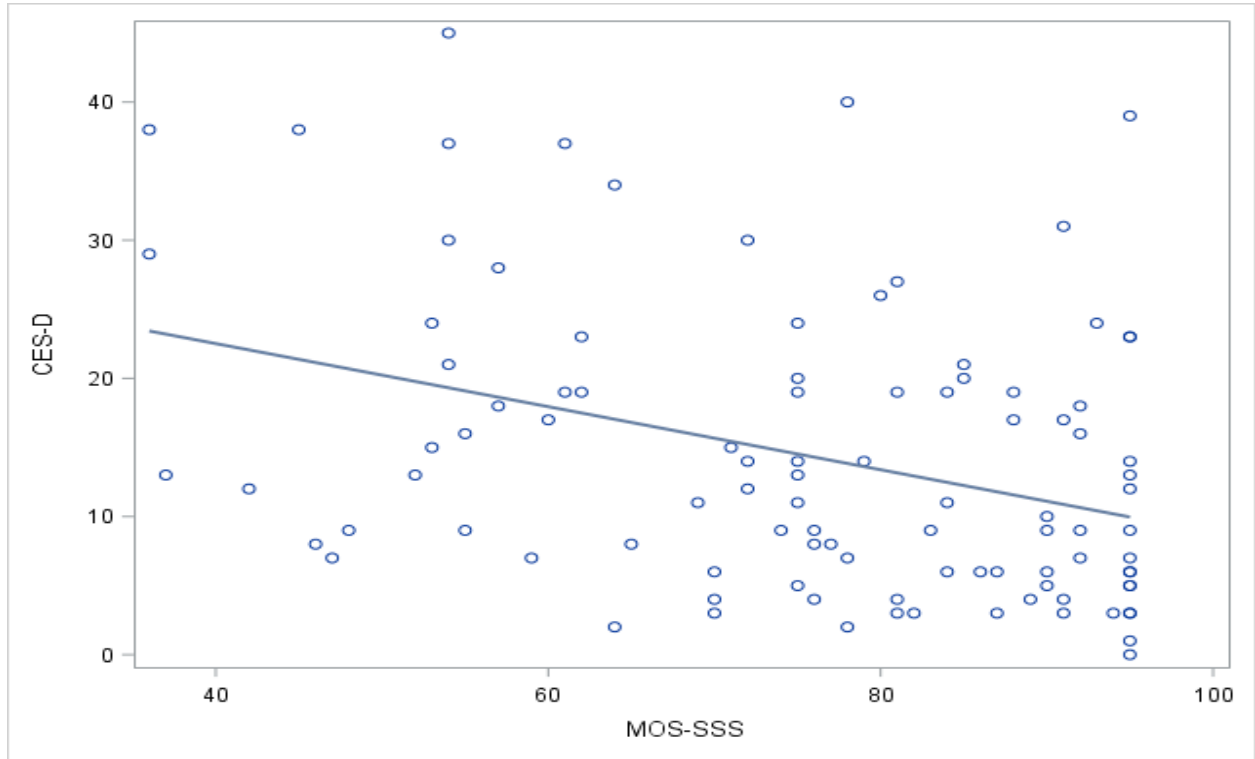


Figure 2. Scatter plot describing the relationship between depressive symptoms (CESD score) and perceived social support (MOS-SSS) among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

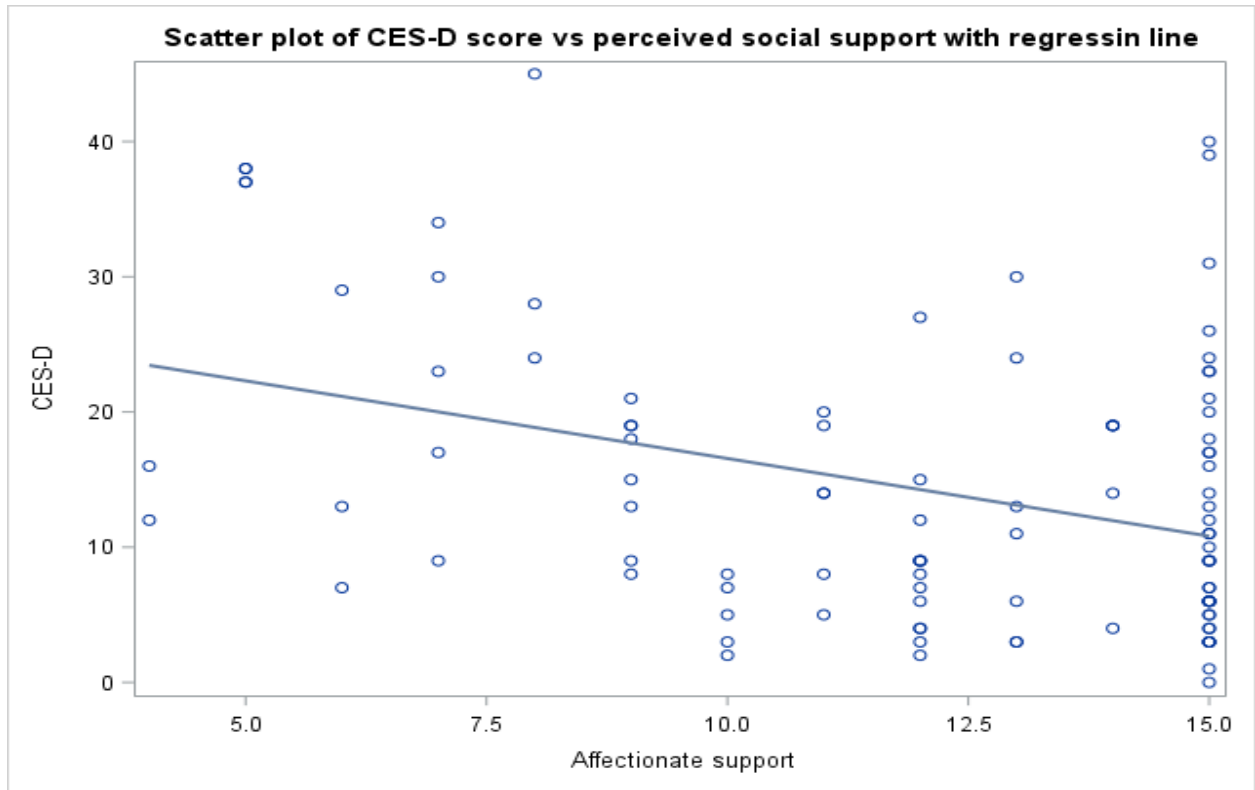


Figure 3. Scatterplots with regression line between depressive symptoms (CESD score) and Affectionate social support among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

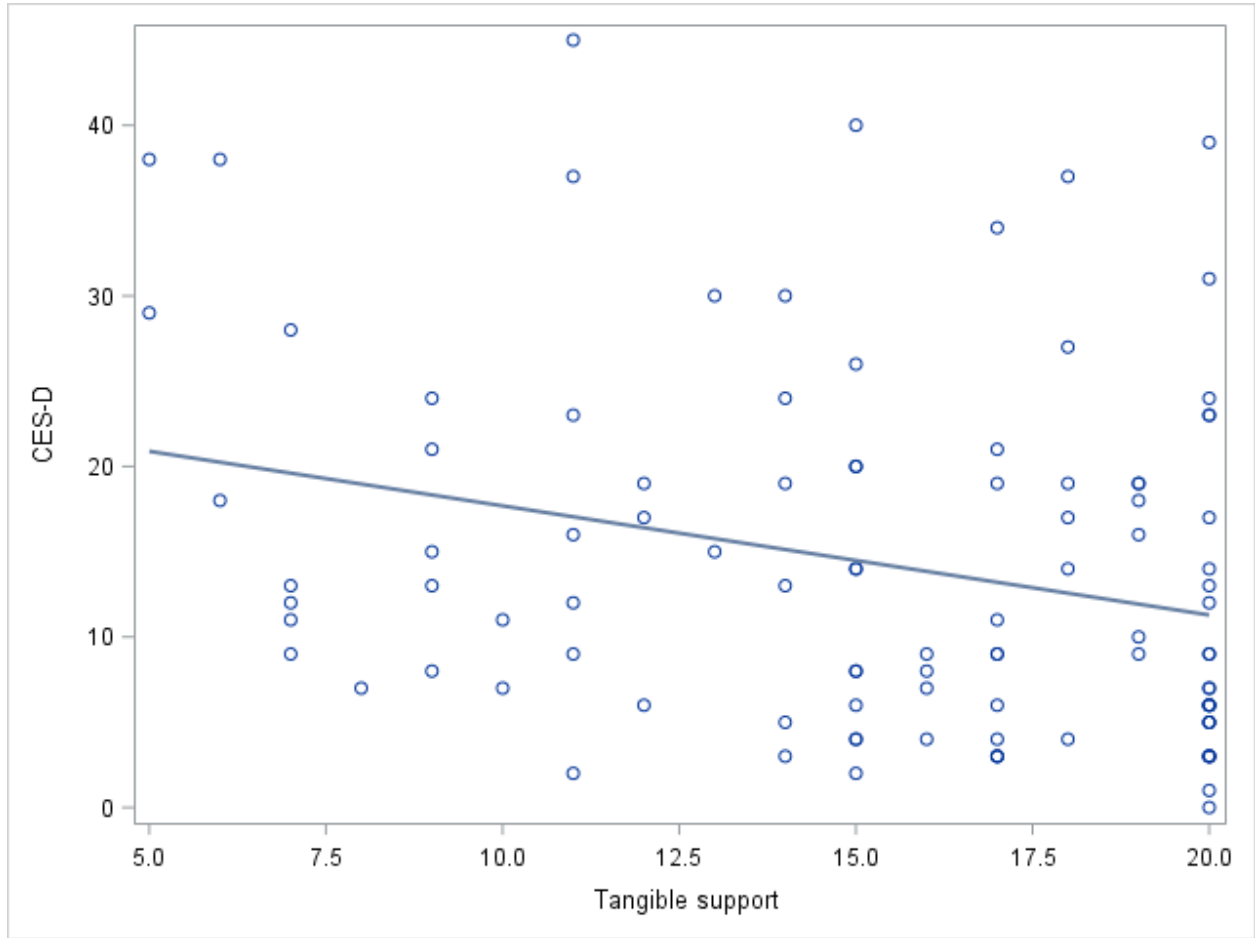


Figure 4. Scatterplots with a regression line between depressive symptoms and tangible social support among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

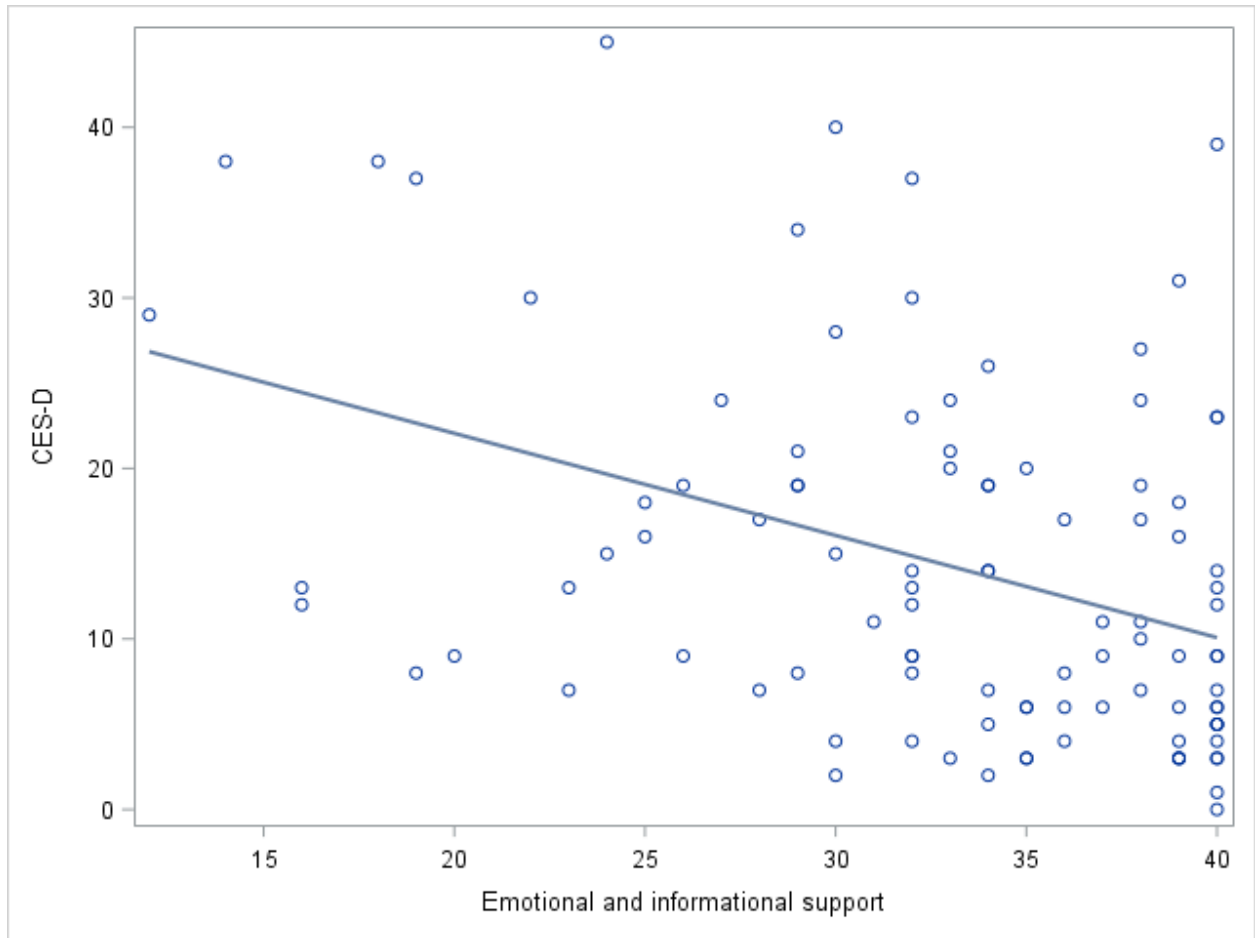


Figure 5. Scatterplots with regression line between depressive symptoms and emotional and informational social support among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

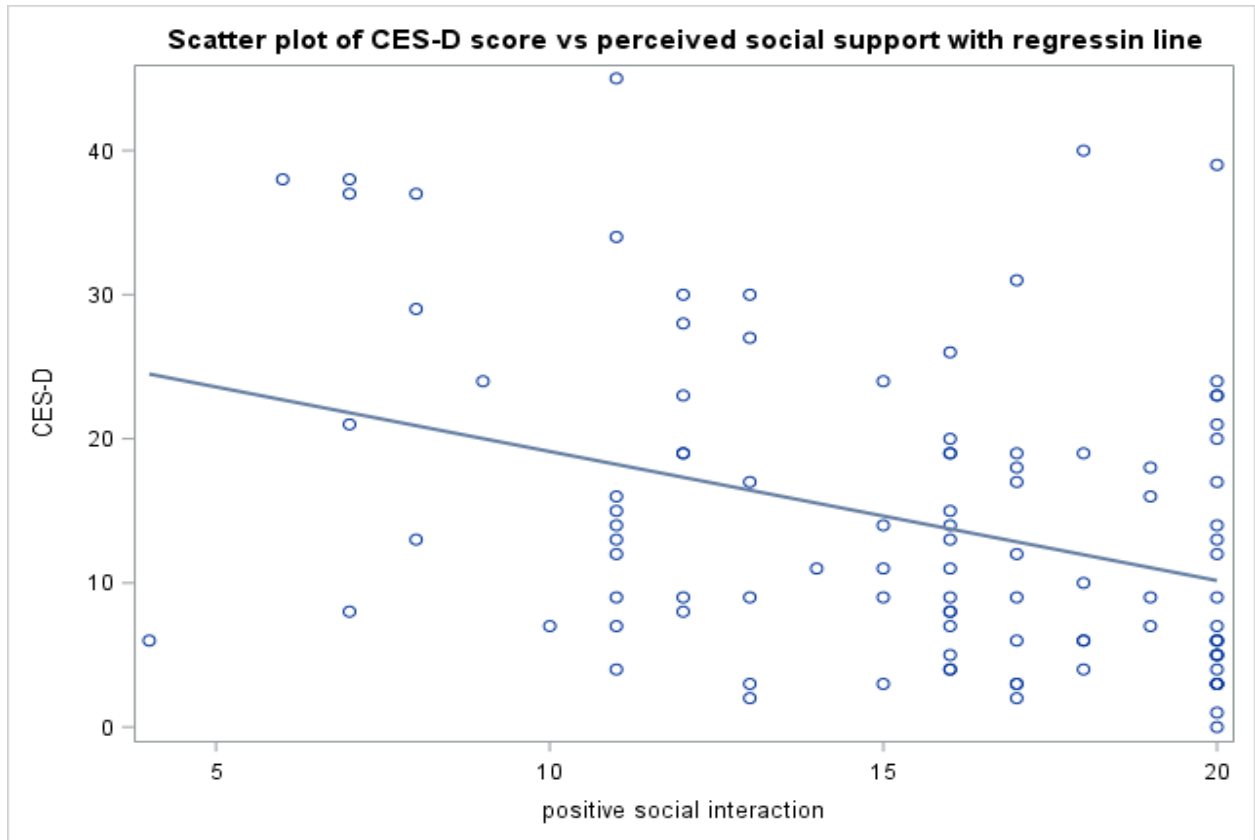


Figure 5. Scatterplots with regression line between depressive symptoms and positive social interaction social support among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

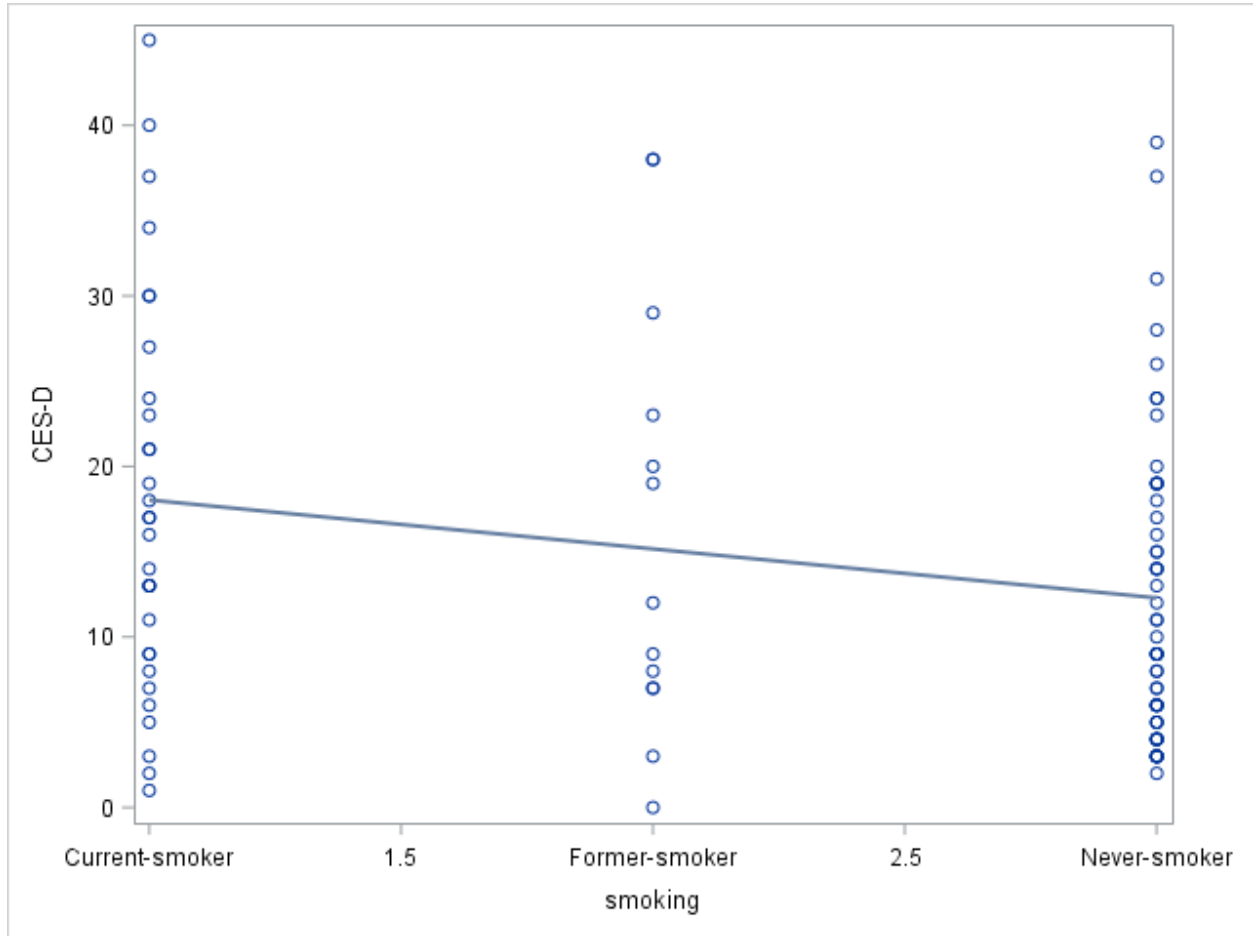
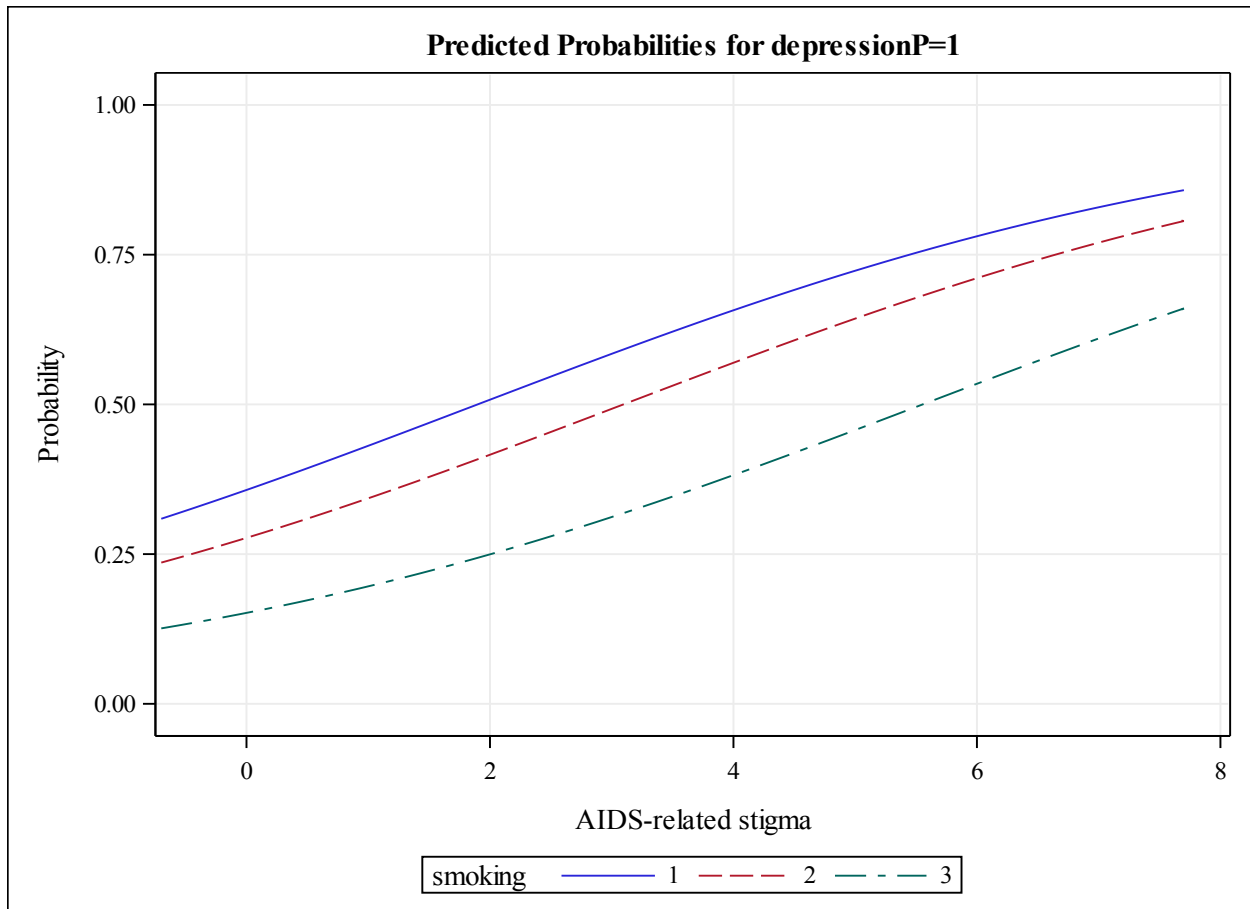


Figure 6. Scatterplots with a regression line between depressive symptoms (CESD score) and smoking status among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

Table 4. Multivariate analysis of key factors with depressive symptoms after including all statistically significant variables in the model.

Parameters	Estimate	Standard Error	Odds ratio (95% CI)	p-value
Intercept	-1.72	0.45		0.0001
AIDS Related stigma	0.31	0.11	1.36 (1.09,1.71)	0.007
Current Smokers (ref= Never)	1.13	0.50	3.10 (1.17,8.24)	0.023
Former Smokers (ref= Never)	0.7613	0.6651	2.14 (0.58, 7.88)	0.2524



1= current smoker 2= former smoker 3=never smoked

Figure 6. Predicted probability of presence of depressive symptoms (CESD score >16) by Internalized AIDS related stigma and smoking status among HIV positive individuals obtaining anal cancer screening at Ponce De Leon Center Atlanta, GA.

Chapter V: DISCUSSION

This study was a cross-sectional analysis conducted to identify the factors associated with depression among HIV positive individuals. We found depressive symptoms were associated with internalized AIDS related symptoms, current smoking status and overall perceived social support.

The mean CES-D score in our study was 14.3 (SD=10.5) which is comparable to a related study in Atlanta with the mean 16.6 (SD =10.0)(Overstreet et al., 2013). The frequency of depressive symptoms in our study was higher when compared with a similar study done in Ontario, Canada where the point estimate of depression prevalence among HIV positive individuals was 28% (Bekele et al., 2013) at the baseline. This difference in prevalence between the two studies could be due to the cutoff point used in the Ontario study was 23 instead of 16. Additionally, the sample size also larger in the Ontario study, which might have lowered the apparent rate of depression in Canada study. Also, the prevalence in our study (38%) was comparable to Louisiana study (33%) (Stewart, Jones, & Minor, 2011) both studies had similar study participants. The prevalence in our study was smaller compared to 49% depression rate that Holden et al. observed in Atlanta (Holden, Bradford, Hall, & Belton, 2013), which may be because the study participants in their investigation were African American women. Depressive symptoms among females are commonly reported being high compared to males (Bernard et al., 2017) and Holden et al. used different instruments (they used PHQ-9 with greater than or equal to five) to classified depression.

Depressive symptoms were negatively correlated with perceived social support. As the individuals perceived greater social support, depressive symptoms were found to decrease. This result is similar to the Ontario AIDS trial where there was a significant correlation between depression and perceived social support using MOS-SSS Pearson correlation coefficient ($R=0.34$) (Bekele et al., 2013). Protective effects of affectionate and emotional and informational support observed in depressive symptoms when we divide patients into a depressed and non-depressed group. On the other hand, tangible and positive social support did not show such association. As overall perceived social support and the subgroups of perceived social support negatively correlated with types of health insurance and place of residency. This correlation showed that low perceived social support observed in the individuals who had difficulty of finding stable residences, and with inadequate health insurance. The negative correlation of perceived social support with insurance type and housing illustrated that poverty might play an essential role in the lack of perceived social support and finally the development of depression among the study subjects. In our study, almost 40% of the study participants had an annual income less than equal to 12,000 dollars per year, i.e., fulfilling the criteria for being below the poverty limit even without considering the number of people depending on that money. So, we can say poverty could play a crucial part in the low perception of social support and developing the depressive symptoms.

In our study depressive symptoms moderately correlated with current cigarettes smoking status. We found the depressive symptoms rate among former smokers and non-smokers did not differ statistically. The majority of smokers (53 %) had depressive symptoms compared to (29%) of never smokers. Smoking could be related to the pathogenesis of depression or vice versa.

Some medication for depression have also been used for the smoking cessation. Perhaps the participants may be use smoking as a coping mechanism for their depressions, and that could be a reason for the depressed groups were more likely to be smokers compared to non-depressed groups.

Conversely, those who smoke cigarettes might be the individuals with personality traits of high risk-taking behaviors, that lead them to acquire HIV infection in the first place and prone to depression as well. This could be a reason why the cigarette smoking rate in HIV positive individuals is more than two times the rate of cigarette smoking in HIV negative individuals. The prevalence of smoking is 20.6 % for the general US population vs. 42.9 % HIV positive individuals (Mdodo et al., 2015).

In our study, 83% of study participants reported at least one internalized stigma symptom. The mean internalized AIDS stigma score was 2.5 (SD=2.01) and the median was 2.0, which is similar to what Overstreet et al. found among African American gay men where the mean was equal to 2.07 (SD=0.71) (Overstreet et al., 2013). The reasons the standard deviation in our study was larger compared with Overstreet et al. could be due to the fact that only a homogeneous group (African American gay men) were included and that a relatively larger sample size was included in the earlier study. When investigating the relationship between internalized AIDS stigma and depression, we found that the two were significantly correlated. Similar results were found in China by Zeng et al. where they found the Pearson correlation of internalized AIDS-stigma was 0.39, which they determined to be a statistically significant association (Zeng et al., 2018). The majority of study participants in our study were gay, bisexual, or lesbian. Their sexual orientation might create a tense relationship with family members who might oppose the same-sex relationship. As the result of family opposition to the

same-sex relationships, participants could have established a weak family cohesion, and they could encounter stigma related to their sexual preference which could predispose them to developing depressive symptoms.

This relationship demonstrated that AIDS-related stigma could be a universal predictor of depressive symptoms. The effect of perceived social support waned when all significant variables were included in the model. The odds ratio of each variable slightly decreased when the three variables added to the model. In our study, we did not find a statistically significant relationship between depressive symptoms and demographic factors such as age, gender identity, ethnicity/race, income, and presence of health insurance with bivariate analysis. The lack of association could be due to a relatively small sample size of the study.

Conclusion

The prevalence of depressive symptoms in our study was five times the depression rates of the US general populations (7.6%)(Pratt & Brody, 2014). We found that HIV positive individuals who had the presence of internalized AIDS-related stigma, were current smokers, and had low social support had a higher rate of depressive symptoms than those without these conditions. Primary care physicians should be able to identify patients at risk of developing depressive symptoms. The clinician should help patients with internalized AIDS related stigma symptoms build self-esteem by providing education around living with the virus and connecting with peer support groups which help them to create a sense of community, discuss common problems and solve HIV/AIDS-related stigma and depressive symptoms as a group. Another factor the providers need to tackle is current smoking status include smoking cessation as part of HIV care. A Project Exhale study that examined the group-based counseling combined with nicotine patch programs in HIV positive African American male smokers found that smoking

cessation interventions decreased depression scores considerably (Matthews, Conrad, Kuhns, Vargas, & King, 2013). The intervention for internalized AIDS related stigma also helped to improve low perceived social support since they could have a chance to meet new people from peer support groups.

Early identification of at-risk populations and the provision of appropriate treatment such as mental health counseling service are recommended for those with depression symptoms. The necessary treatment would help to eliminate the negative impact of depression on HIV positive population.

Limitation of the study

The study had a cross-sectional design, and it was difficult to determine the relationship of depressive symptoms with depression since the symptoms could be due to many factors. The study also included only individuals interested in being involved (convenience sampling) in the research, and that might affect the external validity of the study. The respondent answers the questionnaire that could be affected by recall bias. We analyzed individual-level factors such as internalized AIDS-related stigma and substance abuse; interpersonal factors such as perceived social support; and community factors such as income and ethnicity/ race to understand the associated factors. The strength of this study, we analyzed multilevel elements to identify a level of influence on the effect of depression and assessed the relationships between different levels.

Recommendation

Depressive symptoms prevalence was substantially high in our study population. The impact of depression on HIV positive patients has been well described for some time. The author of this paper recommends screening of all HIV positive patients appearing to health care systems to treatment or prevention services, for internalized AIDS-related stigma and cigarettes smoking. Those with self-reported stigma or smokers should be further investigated for depressive symptoms using short form depression screening tools. The whole screening process could be completed in less than five minutes. If the patients have depressive symptoms during screening it is advisable to referral those with positive symptomatology to mental health services providers. The early identification and treatment of depression could improve the treatment success of HIV positive individuals with antiretroviral therapy and help prevention of HIV transmission in the community.

Reference

- Arseniou, S., Arvaniti, A., & Samakouri, M. (2014). HIV infection and depression. *Psychiatry Clin Neurosci*, *68*(2), 96-109. doi:10.1111/pcn.12097
- Balfour, L., Wiebe, S. A., Cameron, W. D., Sandre, D., Pipe, A., Cooper, C., . . . MacPherson, P. A. (2017). An HIV-tailored quit-smoking counselling pilot intervention targeting depressive symptoms plus Nicotine Replacement Therapy. *AIDS Care*, *29*(1), 24-31. doi:10.1080/09540121.2016.1201195
- Bekele, T., Rourke, S. B., Tucker, R., Greene, S., Sobota, M., Koornstra, J., . . . Guenter, D. (2013). Direct and indirect effects of perceived social support on health-related quality of life in persons living with HIV/AIDS. *AIDS Care*, *25*(3), 337-346. doi:10.1080/09540121.2012.701716
- Bernard, C., Dabis, F., & de Rekeneire, N. (2017). Prevalence and factors associated with depression in people living with HIV in sub-Saharan Africa: A systematic review and meta-analysis. *PLoS One*, *12*(8), e0181960. doi:10.1371/journal.pone.0181960
- Centers for Disease Control and Prevention. (2017). HIV Surveillance Report, 2016.
- Chan, B. T., Pradeep, A., Prasad, L., Murugesan, V., Chandrasekaran, E., Kumarasamy, N., . . . Tsai, A. C. (2017). Association between internalized stigma and depression among HIV-positive persons entering into care in Southern India. *J Glob Health*, *7*(2), 020403. doi:10.7189/jogh.07.020403
- Choi, S. K., Boyle, E., Burchell, A. N., Gardner, S., Collins, E., Grootendorst, P., & Rourke, S. B. (2015). Validation of Six Short and Ultra-short Screening Instruments for Depression for People Living with HIV in Ontario: Results from the Ontario HIV Treatment Network Cohort Study. *PLoS One*, *10*(11), e0142706. doi:10.1371/journal.pone.0142706
- Cook, S. H., Valera, P., & Wilson, P. A. (2015). HIV status disclosure, depressive symptoms, and sexual risk behavior among HIV-positive young men who have sex with men. *J Behav Med*, *38*(3), 507-517. doi:10.1007/s10865-015-9624-7
- Dailey, A. F., Hoots, B. E., Hall, H. I., Song, R., Hayes, D., Fulton, P., Jr., . . . Valleroy, L. A. (2017). Vital Signs: Human Immunodeficiency Virus Testing and Diagnosis Delays - United States. *MMWR Morb Mortal Wkly Rep*, *66*(47), 1300-1306. doi:10.15585/mmwr.mm6647e1
- Do, A. N., Rosenberg, E. S., Sullivan, P. S., Beer, L., Strine, T. W., Schulden, J. D., . . . Skarbinski, J. (2014). Excess burden of depression among HIV-infected persons receiving medical care in the united states: data from the medical monitoring project and the behavioral risk factor surveillance system. *PLoS One*, *9*(3), e92842. doi:10.1371/journal.pone.0092842
- Flensburg-Madsen, T., von Scholten, M. B., Flachs, E. M., Mortensen, E. L., Prescott, E., & Tolstrup, J. S. (2011). Tobacco smoking as a risk factor for depression. A 26-year population-based follow-up study. *J Psychiatr Res*, *45*(2), 143-149. doi:10.1016/j.jpsychires.2010.06.006

- Georgia department of public health. Georgia's HIV/AIDS Epidemiology Surveillance Retrieved 12/20/2017 <https://dph.georgia.gov/georgias-hiv-aids-epidemiology-surveillance-section>.
- Georgia Department of Public Health. HIV Surveillance Fact sheet 2015 Retrieved 12/20/2017 <http://dph.georgia.gov/georgias-hiv-aids-epidemiology-surveillance-section>
- Hellmuth, J., Colby, D., Valcour, V., Suttichom, D., Spudich, S., Ananworanich, J., . . . Group, R. S. S. (2017). Depression and Anxiety are Common in Acute HIV Infection and Associate with Plasma Immune Activation. *AIDS Behav*, *21*(11), 3238-3246. doi:10.1007/s10461-017-1788-4
- Holden, K. B., Bradford, L. D., Hall, S. P., & Belton, A. S. (2013). Prevalence and correlates of depressive symptoms and resiliency among African American women in a community-based primary health care center. *J Health Care Poor Underserved*, *24*(4 Suppl), 79-93. doi:10.1353/hpu.2014.0012
- Jackson, T., Huang, A., Chen, H., Gao, X., Zhang, Y., & Zhong, X. (2013). Predictors of willingness to use HIV pre-exposure prophylaxis among female sex workers in Southwest China. *AIDS Care*, *25*(5), 601-605. doi:10.1080/09540121.2012.726341
- Johnson, W. D., Diaz, R. M., Flanders, W. D., Goodman, M., Hill, A. N., Holtgrave, D., . . . McClellan, W. M. (2008). Behavioral interventions to reduce risk for sexual transmission of HIV among men who have sex with men. *Cochrane Database Syst Rev*(3), Cd001230. doi:10.1002/14651858.CD001230.pub2
- Joint United Nations Programme on HIV/AIDS (UNAIDS). (2017). Ending AIDS:Progress towards the 90–90–90 targets Retrieved 12/20/2017 http://www.unaids.org/sites/default/files/media_asset/Global_AIDS_update_2017_en.pdf
- Kagee, A., Saal, W., & Bantjes, J. (2017). Distress, depression and anxiety among persons seeking HIV testing. *AIDS Care*, *29*(3), 280-284. doi:10.1080/09540121.2016.1259453
- Lovejoy, T. I., & Heckman, T. G. (2014). Depression moderates treatment efficacy of an HIV secondary-prevention intervention for HIV-positive late middle-age and older adults. *Behav Med*, *40*(3), 124-133. doi:10.1080/08964289.2014.893982
- Marando, F., Gualberti, G., Costanzo, A. M., di Luzio Papparatti, U., Franzetti, M., Ammassari, A., . . . Galli, M. (2016). Discrepancies between physician's perception of depression in HIV patients and self-reported CES-D-20 assessment: the DHIVA study. *AIDS Care*, *28*(2), 147-159. doi:10.1080/09540121.2015.1080794
- Matthews, A. K., Conrad, M., Kuhns, L., Vargas, M., & King, A. C. (2013). Project Exhale: preliminary evaluation of a tailored smoking cessation treatment for HIV-positive African American smokers. *AIDS Patient Care STDS*, *27*(1), 22-32. doi:10.1089/apc.2012.0253
- Mdodo, R., Frazier, E. L., Dube, S. R., Mattson, C. L., Sutton, M. Y., Brooks, J. T., & Skarbinski, J. (2015). Cigarette smoking prevalence among adults with HIV compared with the general adult population in the United States: cross-sectional surveys. *Ann Intern Med*, *162*(5), 335-344. doi:10.7326/m14-0954
- Millar, B. M., Starks, T. J., Grov, C., & Parsons, J. T. (2017). Sexual Risk-Taking in HIV-Negative Gay and Bisexual Men Increases with Depression: Results from a U.S. National Study. *AIDS Behav*, *21*(6), 1665-1675. doi:10.1007/s10461-016-1507-6
- Nanni, M. G., Caruso, R., Mitchell, A. J., Meggiolaro, E., & Grassi, L. (2015). Depression in HIV infected patients: a review. *Curr Psychiatry Rep*, *17*(1), 530. doi:10.1007/s11920-014-0530-4

- Olatunji, B. O., Mimiaga, M. J., O'Cleirigh, C., & Safren, S. A. (2006). Review of treatment studies of depression in HIV. *Top HIV Med*, *14*(3), 112-124.
- Overstreet, N. M., Earnshaw, V. A., Kalichman, S. C., & Quinn, D. M. (2013). Internalized stigma and HIV status disclosure among HIV-positive black men who have sex with men. *AIDS Care*, *25*(4), 466-471. doi:10.1080/09540121.2012.720362
- Pratt, L. A., & Brody, D. J. (2014). Depression in the U.S. household population, 2009-2012. *NCHS Data Brief*(172), 1-8.
- Primeau, M. M., Avellaneda, V., Musselman, D., St Jean, G., & Illa, L. (2013). Treatment of depression in individuals living with HIV/AIDS. *Psychosomatics*, *54*(4), 336-344. doi:10.1016/j.psych.2012.12.001
- Sagtani, R. A., Bhattarai, S., Adhikari, B. R., Baral, D., Yadav, D. K., & Pokharel, P. K. (2013). Violence, HIV risk behaviour and depression among female sex workers of eastern Nepal. *BMJ Open*, *3*(6). doi:10.1136/bmjopen-2013-002763
- Sherbourne, C. D., & Stewart, A. L. (1991). The MOS social support survey. *Soc Sci Med*, *32*(6), 705-714.
- Siddaway, A. P., Wood, A. M., & Taylor, P. J. (2017). The Center for Epidemiologic Studies-Depression (CES-D) scale measures a continuum from well-being to depression: Testing two key predictions of positive clinical psychology. *J Affect Disord*, *213*, 180-186. doi:10.1016/j.jad.2017.02.015
- Sin, N. L., & DiMatteo, M. R. (2014). Depression treatment enhances adherence to antiretroviral therapy: a meta-analysis. *Ann Behav Med*, *47*(3), 259-269. doi:10.1007/s12160-013-9559-6
- Stahlman, S., Grosso, A., Ketende, S., Sweitzer, S., Mothopeng, T., Taruberekera, N., . . . Baral, S. (2015). Depression and Social Stigma Among MSM in Lesotho: Implications for HIV and Sexually Transmitted Infection Prevention. *AIDS Behav*, *19*(8), 1460-1469. doi:10.1007/s10461-015-1094-y
- Stewart, D. W., Jones, G. N., & Minor, K. S. (2011). Smoking, depression, and gender in low-income African Americans with HIV/AIDS. *Behav Med*, *37*(3), 77-80. doi:10.1080/08964289.2011.583946
- Sueoka, K., Goulet, J. L., Fiellin, D. A., Rimland, D., Butt, A. A., Gibert, C., . . . Justice, A. C. (2010). Depression symptoms and treatment among HIV infected and uninfected veterans. *AIDS Behav*, *14*(2), 272-279. doi:10.1007/s10461-008-9428-7
- Tsai, A. C. (2014). Reliability and validity of depression assessment among persons with HIV in sub-Saharan Africa: systematic review and meta-analysis. *J Acquir Immune Defic Syndr*, *66*(5), 503-511. doi:10.1097/qai.0000000000000210
- UNAIDS. (05/31/2016). Global AIDS Update 2016. Retrieved 12/20/2017 <http://www.unaids.org/en/resources/documents/2016/Global-AIDS-update-2016>
- UNAIDS. (2017). UNAIDS: Fact sheet- world AIDS day 2017
- Uthman, O. A., Magidson, J. F., Safren, S. A., & Nachega, J. B. (2014). Depression and adherence to antiretroviral therapy in low-, middle- and high-income countries: a systematic review and meta-analysis. *Curr HIV/AIDS Rep*, *11*(3), 291-307. doi:10.1007/s11904-014-0220-1
- Weiss, M. G., Ramakrishna, J., & Somma, D. (2006). Health-related stigma: rethinking concepts and interventions. *Psychol Health Med*, *11*(3), 277-287. doi:10.1080/13548500600595053

- Wohl, A. R., Galvan, F. H., Carlos, J. A., Myers, H. F., Garland, W., Witt, M. D., . . . George, S. (2013). A comparison of MSM stigma, HIV stigma and depression in HIV-positive Latino and African American men who have sex with men (MSM). *AIDS Behav*, *17*(4), 1454-1464. doi:10.1007/s10461-012-0385-9
- Yotebieng, K. A., Fokong, K., & Yotebieng, M. (2017). Depression, retention in care, and uptake of PMTCT service in Kinshasa, the Democratic Republic of Congo: a prospective cohort. *AIDS Care*, *29*(3), 285-289. doi:10.1080/09540121.2016.1255708
- Zeng, C., Li, L., Hong, Y. A., Zhang, H., Babbitt, A. W., Liu, C., . . . Cai, W. (2018). A structural equation model of perceived and internalized stigma, depression, and suicidal status among people living with HIV/AIDS. *BMC Public Health*, *18*(1), 138. doi:10.1186/s12889-018-5053-1

APPENDICES

CES-D questionnaire

Below is a list of the ways you might felt or behaved. please tell me how often you have felt this way During the Past Week

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I did not feel like eating; my appetite was poor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I felt that I could not shake off the blues even with help from my family or friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I felt I was just as good as other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I felt that everything I did was an effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I felt hopeful about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I thought my life had been a failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I was happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I talked less than usual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I felt lonely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. People were unfriendly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I enjoyed life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I had crying spells.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I felt sad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I felt that people dislike me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I could not get "going."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

MOS-SSS (perceived social support) questionnaire

Emotional/informational support	None of the time	A little of the time	Some of the time	Most of the time	All of the time
Someone you can count on to listen to you when you need to talk	1	2	3	4	5
Someone to give you information to help you understand a situation	1	2	3	4	5
Someone to give you good advice about a crisis	1	2	3	4	5
Someone to confide in or talk to about yourself or your problems	1	2	3	4	5
Someone whose advice you really want	1	2	3	4	5
Someone to share your most private worries and fears with	1	2	3	4	5
Someone to turn to for suggestions about how to deal with a personal problem	1	2	3	4	5
Someone who understands your problems	1	2	3	4	5
Tangible support					
Someone to help you if you were confined to bed	1	2	3	4	5
Someone to take you to the doctor if you needed it	1	2	3	4	5
Someone to prepare your meals if you were unable to do it yourself	1	2	3	4	5
Someone to help with daily chores if you were sick	1	2	3	4	5
Affectionate support					
Someone who shows you love and affection	1	2	3	4	5
Someone to love and make you feel wanted	1	2	3	4	5
Someone who hugs you	1	2	3	4	5
Positive social interaction					
Someone to have a good time with	1	2	3	4	5
Someone to get together with for relaxation	1	2	3	4	5
Someone to do something enjoyable with	1	2	3	4	5

https://www.rand.org/health/surveys_tools/mos/social-support/survey-instrument.html