

**The Effect of Behavioral and Socioeconomic Factors on Health-Related Quality of  
life Among Adults with Depressive Disorder in the United States**

By

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**Final Dissertation Approval Form**

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among adults with depressive disorder in the United States**

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## ABSTRACT

**Background:** Depressive disorder is a significant public health problem that is related to higher rates of chronic disease, increased health care utilization, and impaired functioning (Katon, 2003). Previous studies of health-related quality of life and depressive disorder have relied on measuring the score of health-related quality of life (HRQoL) among patients with depressive disorder. This research expands upon the previous work and designed to determine and measure the impact of socioeconomic and behavioral factors associated with depressive disorder on HRQoL among adults aged 18 and older.

**Objectives:** This study aims to determine and measure the effect of significant behavioral factors such as smoking, alcohol use, exercise, and hours of sleep and socioeconomic factors such as education level, marital status, employment status, and income level on HRQOL outcomes that include activity limitation, physical health problems, and mental health problems among adults with depressive disorder in the United States.

**Methods:** The data used in this study was obtained from 2014 Behavioral Risk Factor Surveillance System (BRFSS). The sample size consists of 88,233 patients including male and female aged 18 and older. Statistical Analysis System Software (SAS) 9.4 was employed to analyze the data. Both descriptive and inferential analyses were performed to examine the data distributions, sample metrics and associations among the studied variables. Furthermore, predictive analysis, namely logistic regression modeling, was conducted to predict and define the relation between the behavioral and socioeconomic factors and HRQoL outcomes.

**Result:** The present study found that depressive disorder has a statistically significant association with health-related quality of life. Adults with depressive disorder have higher chance of having activity limitation by 80.84%, physical health problems by 75.70%, and mental health problems by 87.99% than other adults with no depressive disorder. One of the major negative behavioral factors was smoking status. Depressive disorder patients with positive smoking stats have higher chance of having activity limitation by 59.10%, physical health problems by 55.89%, and mental health problems by 59.77% than others with negative smoking status. In addition, the most negative socioeconomic factors that has a great effect on HRQoL among depressive disorder patients is low income level. According to the result of this study, depressive disorder

patients with low income level had higher chance of having activity limitation by 66.74%, physical health problems by 63.38%, and mental health problems by 60.11% than depressive disorder patients with high income level. The result of this study showed that all investigated behavioral and socioeconomic factors have a statistically significant effect on health-related quality of life among adults with depressive disorder.

**Conclusion:** There is a significant relationship between depressive disorder and health-related quality of life among adults. This relation comes from the impact of depression on individual's satisfaction with life and well-being. Measuring and assessing the association between these depressive disorder associated behavioral and socioeconomic factors and health-related quality of life would be critical for planning and conducting related clinical trials, important for improving patients' quality of care, and for providing information for the policymaker and the public alike.

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## **DEDICATION**

I am dedicating my dissertation to my mother, who has always been a positive role model in my life. I would not be the person I am today if it was not for her. My mother has been a lifelong example of hard work and perseverance. She has taught me the importance of hard work, integrity, and never giving up. She is a strong and beautiful person inside and out. Thank you, Mom, for your love, prayers, and support that encouraged me at every stage of my personal and academic life. My appreciation and gratitude are endless for everything you have done, and continue to do, for me.

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## **CHAPTER I: INTRODUCTION**

### **1.1 statement of the problem**

Depressive disorder also called major depressive disorder (MDD) is a serious mood disorder that negatively affects the feelings causing sadness and loss of interests and pleasures. Major depressive disorder is associated with an increased risk of developing heart disease, diabetes mellitus, and stroke in healthy populations (Whooley & Wong, 2013). In addition, MDD is one of the most important cause of death by suicide. In 2013, The Global Burden of Disease Consortium found that in both developed and developing countries, MDD was the second leading contributor to global disease burden (Global Burden of Disease Study, 2015). The association between MDD and much of the burden of the disease comes from the spectacular effects of MDD on people's ability to work and the pressure on family's life.

Several studies have linked depressive disorder to the poor health related quality of life. In the elderly, depression is the most common health problem that would significantly impact their quality of life (Blazer, 2003). This research adds to previous finding in many significant ways. Previous researches of health-related quality of life and depressive disorder have relied on measuring the score of HRQoL among patients with depressive disorder. This research expands upon the previous work and aims to assess the impact of behavioral and socioeconomic factors associated with depressive disorder on HRQoL among adult patients of depressive disorder in the USA.

Depressive symptoms are recognized to be linked to worse health related quality of life among patients with depressive disorder, but the impacts of the depressive disorder

associated factors on HRQoL are unrecognized. This research is designed to define these impacts by measuring the relationship between the associated socioeconomic and behavioral factors and health-related quality of life. To measure health related quality of life this research measures the degree to which activity limitation, physical health, and mental health of depression's patients are affected by these associated factors. Measuring this relationship would acknowledge the researchers and the patients with the significant effects of associated factors of depressive disorder on HRQoL among adult patients who are suffering from depressive disorder.

## **1.2 Background**

Depression is a major medical illness associated with mood, cognitive, and physical symptoms (Pratt LA, 2014). It is a significant public health problem that is related with higher rates of chronic disease, increased health care utilization, and impaired functioning (Katon, 2003). According to National Health and Nutrition Examination Survey, the prevalence of depression is higher among women and adults aged 40–59 (Pratt LA, 2014).

There is a dramatic relation between depressive disorder and health related quality of life (HRQoL). HRQoL stands for the impact of health, illness, and medical treatment on the individual's quality of life (QoL) (Eiser & Morse, 2001). Quality of life refers to the individual's satisfaction with life and well-being (Ali et al., 2010). Measuring HRQoL is very effective for clinical trials, important for improving patients' quality of care, and for providing information for policy makers.

First, this research examined the effect of behavioral factors that include smoking status, alcohol use, exercise, and hours of sleep on HRQoL outcomes, which include

activity limitation, physical health, and mental health among adults with depressive disorder in the U.S. Second, this research determined the association between the socioeconomic factors, which include (education level, marital status, employment status, and income level) and health related quality of life outcomes among adult patients of depressive disorder in the United States.

### **1.3 Goals and Objectives**

- The main goal of this study is to determine the impact of depressive disorder associated risk factors on health-related quality of life among adult patients of depressive disorder in the USA.
- Assessing the association between the behavioral factors and health related quality of life (HRQOL) among adults with depressive disorder in the USA.
- Defining the effects of socioeconomic factors on health-related quality of life (HRQOL) among adults with depressive disorder in the USA.
- Evaluating and measuring the health-related quality of life (HRQOL) outcomes among adults with depressive disorder in the USA.

### **1.4 Significance of the study**

- This study will extend the existing knowledge about the poor health related quality of life of depressive disorder patients by adding the impact of behavioral and socioeconomic associated factors on HRQoL of these patients.
- This research will be serving as a guide in the assessment of the effect of depressive disorder on a patient's quality of life.
- This study can be also a source of valuable and valid information for other studies in the same field.

- It will add a significant value to the field of public health informatics by providing the patients with the awareness of their illness and the factors that would make it even worse.
- It will build a successful understanding of the studied behavioral and socioeconomic factors in purpose of controlling the symptoms of depressive disorder.

### **1.5 Hypotheses of the Research**

The research hypothesis will be answered by using the following research questions:

1. Do behavioral factors that include smoking status, alcohol use, exercise, and hours of sleep have significant effect on HRQoL outcomes, which include activity limitations, physical health, and mental health among adult patients of depressive disorder in the USA?

(H<sub>1</sub>) Behavioral factors that include smoking status, alcohol use, exercise, and hours of sleep have statistically significant effect on HRQoL outcomes, which include activity limitations, physical health, and mental health among adult patients of depressive disorder in the USA.

2. Do socioeconomic factors that include education level, marital status, employment status, and income level have significant relation with HRQoL outcomes, which include activity limitation, physical health, and mental health among adult patients of depressive disorder in the USA?

(H<sub>2</sub>) There is a statistically significant relation between socioeconomic factors that include (education level, marital status, employment status, and income level) and

HRQoL outcomes, which include activity limitation, physical health, and mental health among adult patients of depressive disorder in the USA.

## **1.6 Research Design and Methods**

This study is a secondary analysis and a cross sectional study. The data used in this study obtained from 2014 Behavioral Risk Factor Surveillance System (BRFSS), which conducted by the Centers for Disease Control and Prevention (CDC). It is an open source data and publicly available. (BRFSS) is one of the biggest health survey system around the world that collects the data by conducting landline telephones and cellular telephones surveys, which consist of an integrated questionnaire in all states of the United States (CDC, 2014). It was established in 1984 and completes more than 500,000 interviews each year among adults U.S. residents concerning their risk behaviors and preventive health practices that can impact their health status (CDC, 2014).

The sample size of this study consists of 88,233 depressive disorder patients that include male and female aged 18 and older who answered the 2014 survey question, “Have you ever told you have a depressive disorder?” Responses included “yes,” “no” and “don’t know or not sure.” Participants who answered “yes” were classified as depressive disorder patients, and who responded “no” were classified as patients with no depressive disorder. Participants who responded, “don’t know or not sure” were excluded from this study. 2014 BRFSS data sets include various of clinical and nonclinical data elements. However, this research focused on depressive disorder as the chronic health condition, demographic data include (gender, age, and race), behavioral factors include (current smoking status, alcohol use, exercise, and hours of sleep), socioeconomic factors include (education level, income level, marital status, and employment status), and health-

related quality of life measurements variables include (activity limitation, physical health, and mental health). Statistical Analysis System Software (SAS) 9.4 were employed to extract the data and perform the appropriate analyses.

## CHAPTER II: LITERATURE REVIEW

### 2.1 Introduction

Depressive disorders are typically categorized as MDD (Major Depressive Disorder), PDD (Persistent Depressive Disorder), and multiple other subsyndromal disorders. These depressive disorders are the potential direct source of morbidity across the world, and particularly in the USA (Smithson & Pignone, 2017). Besides, the consequences are also observable in terms of indirectly causing mortality across the USA and all over the world. According to the National Institute of Mental Health, 17.3 million (7.1% ) of all U.S. adults had at least one episode of major depression (NIMH, 2017). In addition, the prevalence is noted to be higher among adult females (8.7%) compared to male (5.3%), and greater across the age group of 18-25 years (13.1%) (NIMH, 2017). The severity of the impacts is represented from the figure below, which illustrates the resulting rates of impairment.

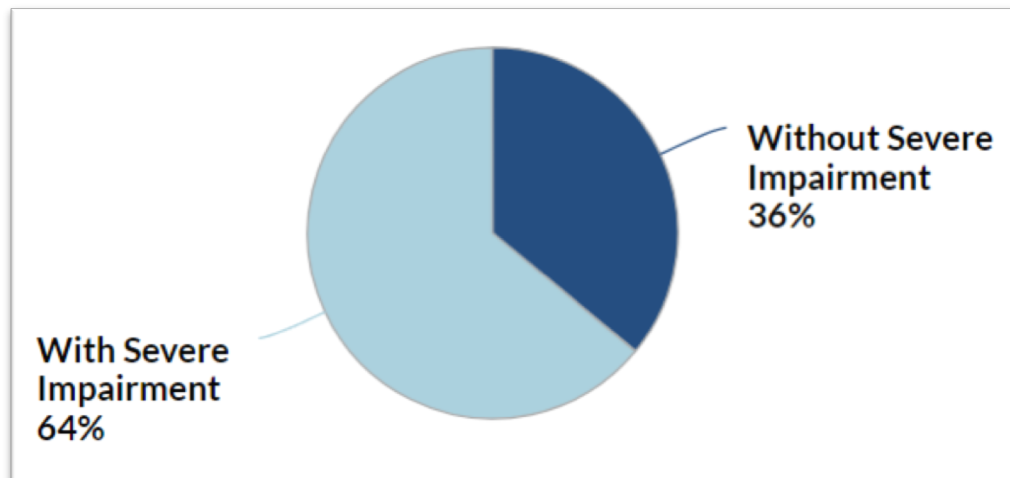


Figure 1. Severity associated with Depression among U.S. Adults. Reprinted from NIMH, 2017. Retrieved October 20, 2018, from <https://www.nimh.nih.gov/health/statistics/major-depression.shtml>.

The entire world is affected by depressive disorders severe impacts that are prevalent among 450 million individuals (ADAA, 2015). The impacts of depressive disorders are significantly apparent over the quality of life, particularly impacting the professional, social, and personal life in terms of home functionality. The level of difficulty in the mentioned realms of the quality of life is extreme for the individuals with severe depressive episodes (74 - 88%), as compared to the ones with mild symptoms (46%) (Pratt & Brody, 2014).

Pratt and Brody (2014), have stressed that the prevalence of depression is characterized on the basis of individuals' experiences with their lives. For instance, the occurrence is higher among the ones who have encountered traumatic situations, also those who are widowed, divorced, or even unmarried. For sure, the impacts of family history are also significant.

The current study intends to explore the impacts (either productive or destructive) of behavioral (smoking, exercise, alcohol use, and hours of sleep) and socio-economic factors (education level, employment status, marital status, and income level) on health-related quality of life (activity limitation, physical health, and mental health) among the adult patients of depressive disorder in the USA. More importantly, the factors that are considered eventually make the study unique, since the collective impact of these factors has not been investigated before. Thus, the study is potentially going to fill the gap in the literature. The proceeding section underpins the detailed description of the phenomenon under consideration.

## **2.2 Depressive disorder**

Depression, either as clinical depression or major depressive disorder, refers to the most common mood disorder that has severe impacts. The severity of impacts is evident in the lifestyle, the feelings, and thinking patterns. NIMH (2017) has reported that the depressive disorder is confirmed if the relevant symptoms are present for a minimum of 2 weeks. ADAA (2015) reports that the ones diagnosed with depressive disorders tend to have severe episodes of low mood that eventually persist for long. The prevalence of the depressive disorder is increasingly reported among women than men, while the ways of manifesting depression vary across age groups and also gender. For instance, men tend to manifest the behavior of irritability, tiredness, anger, and even the extreme scenarios of drug abuse or alcohol abuse. Most importantly, the studies have recognized that men are reluctant towards accepting the need for help (Hammer & Vogel, 2010; Vogel, Heimerdinger-Edwards, Hammer, & Hubbard, 2011).

(Gulliver, Griffiths, & Christensen, 2010) have contended that though depressive disorders are treatable, and accordingly, multiple intervention programs are existent to promote positive attitudes of help-seeking in the society, yet the evidence are contrary. Aside from the manifestation of depression among men, women are observed to be feeling sad, guilty, and also worthless in most of the cases. Numerous studies have reported that the adults typically react subtly towards admitting the feelings that in turns enhance the severity of the problem, while the teenagers receive significant impacts of their depressive mood in terms of co-morbid anxiety, more specifically, get indulged into substance abuse or eating disorders (ADAA, 2015; NIMH, 2017).

### **2.3 Types of depressive disorders**

ADAA (2015) has presented Major Depressive Disorder (MDD) as the most common form of depression. Almost 16.1 million individuals over 18 years had experienced such depressive episodes in 2015 (ADAA, 2015). More specifically, it has also been a major cause of disability among the individuals of 15-44 years in the USA (ADAA, 2015). Some studies have characterized MDD with the loss of interest in activities once enjoyed, sad feelings, abnormality of appetite (decrease or increase), hypersomnia or insomnia, constant fatigue, extreme guilt, retardation, and most critically, suicidal tendencies (Lim et al., 2014; NIMH, 2017). Moreover, the cognitive condition is also affected, as the capability of decision making, or thinking is diminished (Bourassa, Memel, Woolverton, & Sbarra, 2017; Carek, Laibstain, & Carek, 2011). Hence, the professional, social, and other aspects of life are affected (ADAA, 2015).

Besides MDD, there is another situation of dysthymia or Persistent Depressive Disorder (PDD) since the symptoms of depression persist for a minimum of 2 years, though the symptoms throughout the period could be mild or severe (Hammer & Vogel, 2010). Among the most common signs of PDD, overeating or poor appetite, low self-esteem, hypersomnia or insomnia, cognitive difficulty, and hopelessness are the notable ones. Even if there is a period when none of the signs is noticed, the period would not last for more than 2 months, if the person suffering from PDD. For sure, the symptoms of MDD eventually ascend to PDD (ADAA, 2015).

Other than MDD and PDD, there are Postpartum depression, Psychotic depression, and also Seasonal disorder types. Postpartum depression is the full-blown depressive mood of the mothers during or after pregnancy that keeps them exhausted,

sad, or restless. The impacts are much different than the baby blues, which effects are noticeable hardly for 2 weeks. Women with postpartum depression find it difficult to take care of their babies or even themselves (Choi et al., 2018; NIMH, 2017). Conversely, psychotic depression carries the inclusion of an individual's delusions or hallucinations, which is evident as depressive themes of delusive illness, guilt or any such belief (Stafford, 2018). NIMH (2017) has also documented the Seasonal Affective Disorder or SAD as the most observable depressive condition among the individuals with no such symptoms like MDD or PDD. SAD is observed mainly in the winter season when the individuals do not get enough sunlight. Accordingly, the resulting variations in moods are represented in terms of increased sleep hours, decreased socializing, and also weight gains (NIMH, 2017).

Even the low moods in bipolar disorder are also categorized as depressive disorders (Papakostas, Martinson, Fava, & Iovieno, 2016). A person with bipolar disorder can experience both the low and high mood extremes of mania and hypomania, respectively (NIMH, 2017). The depressive disorders of Premenstrual Dysphoric Disorder (PMDD) and Disruptive Mood Dysregulation Disorder (DMDD) have also been added to diagnostic classification of DSM-5. PMDD is different from PMS (Premenstrual Syndrome) since the women are extremely depressed, tearful, and irritable before menstruation. (Ussher, 2014) has presented the findings that almost 8-13% of women undergo PMDD while 75% suffer PMS. On the other hand, the DMDD occur among children and teenagers for their extreme irritability or frequent outbursts of anger that are inconsistent with the situation or infrequent among the other individuals of the same age (Gilea & O'Neill, 2015).

## **2.4 Different factors or determinants for investigating depressive disorders**

A number of studies had explored different factors in relation to the objectives of diagnosis the individuals with depressive disorders. One of the studies had determined the implications of personality traits leading to the severe mood disorders among the individuals (Bajraktarov, Gudeva-Nikovska, Manuseva, & Arsova, 2017). It is contended that the human personality cannot be characterized in terms of individual components, but multiple dimensions add to the complexity of the interactive system. Accordingly, by using the research instrument of *TCI-R (Temperament and Character Inventory-Revised)* in a *case-control* research setting, the authors have presented low scores of *Self-directedness* as the predictive character trait, and high scores of *Harm Avoidance* as the predictive temperament trait for affirming the susceptibility of individuals to depressive disorder (Bajraktarov et al., 2017). On the other hand, the implications of coping strategies and attribution styles have also been noted in relation to depressive disorders (Chan, 2012). Chan (2012) has reported that the adopted factors are significantly predictive of the depressive mood. However, the varying dimensions of the attributes lead to varying magnitudes of depressive symptoms.

In the same context, it is also stressed that the depressive moods of adolescent turn out to be increasingly predictive and stable in relation to self-esteem, social competence, and dealing with the problems in adulthood (Chan, 2012; Roekel, Ha, Scholte, Engels, & Verhagen, 2016). Therefore, the variables of social-cognitive behaviors are commended as the predictors of adults' depression symptomatology (Roekel et al., 2016). (Lim et al., 2014) have focused the investigation of factors leading to suicide in the patients with depressive disorders. The authors have intended to facilitate

predicting the MDD patients' vulnerability to suicidal attempts, based on the identified clinical and socio-demographic predictors. The recorded socio-demographic variables included Education Level (college, secondary, primary, none), Employment Status (Unemployed, student, employed), Marital Status (Never married, widowed, divorced, married), sex and age, while the clinical factors included the records of participants' age at first episode, period of illness, severity of depression, and the number of help-seeking visits to psychiatrists (Lim et al., 2014). The authors have investigated the impacts across 6 Asian countries that led to the conclusion that the abruptly changing social conditions and the associated impacts of economic recessions across the targeted countries have significant contribution to the suicidality levels among the MDD patients (Lim et al., 2014).

There is another study of (O'Connor, Whitlock, Gaynes, & Beil, 2009) in which the authors have emphasized the needs for screening programs in primary care, where the practitioners are potentially capable of assessing the severity of depressive disorders among the patients. It is highlighted that there has already been the performance review of USPSFT (United States Preventive Services Task Force) in relation to governing the treatment efficacy of adult populations with psychotherapy and also antidepressants. However, it is also contended that the issues of older adults were not focused during the investigation. Hence, the authors presented the results that positive outcomes of depression care support would be attained if there are staff-assisted interventions in practice (O'Connor et al., 2009). More specifically, the adult patients over the age of 30 years require close monitoring when they are involved in antidepressant treatments (O'Connor et al., 2009; Siu et al., 2016). Likewise, (Smithson & Pignone, 2017) have also

stressed the needs for screening for depression among adults, while arguing the substantial burden of depression across the USA. In the same manner, (Olfson, Blanco, & Marcus, 2016) have also accentuated the needs for dedicated treatments to the adult patients with depression in the United States. It is reported that only 28.7% of the screened positive adults received treatment for depression, and out of these individuals who had received treatment, still 29.9% were having screen-positive depression with the severe psychological disorder (Olfson et al., 2016).

On the other hand, (Kupfer, Frank, & Phillips, 2012) have studied the development trends across the treatment procedures of depressive disorder, emphasizing the areas of diagnosis and also neurobiology. With respect to the needs for diagnosis, medical and psychiatric co-morbidity has been identified as the potentially effective factors for assessing and managing depression. The authors have argued that none advancement could have yielded the anticipated outcomes for treating depression (Kupfer et al., 2012). Hence, it can be stated that the problem of depressive disorders has been extensively studied, though different approaches have been adopted while exploring the phenomenon from different perspectives with different factors fostering the phenomenon. The current study was intended to explore the phenomenon particularly in terms of the behavioral factors, and socio-economic factors that are described in the proceeding section. However, the impact of the identified factors could either be increasing or decreasing the intensity of depressive disorders and its effects on health-related quality of life.

## **2.5 Behavioral factors**

Depression is the most common cause of morbidity among the individuals, which is further affected by poor health behaviors (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015). Other studies have also associated the risky unhealthy behaviors such as smoking, physical inactivity, substance abuse, etc. with depression that are induced by typical scenarios of loneliness and social isolation (Hawkley & Cacioppo, 2010). The behavioral impacts are evident among elderly individuals, particularly before and after the age of retirement, and the impacts are more adverse if the depressed individuals are widowed or divorced or never married (Holt-Lunstad et al., 2015). The section below presents the findings from the relevant literature regarding of the behavioral factors of smoking, exercise, alcohol use, and hours of sleep.

### **2.5.1 Smoking**

Adult with depressive disorder or any mental illness are usually smoke more than other adult without these disorders (CDC, 2013). a depressed individual is likely to have smoking habit or would start smoking and even a smoker with no signs of depression would eventually get mood disorders. These associations are built on the impacts of nicotine that may alleviate depressive symptoms if a depressed individual smoke or lead to mood swings as a result of negative influence of nicotine on the brain regulation of mood. Accordingly, numerous studies have reported that the consumption patterns of cigarettes could have been declined in general, but there is no change or most likely an increment in the consumption among individuals with mental illness.

(CDC, 2018) has presented that “approximately 1 in 4 (or 25%) of adults in the U.S. have some form of mental illness or substance use disorder, and these adults

consume almost 40% of all cigarettes smoked by adults”. The impacts of nicotine favor the mood-altering needs of the depressed individuals, which turns into addiction (Benowitz, 2008; Taylor et al., 2014). In addition, this nicotine addiction slows down or restrains the effectiveness of certain medications if taken by the patients with mental illness or depressive disorders (CDC, 2018). (Pasco et al., 2008) have investigated the concerned scenario of the unreasonably prevalent behavior of smoking among the individuals with psychiatric illness as MDD.

Multiple studies have yielded the innocuous impacts of smoking on mental health, mainly due to the neurobiological aspects of nicotine’s or dopamine’s impacts on neurotransmitter regulation. The study of CDC, 2018 has reported smoking as a potentially unhealthy behavior of people of the USA with depressive disorders. (Lawrence, Mitrou, & Zubrick, 2009) have studied smoking-related health impacts that are observed in terms of mental disorders of anxiety, depression, and schizophrenia. The study has specifically highlighted the smoking-caused health issues of respiratory diseases and cardiovascular diseases, particularly among the persons with mental disorders.

(Hung, Liu, & Yang, 2016) have also reported smoking to be greater among the patients with severe symptoms of depression. The intensity is contended to be extreme as the consequent conditions are found to directly causing unintentional injuries among the depressed people, which is mainly boosted by the corresponding impacts of toxicity, psychiatric comorbidities, distractibility, and other medical conditions due to smoking (Hung et al., 2016). In general, the impacts of smoking are extremely risky to the health of patients with depressive disorders.

### 2.5.2 Exercise

Exercise is linked to being physically active. It is always encouraged by the physicians for its support to the improvement of physical conditions, and also fosters body's potential to fight against diseases. (ADAA, 2018) informs that exercise is essential for reducing the stress that serves mental fitness as well. Moreover, exercise is reported to effectively reducing fatigue while enhancing the cognitive functioning of the individuals. For the individuals with stressful life or depressing circumstances, exercise is a definite way out. ADAA 2018, has commended exercising or being physically active as the potential of making the mind at ease since the produced chemicals such as endorphins serve as natural painkillers. It also leads to improve sleep that is the basic need of individuals, particularly of the individuals with depressive disorders.

In addition, the study of (Josefsson, Lindwall, & Archer, 2014) investigated the impacts of exercise on the mental health of depressed individuals, by eliminating the integrated elements of medication or any intervention objectives of relaxation or meditation. The study led to the conclusive statement that individuals with depressive disorders of mild or moderate level receive greater impacts of exercise if the individuals are willingly involved (Josefsson et al., 2014).

On the other hand, the study of (Dinas, Koutedakis, & Flouris, 2011) is focused on investigating the impacts of exercise on the mental health of the individuals, along with the supporting implications of therapeutic medications for acute and chronic depression. The study has generated the findings that physically active individuals with depressive disorders tend to get beneficial impacts in terms of reduced symptoms or mood disorders. It is justified by presenting the evidence of  $\beta$ -endorphins (the chemical

that acts as a painkiller to foster the feelings of well-being) that is secreted during the exercise. It is widely recognized that depressive disorders among the individuals make the affected ones less active and fit in their lives (Dinas et al., 2011). These individuals do not have a cardiac fitness neither there are obvious signs or willingness of being physically active, as compared to the individuals without mental disorders (Knapen et al., 2009).

It is enforced that exercise is equally beneficial for the healthy behavior of individuals, with specific benefits to the patients with mild or moderate depressive orders by serving as an alternative to the anti-depressants, and for the patients with severe symptoms of depressions, the therapeutic use of exercise training is a valuable solution over the traditional treatments (Knapen et al., 2009; Kvam, Kleppe, Nordhus, & Hovland, 2016) . The impacts of exercise are always positive, whether in terms of treating physical illness or enhancing cognitive functioning.

(ADAA, 2018) reports that individuals with depressive disorders are also recommended to exercise on daily basis as a mean of medication. Besides, it is also stressed that the impacts last longer, as a single exercise session induces significant impacts that last for hours, and if the practice is ensured on daily basis, the symptoms may even alleviate over the time. On the other hand, the contrary impacts have also been reported on the mental health of the individuals with exercises. There could be the scenario that the mood disorders are not much affected by exercises or the individuals might even get fierce when provoked to involve in physical exercises. However, (Pasco et al., 2008) have affirmed that being physically active is a practice that needs to be

enforced at all the levels, rather than regarding it a matter of dispute among the mentally ill individuals.

### **2.5.3 Alcohol Use**

The use of alcohol has been extensively investigated in terms of its abuse or dependence while relating to the individuals with a mental disorder or depressive disorders (Briere, Rohde, Seeley, Klein, & Lewinsohn, 2014; Pasco et al., 2008). Alcohol abuse is referred to the unhealthy intake of alcohol on daily basis or multiple times a week, while alcohol dependence is a disorder itself that directs the addictive aspects of substance use (Pasco et al., 2008). The study of (Connor, Haber, & Hall, 2016) has found a significant association between the variables of depression and alcohol use, along with confirming the resulting impacts in terms of impairment. Moreover, greater prevalence has been reported among the older adults.

(Connor et al., 2016) have investigated the disorder of alcohol use in relation to assessing the respective efficacy of the behavioral intervention, and reported the increased chances of MDD occurrence among these patients. (Briere et al., 2014) have presented the findings regarding the comorbidity of alcohol abuse and MDD among the individuals while reporting greater prevalence in adulthood as compared to adolescence. Uniquely, the authors have provided the correlation between the major depressive disorder and alcohol use disorder. Moreover, the co-occurrence of these conditions ascends towards the risky behaviors of alcohol dependence, life dissatisfaction, and also high levels of suicidality (Briere et al., 2014).

It is also noteworthy that CDC (2018) has associated alcohol use with the behavioral factor of smoking among adults. It is reported that 65.2% adult smokers tend to use alcohol, while 48.7% are non-smokers (CDC, 2018).

#### **2.5.4 Hours of sleep**

People having insomnia or difficulty sleeping tend to have comorbid MDD as well (Manber et al., 2008). Insomnia is said to have serious health impacts if the person is already a depression patient, as it hinders treatment efficacy and also enhances the prospects of depressive relapse. (van Mill, Hoogendijk, Vogelzangs, van Dyck, & Penninx, 2010) have investigated the issue of psychopathology among the individuals with disturbed sleep patterns. The epidemiological study has focused on the impacts of sleep duration in relation to insomnia for investigating the collective impact on anxiety and depressive disorders (DSM-IV based diagnosis). As a result, it is reported that the impacts of short sleep duration followed by insomnia are significant in terms of causing current anxiety disorders; most importantly, the impacts are also associated with current and remitted disorders of depression (van Mill et al., 2010).

In more precise words, it can be stated that even after the remittance of anxiety and depressive disorders, short duration of sleep and insomnia persist. On the other hand, if a person is observed to sleep for long hours, current anxiety or depressive disorders are present (van Mill et al., 2010). Almost all the MDD patients are affected with sleep disturbances, since the regulation of sleep, mood, and circadian rhythms are strongly correlated (Kasper et al., 2010). It is also reported that almost 90% of the patients with depression tend to have sleep disruption that leads to affected functioning in the daytime (Kasper et al., 2010). As well as, the sleep disturbances make the remittance of

depressive disorders less effective that increases the prospect of relapses (van Mill et al., 2010). The loss of sleep among the adolescents would be the major cause of health issues ahead. It has been contended that this particular sleep decline among the adolescents is the result of biological, socio-cultural, and psychological influences (Carskadon, 2011).

In addition, the impacts of increased social media use and over-consumption of caffeine are also the risk factors of sleep loss or reduced duration of sleep that leads to severe health consequences (Owens, Adolescent Sleep Working, & Committee on, 2014). Accordingly, (Lemola, Perkinson-Gloor, Brand, Dewald-Kaufmann, & Grob, 2015) have also reported the adverse impacts of electronic media use on the recurrence of depressive symptoms due to affected sleep hours. (Stubbs et al., 2016) have conducted a systematic review with meta-analysis to investigate the prevalent predictors of sleep apnea in three major psychiatric disorders of MDD, bipolar, and Schizophrenia. It is contended that patients having serious mental illness tend to have severe scenarios of sleep disturbance as OSA (*Obstructive Sleep Apnea*) (Stubbs et al., 2016).

Individual with less sleep hours or insufficient sleep would be more susceptible to depression, substance abuse, and even suicidality (Sarchiapone et al., 2014). (Lippman et al., 2017) have investigated the impact of variation in sleep hours among the older adults having depressive symptoms. It was only short sleep that affirmed the occurrence of depressive symptoms, as compared to the results of intermediate sleep and long sleep hours. Hence, the impacts of sleep hours are significant on the mental health of individuals.

## **2.6 Socio-economic Factors**

Across the studies focused on assessing the impacts of socio-economic factors on the depression symptoms, a significant association has been observed. The studies have increasingly reported that the low socioeconomic status of the individuals eventually led to increased prospects of depressive disorders among them (Sharifi et al., 2015; Turner, Brown, & Hale, 2017). Accordingly, these assertions are justified on the basis of typically limited accessibility to healthcare facilities, which directs the chances of disability and also high morbidity of psychiatric disorders. The proceeding section discusses the main areas of socio-economic factors describing the lifestyle and the associated challenges encountered by the individuals.

### **2.6.1 Educational level**

It is noted that the recent literature is advocating the need for active participation of the patients in the decision-making process, in terms of their knowledge regarding the treatment options, which direct their intention for seeking treatment (Berry, Beckham, Dettman, & Mead, 2014). Based on the recognition of the impacts of low education-level in relation to the attainment of care-support for depressive symptoms, the study of (Perestelo-Perez et al., 2017) has proposed the system of shared decision making that would foster informed choices for the patients with depression. The effectiveness of aided decision making tends to improve the health status of the society, as the patients are more directed to seek treatment since the typical decision conflicts are mitigated (LeBlanc et al., 2015; Simon et al., 2012; Stacey et al., 2014). Most importantly, the implications of decision support system across the mental health treatment are significant for the mentally ill patients who are less knowledgeable or more generally referred as

disadvantaged (Durand et al., 2014; Gentles, Stacey, Bennett, Alshurafa, & Walter, 2013).

The study of (Miech, Pampel, Kim, & Rogers, 2011) has presented the adverse impacts of educational disparity in terms of highlighting the consequences of increased mortality due to significant negative association with the attainment of health care services. Moreover, (Fleiz Bautista et al., 2012; Olfson et al., 2016) have also presented the negative impacts of low education level in terms of highly positive screening of depression among the targeted individuals.

In general, the impacts of low education level have a usual independent correlation with poor mental health conditions (Margaretten, Julian, Katz, & Yelin, 2011). Sharifi et al., (2015) identified that the individuals with university-level education have fewer prospects for psychiatric disorders as compared to the ones with lower or no education. Accordingly, the study of (Liu et al., 2017) has reported that the importance of education, in particular, the facilitation of psycho-education to the patients and also to the clinicians, is critical to enhancing the mental health status of the individuals. However, a considerable amount of research is also focused on negating the dependence of education level on the occurrence of depressive symptoms (Lou et al., 2012; Margaretten et al., 2011; Nabolsi, Wardam, & Al-Halabi, 2015). Researchers argue the typical association of low level of education to the depression since even highly educated individuals are significantly observed to have depressive disorders of the severe level that is having the cumulative impact of other relevant factors (Nabolsi et al., 2015).

### **2.6.2 Employment status**

Numerous studies have investigated the impact of job loss on mental health (Park, Cho, & Jang, 2012). A study of (McKee-Ryan, Song, Wanberg, & Kinicki, 2005) has reported that unemployment status was associated to different psychological status such as depression, anxiety, and lowered health outcomes. Employment status is a strong determinant of socioeconomic status, which in turn has substantial effects on the health outcome (Prus, 2011). Another study in South Korea confirmed that individuals with constant unemployment status were more likely to have depressive symptoms compared to those with full-time permanent employment and those with full-time precarious employment (Kim, Muntaner, Kim, Jeon, & Perry, 2013).

In the other hand, major depressive disorder has a strong negative effect on employment status. “MDD is responsible for the highest number of days out of role among physical or mental disorders” (Rizvi et al., 2015). MDD is also a strong predictor of disability which is associated with a higher rate of unemployment.

### **2.6.3 Marital status**

The impacts of marital status are significant to cause depressive symptoms among both women and men. women with divorced status tend to have more depressive symptoms, while the intensity of the depressive symptoms is greater among men who are reported to be widowed as there is 3.2 times likeliness in this regard (Fleiz Bautista et al., 2012). The study of (Sharifi et al., 2015) reflected greater odds for having depressive disorders or other psychotic disorders among the women who were married or divorced, as compared to the ones who were never married. In addition, (Olfson et al., 2016) has also presented the significant impact of the marital status of the adult patients with

depressive disorders on the severity of their depressive symptoms. It was reported that the patients who are divorced, widowed, or separated tend to reflect severe levels of depression as compared to the ones who are currently married.

On the other hand, the ineffectiveness of marital status has also been reported when investigation in relation to the depressive symptoms. (Cho et al., 2011) have affirmed the ineffectiveness between the marital status and the severity of depression among the mentally ill individuals. In addition, the study of (Parmelee, Tighe, & Dautovich, 2015) could not find any impact of marital status on the depressive symptoms of the targeted individuals, as the focus of the study was sleep disturbance which does not carry any significant association with the marital status of the individuals. Also, (Lim et al., 2014) have contended that the impacts of marital status are not significant when investigating the levels of suicidality among the depressed individuals of Asian countries.

#### **2.6.4 Income level**

Researchers have mostly associated the impacts of income level on the depression symptomatology among the patients with depressive disorders, particularly with the level of education. For instance, it is cited in the study of (Margaretten et al., 2011) that income level and education level of the individuals cannot be categorized on the basis of compatibility. It is justified on the basis of the assertions that even the individuals with high level of education are observed to receive a low income (Margaretten et al., 2011). However, certain other factors are more effective in this regard, like ethnicity, age or even gender of the individuals. Moreover, the study of (Chisholm et al., 2016) has also commended the need for income support among the individuals encountering severe health impacts, as there are certain limitations towards the accessibility of healthcare

settings. In the similar context, (Vigo, Thornicroft, & Atun, 2016) have also stressed the need for controlling measures of income-related impacts on the mental health treatment of the patients with MDD and other psychotic disorders, in relation to the increasing global burden of mental illness.

According to the study of (Lim et al., 2014) the impacts of income level are significant on the severity of the depressive symptomatology among the individuals. In particular, the targeted six Asian countries have reflected higher ratios of suicidality (2.5times) under the influence of depression that is mainly fueled by their unemployment status. Aside from this, (Fleiz Bautista et al., 2012) have presented more focused findings with respect to the possible outcomes of depressive symptoms. It is contended that older adults, particularly men, tend to represent increased rates of depressive symptomatology. It is based on the typical social influence of their changed cultural role of a family provider. The termination of salary or their retirement impacts their self-esteem that is reflected in their mood disorders, and the consequences are adverse if the individuals are widowed as well.

## **2.7 Health-Related Quality of Life (HRQoL)**

(CDC, 2017) has defined HRQoL as “an individual’s or group’s perceived physical and mental health over time.” The public health sector considers the health status of the society based on multidimensional constructs (CDC, 2017). These multidimensional constructs include the considerations for all the positive and negative prospects of life that evaluated based on subjectivity. Accordingly, the process of measuring QoL (Quality of Life) turns out to be challenging, since multiple determinants are influential, such as cultural differences, social and economic status, and behavioral

perspectives. Therefore, the concept of HRQoL entails the consideration of both the perspectives at individual and also at collective or community level. In general, the deployment of HRQoL is based on the objectives of enhancing the health status of the society that is fostered by the self-reported approach.

(Holubova et al., 2018) have employed the strategy of evaluating the adopted coping strategies of the patients with depressive disorder in relation to their perceived beliefs of QoL. The authors have intended to better comprehend the mental healthcare scenario, in terms of identifying the typically adopted coping strategies by the depressed individuals. Among the selected 82 outpatients, the adopted coping strategies reflected significantly negative perceptions regarding their QoL. Most of the individuals have reported the adoption of resignation and escape tendency to avoid the scenarios leading to depressive symptomatology. Another study of (Yang, Lin, Wang, & Lu, 2017) has also investigated the association between HRQoL and the symptoms of depression. However, the study has focused on the in-patient settings among the patients with MDD, while providing 6-weeks treatment of *Fluoxetine* (an antidepressant) to the targeted participants for exploring the respective changes in HRQoL. As a result, it was noted that the treatment of *Fluoxetine* had significantly altered the severity of depressive symptomatology among the patients, which is reflected from improved HRQoL results. It is also stressed that there is a consistent need for observing and evaluating the negative impacts of treatments provided to the patients with mental illness (Yang et al., 2017).

The current study is going to employ the measurement approach of HRQoL in terms of the identified areas of physical health problems, activity limitation, and mental health problems while seeking adult patients' perceptions towards these metrics.

Accordingly, the study will generate specific outcomes regarding the depressed patients' perceptions under the influence of different behavioral factors (Smoking, Exercise, Alcohol use, and Hours of sleep) and socio-economic aspects of life (Education level, Employment status, Marital Status, and Income level).

## **2.8 Research Gap in Literature**

Since a comprehensive literature review has been conducted, the only gap that could be identified is lack of incorporating the collective impact of both the behavioral and socio-economic factors on HRQoL of depressive disorder patients while exploring the extent of depressive symptomatology among the patients. The previous studies have explored the associated behavioral factors but the inclusiveness of all the potential aspects has not been considered and the correlation of all identified typical factors has not been discussed in terms of its effect on HRQoL among depressed patients. For instance, most of the studies presented the findings for sleep disturbance only or focused on the abuse of alcohol in most of the cases. Aside from this, significant lacking is noted across the consideration of socio-economic factors in particular. In the same context, studies specific to the investigation of adult patients are also limited.

Considering all these aspects, the current study is going to be an all-inclusive representation of the actual scenario of the mental health status of the US adults. At first, all the basic behavioral factors and socio-economic factors are involved in the research plan. Moreover, the adoption of HRQoL is an added-value to the findings of the study, since the adult participants would better report their current health conditions, along with the adopted coping strategies.

## **CHAPTER III: METHODOLOGY**

### **3.1 Overview research design and data source**

This study is a secondary analysis and a cross sectional study. The data used in this study was obtained from 2014 Behavioral Risk Factor Surveillance System (BRFSS). This data system is conducted by the Centers for Disease Control and Prevention (CDC). It is an open source data and publicly available. BRFSS is one of the biggest health-related telephone survey system around the world that collects the data by conducting landline telephones and cellular telephones surveys with an integrated questionnaire in all 50 states (CDC, 2014). BRFSS was established in 1984 and completes more than 500,000 interviews each year among adults of the U.S. residents concerning their health-related risk behaviors, preventive health practices, and chronic health conditions (CDC, 2014).

The sample size consists of 88,233 depressive disorder patients including male and female aged 18 and older. 2014 BRFSS data sets include various of clinical and nonclinical data elements. However, this research focused on depressive disorder as the chronic health condition, demographic data include (gender, age, and race), behavioral factors include (current smoking stats, alcohol use, exercise, and hours of sleep), socioeconomic factors include (education level, income level, marital stats, and employment stats), and health-related quality of life measurements variables include (activity limitation, physical health, and mental health).

Statistical Analysis System Software (SAS) 9.4 were employed to extract the data and perform the appropriate analyses. In order to correctly analyze the data, the first step is to clean the data by extracting the studied variables and deleting other variables that do

not have relation to the hypotheses of this research. SQL and SAS statements and procedures such as IF-THEN statement, PROC FORMAT, and PROC FREQ were performed to clean the data. As well as, demographics variables, which include gender, age, and race were used to indicate the prevalence of depressive disorder among the data population. This step was done by applying frequency tabulation through SAS procedure (PROC FREQ) and then visualizing the results by graphics through SAS procedure (PROC SGPLOT). Missing values were defined for each of the variables. If more than 10% of the data of a particular variable were missing, an alternative variable was examined. After cleaning the data and getting the nature, dependency, and normality of distribution of the variables, appropriate methods that include descriptive analyses, inferential analyses, and predictive analyses were performed for the rest of the variables.

### 3.2 Major variables reviewed

Studied Variable	Variable Name in BRFSS Data	Variable Description Or Variable Question
Depressive disorder	ADDEPEV2	Have you ever told you have a depressive disorder, including: depression, major depression, or minor depression? Categorical Variable (Binary).  1=YES.            2=NO.
Gender	Sex	Indicate sex of respondent. Categorical Variable (Binary). 1=Male.        2=Female.
Age	_AGEG5YR	How old are you? Categorical Variable. Four age groups. 1=Age 18 to 24.    2=Age 25 to 39. 3= Age 40 to 59    4=Age 60+
Race	_RACE	Indicate race of respondent. Categorical Variable. Eight groups of Race-Ethnicity category. 1=White non-Hispanic 2=Black non-Hispanic

		3=American Indian or Alaskan Native Non-Hispanic 4=Asian non-Hispanic 5=Native Hawaiian or another Pacific Islander Non-Hispanic 6=Another race non-Hispanic 7= Multiracial non-Hispanic 8=Hispanic.
Current Smoking Status	_RFSMOK3	Are you a current smoker? Categorical Variable (Binary). 1=No.                2=Yes.
Alcohol Use	DRNKANY5	Drink any alcoholic beverages in past 30 days? Categorical Variable. 1=Yes                2=No.
Exercise	EXERANY2	Exercise in Past 30 Days. Categorical Variable (Binary). 1=Yes.                2=No.
Hours of sleep	SLEPTIM1	On average, how many hours of sleep do you get in a 24-hour period? Categorical Variable. 1-24 Number of hours.
Income Level	INCOME2	How much is your annual household income from all sources? Categorical Variable. Five-groups of income level. 1= Less than \$15,000. 2= \$15,000 to less than \$25,000. 3= \$25,000 to less than \$35,000. 4= \$35,000 to less than \$50,000. 5= \$50,000 or more.
Education Level	EDUCA	What is the highest grade or year of school you completed? Categorical Variable. Six-groups of education level. 1=Never attended school 2=Grades 1 through 8. 3=Grades 9 through 11. 4=Grade 12 or GED. 5=College 1 year to 3 years. 6=College 4 years or more.
Marital status	MARITAL	Are you: (marital status) Categorical Variable. Six-groups of marital status. 1= Married.                2= Divorced. 3= Widowed.                4= Separated.

		5= Never married. 6= A member of an unmarried couple.
Employment status	EMPLOY1	Are you currently...? Categorical Variable. Eight-groups of employment status. 1= Employed for wages. 2= Self-employed. 3= Out of work for 1 year or more. 4= Out of work for less than 1 year. 5= A homemaker. 6= A student. 7= Retired. 8= Unable to work.
Activity Limitations	QLACTLM2	Are you limited in any way in any activities because of physical, mental, or emotional problems? Categorical Variable (Binary). 1=Yes. 2=No.
Physical Health problems	PHYSHLTH	How many days during the past 30 days was your physical health not good including physical illness and injury? Categorical Variable. Yes=1-30 number of days. No=None.
Mental Health problems	MENTHLTH	How many days during the past 30 days was your mental health not good including stress, depression, and problems with emotions? Categorical Variable. Yes=1-30 number of days. No=None.

### 3.3 Tools used for analysis:

Statistical Analysis System Software (SAS) 9.4 were used to conduct the analysis.

Various analysis tools were performed to do the analysis including:

#### 3.3.1 Sorting the data (Structured Query Language (SQL))

SQL is a programming language used for retrieving and managing data from relational databases. In the current study SQL function was used to create a new data that includes the studied variables only. This function is a very powerful tool in summarizing

the data and selecting patients with certain condition. To use the SQL function SAS provides a procedure called (PROC SQL).

### **3.3.2 Descriptive analysis (Frequency Distributions)**

Since all investigated variables in this study are categorical, frequency distribution was used to display the numbers of occurrence of each variable. Frequency count, percentages, and bar charts were represented for all variables to clearly visualize the data. If distributions were extremely skewed with unpopulated categories, categories were reasonably combined. Physical health was originally a categorical variable contains number of days physical health not good from 1 to 30 each one represents one category and None that represents no physical health problems. This variable was transformed to a dichotomous variable. From “1 to 30 days” were combined to represent “physical health problem (yes)” and the “None” signify “No physical health problem”. Same combine was done for mental health variable. Also, the hours of sleep variable were a categorical variable contains number of hours of sleep per day from 1 to 24 hours each hour represent one category. According to (National Sleep Foundation, 2015) this variable was converted into three categories that include poor sleep (1-5 hours), optimal sleep (6 -9 hours), and over sleep (10 -24 hours). To calculate the frequency distribution of variables in a data set SAS procedure called (PROC FREQ) were used.

### **3.3.3 Inferential Analysis (Chi-square test)**

Inferential analysis is a statistical analysis method that can be used to infer and detect the association among different variables. A chi-square test is the inferential analysis that used to examine the association between two categorical variables. It can be used to test both extent of dependence and extent of independence between variables. It

was performed in the current study to see if there is a statistically significant association between the independent and dependent variables. A significance level was set to be 0.05, which is the alpha level associated with a 95% confidence level. So, to provide a conclusion about the hypothesis with 95% confidence, the *p*-value of the Chi-Square statistic should be less than 0.05. If the *p*-value was less than 0.05 then we can infer that the variables are not independent of each other and there is a statistically significant association between the categorical variables, which means the null hypothesis is rejected. However, if the *p*-value was more than 0.05 that means there is no significant association and the null hypothesis is accepted.

The chi-square is given by this formula:

$$X^2_c = \sum (O_i - E_i)^2 / E_i$$

While: “c” are the degrees of freedom, “O” is the observed value, and “E” is the expected value.

### **3.3.4 Predictive Analysis (Logistic Regression)**

Logistic regression is a predictive analysis used to predict and define the relation between one dependent (outcome) variable and one or more independent (predictor) variables. Logistic regression is used to obtain odds ratio (OR) that shows the constant effect of a predictor, on the likelihood that one outcome will occur. Logistic regression was performed in the current study by using SAS to assess the risk factors and how they may affect the HRQoL outcomes of depressive disorder patients. This test would provide us with the prediction model of the relation between the predictor and outcome variables. Odds ratio was calculated using logistic regression for each factor.

The logistic regression is given by this formula:

$$\log (\pi / 1 - \pi) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots \beta_m x_m$$

While:

$\pi$ : The probability of an event.

$\beta_i$ : The regression coefficients associated with reference group and  $x_i$  explanatory variables.

The Odds ratio is the probability of the event divided by the probability of the non-event that given by the following formula:

$$\text{Odds ratio} = p / (1 - p)$$

In addition, to calculate the probability from the odds ratio the following formula was used:

$$\text{Probability} = \text{odds} / (1 + \text{odds}).$$

## CHAPTER IV: RESULTS

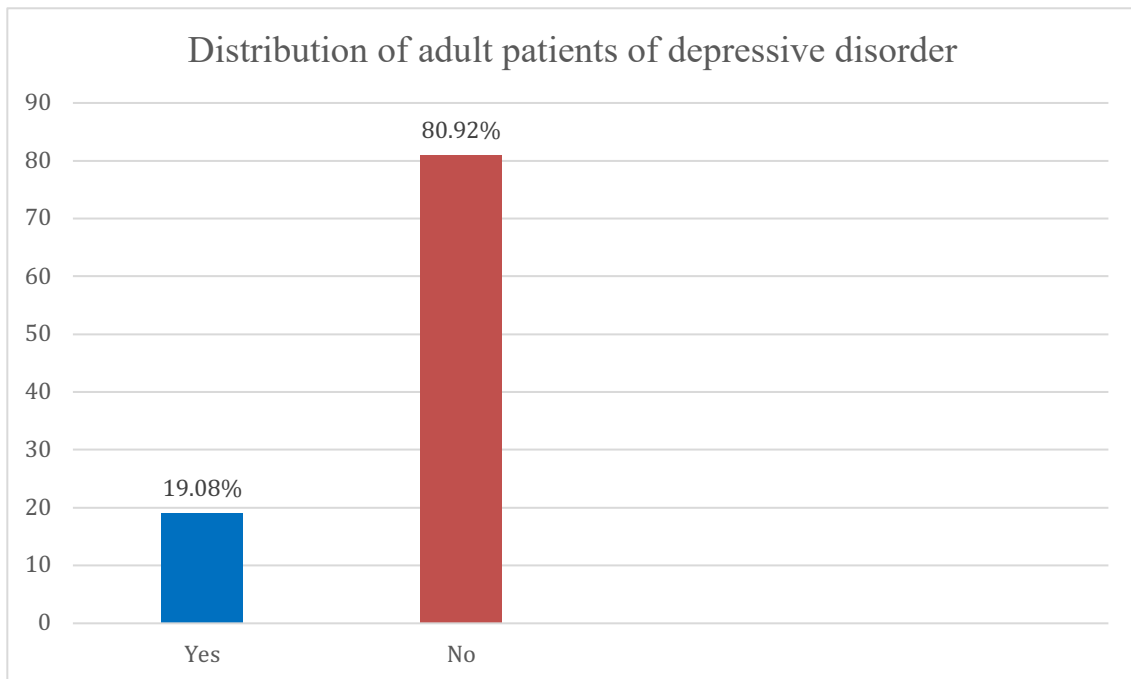
### 4.1 Descriptive analysis

#### 4.1.1 Distribution of demographic data

The total numbers of patients included in BRFSS 2014 are 462,546 patients. 88,233 of these patients had been told they have depressive disorder which will be investigated in this study (Table 1) (figure 2).

**Table 1. Distribution of Adult with depressive disorder**

Ever told you had a depressive disorder (ADDEPEV2)	Frequency	Percent
Yes	88233	19.08
No	374313	80.92

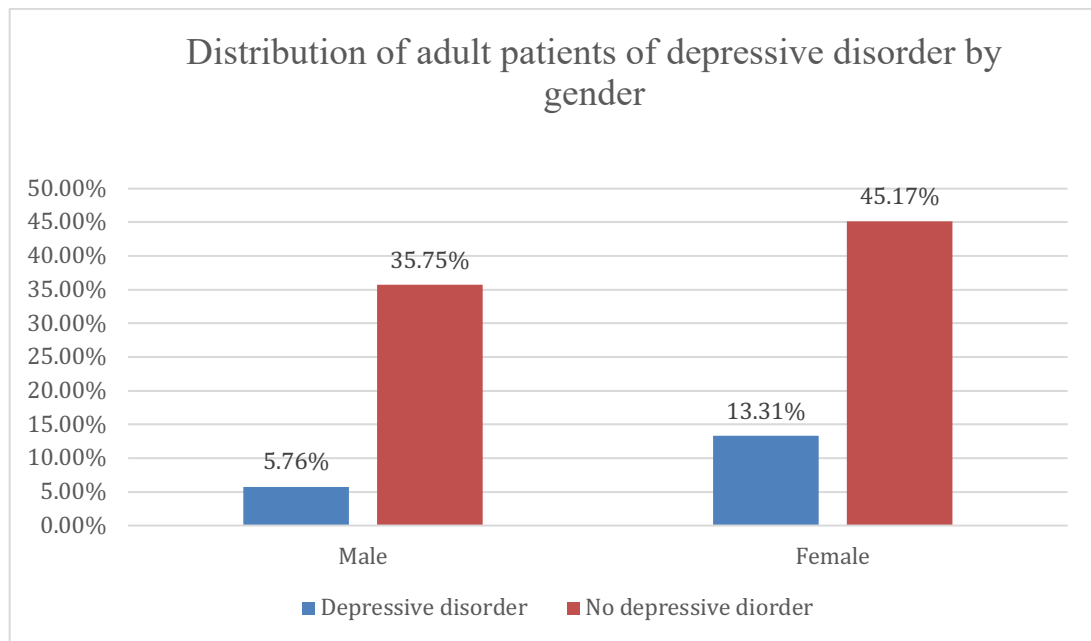


**Figure 2. Distribution of adult with depressive disorder**

The frequency distribution of adult patients of depressive disorder by gender shows that depressive disorder is more prevalent in females with 13.31% more than males with 5.76% (table 2) (figure 3).

**Table 2. Distribution of adult patients of depressive disorder by gender**

Gender	Adult Patients of Depressive Disorder (ADDEPEV2)			
	Yes		No	
	Frequency	Percent	Frequency	Percent
Male	26648	5.76%	165375	35.75%
Female	61585	13.31%	208938	45.17%
Total	88233	19.08%	374313	80.92%

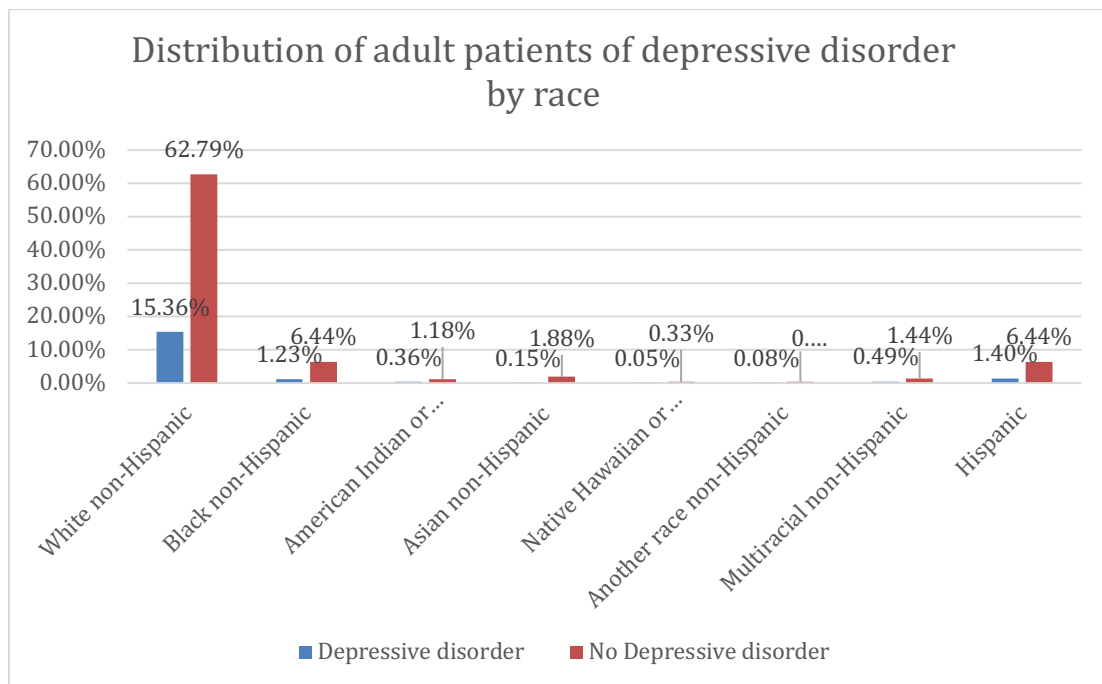


**Figure 3. distribution of adult patients of depressive disorder by gender**

The result in (table 3) (figure 4) shows that depressive disorder was higher among adults with multiracial non-Hispanic race.

**Table 3. Distribution of adult patients of depressive disorder by race**

Race	Adult Patients of Depressive Disorder (ADDEPEV2)			
	Yes		No	
	Frequency	Percent	Frequency	Percent
White non-Hispanic	69842	15.36	285545	62.79
Black non-Hispanic	5573	1.23	29307	6.44
American Indian or Alaskan Native Non-Hispanic	1652	0.36	5384	1.18
Asian non-Hispanic	680	0.15	8564	1.88
Native Hawaiian or another Pacific Islander Non-Hispanic	209	0.05	1495	0.33
Another race non-Hispanic	386	0.08	1712	0.38
Multiracial non-Hispanic	2233	0.49	6527	1.44
Hispanic	6386	1.40	29300	6.44
Total	86961	19.12	367834	80.88

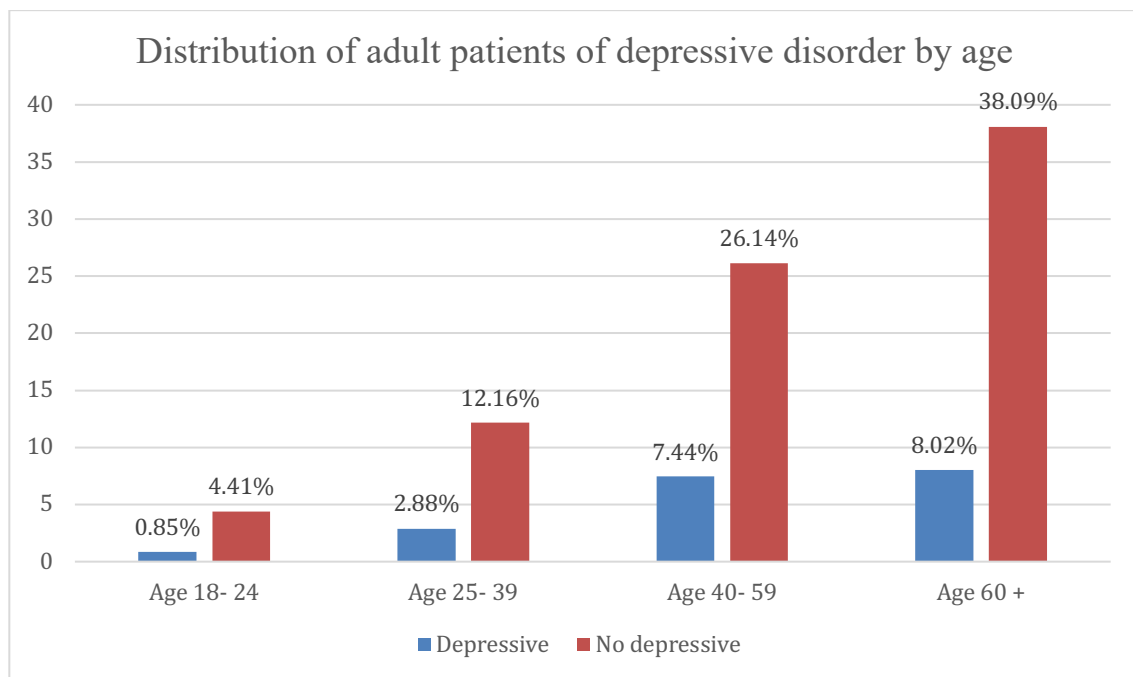


**Figure 4. Distribution of adult patients of depressive disorder by race**

According to the frequency distribution of adult patients of depressive disorder by age, depressive disorder was higher among age 40 to 59 (7.44%) (table 4) (figure 5).

**Table 4. Distribution of adult patients of depressive disorder by age**

Age	Adult Patients of Depressive Disorder (ADDEPEV2)			
	Yes		No	
	Frequency	Percent	Frequency	Percent
Age 18- 24	3873	0.85	20169	4.41
Age 25- 39	13153	2.88	55584	12.16
Age 40- 59	33995	7.44	119430	26.14
Age 60 +	36665	8.02	174055	38.09
Total	87686	19.19	369238	80.81



**Figure 5. Distribution of adult patients of depressive disorder by age**

#### 4.1.2 Distribution of HRQoL variables

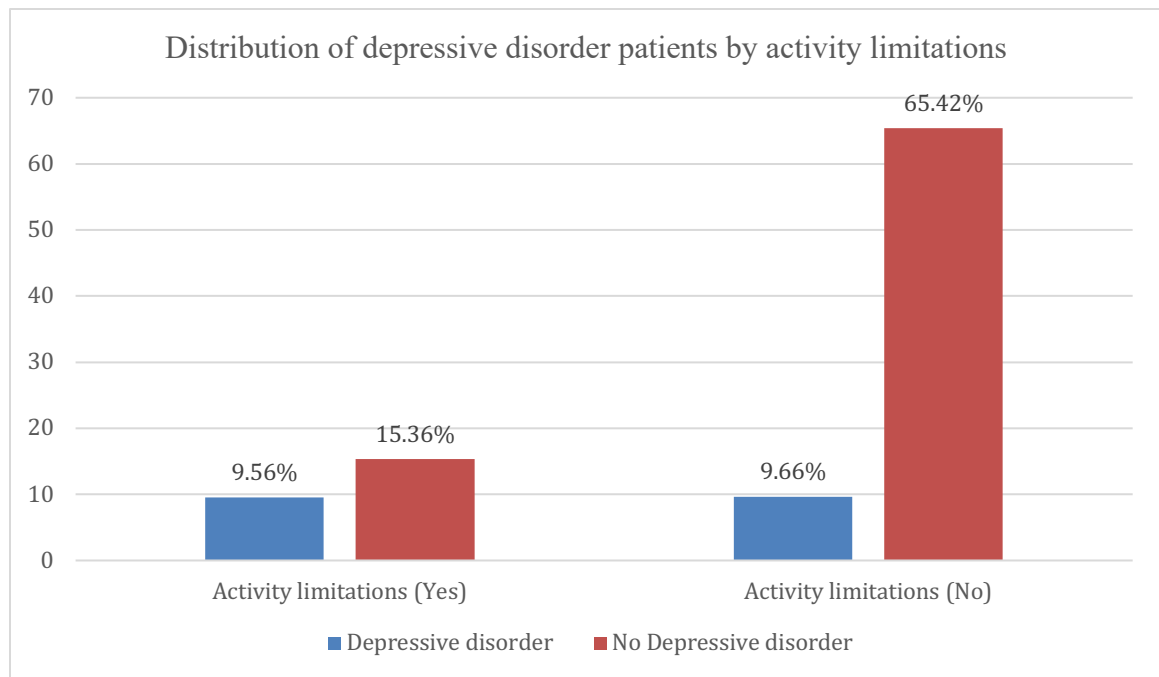
The HRQoL variables are the dependent (outcome) variables in this study which include activity limitation, physical health, and mental health. In the following are the

frequency distribution result for the HRQoL dependent variables with depressive disorder patients.

As seen in (table 5) and (figure 6) the higher percentage of adults with no activity limitation are depression free compared to those who have depressive disorder (65.42% vs 9.66%).

**Table 5. Distribution of depressive disorder patients by activity limitations**

Activity limitations	(ADDEPEV2) Ever told you had a depressive disorder			
	Yes		No	
	Frequency	Percent%	Frequency	Percent%
Yes	42608	9.56	68493	15.36
No	43058	9.66	291650	65.42
Total	85666	19.22	360243	80.70



**Figure 6. Distribution of depressive disorder patients by activity limitations**

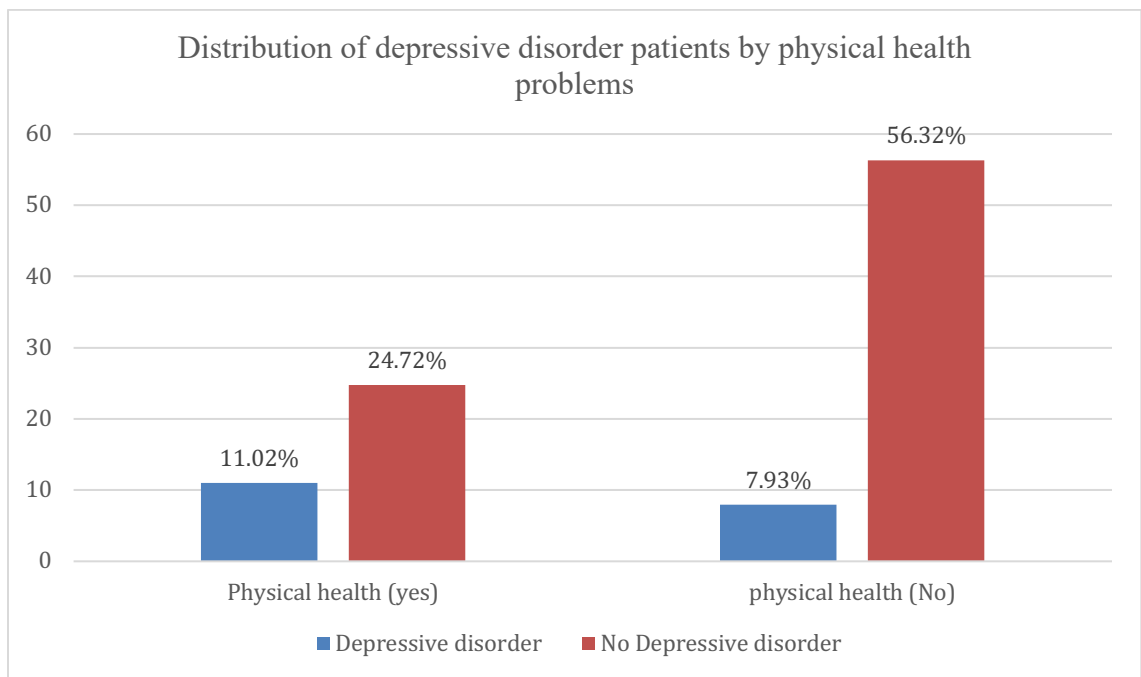
Physical health problems variable in HRQoL refers to the numbers of days during the past 30 days that physical health is not good. As mentioned earlier in the methodology, this variable was originally a categorical variable contains number of days

physical health is not good from 1 to 30 each one represents one category and None that represents no physical health problems. This variable was transformed to a dichotomous variable. From “1 to 30 days” were combined to represent “physical health problem (yes)” and the “None” signify “No physical health problem”.

As showing in (table 6) and (figure 7) greater number of depressive disorder patients had physical health problems compared to those with no physical health problems (11.02% vs 7.93%).

**Table 6. Distribution of depressive disorder patients by physical health problems**

Physical health problems	Ever told you had a depressive disorder (ADDEPEV2)			
	Yes		No	
	Frequency	Percent %	Frequency	Percent%
Yes	49877	11.02	111851	24.72
No	35883	7.93	254821	56.32
Total	85760	18.96	366672	81.04

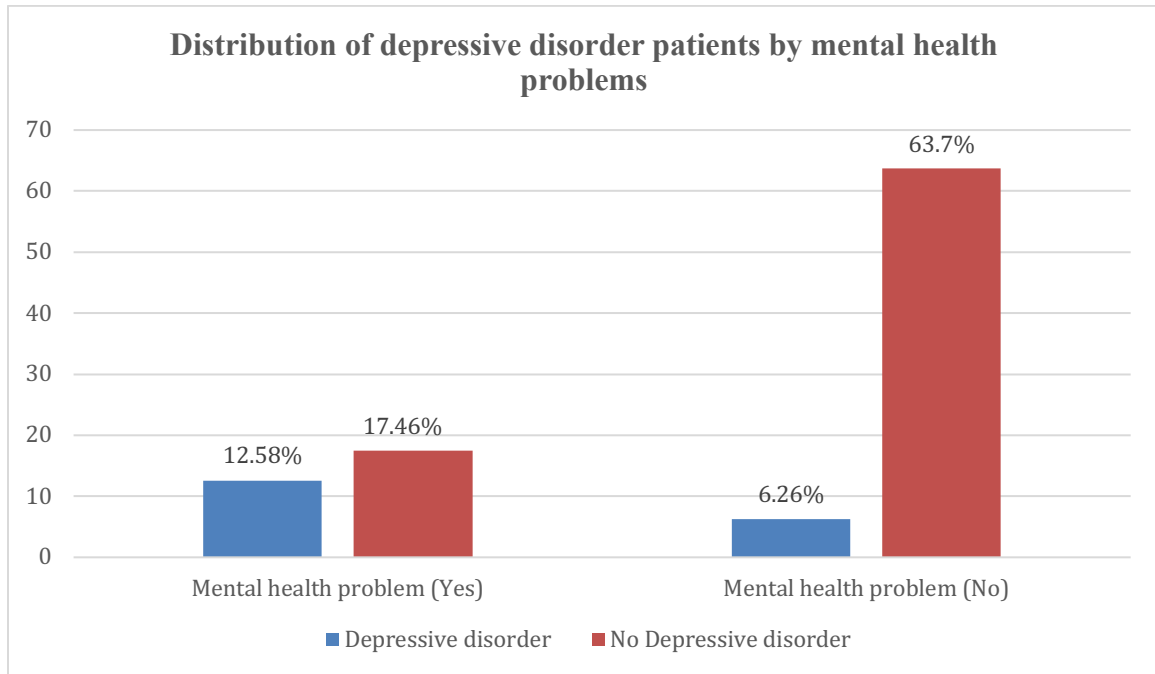


**Figure 7. Distribution of depressive disorder patients by physical health problems**

The other HRQoL variable investigated in the current study is mental health problems. This variable refers to the numbers of days mental health is not good during the past 30 days. This variable also was a categorical variable contains number of days mental health is not good from 1 to 30 each one represents one category and None that represents no mental health problems. Mental health variable was transformed to a dichotomous variable. From “1 to 30 days” were combined to represent “mental health problem (yes)” and the “None” signify “No mental health problem”. The result in (table 7) and (figure 8) shows that greater number of depressive disorder patients had mental health problems compared to those patients with no mental health problems (12.6% vs 6.3%).

**Table 7. Distribution of depressive disorder patients by mental health problems**

<b>Mental health problems</b>	<b>Ever told you had a depressive disorder (ADDEPEV2)</b>			
	<b>Yes</b>		<b>No</b>	
	<b>Frequency</b>	<b>Percent %</b>	<b>Frequency</b>	<b>Percent%</b>
Yes	57218	12.58	79448	17.46
No	28483	6.26	289761	63.70
Total	85701	18.84	369209	81.16



**Figure 8. Distribution of Patients Had depressive disorder by Mental health problems**

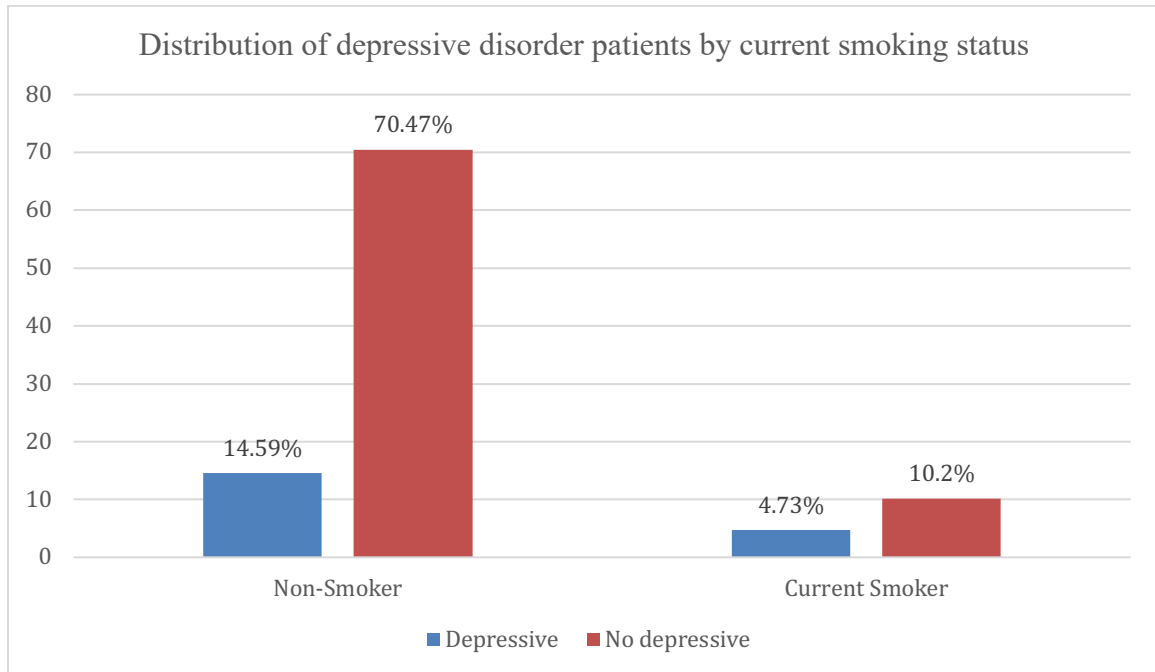
#### 4.1.3 Descriptive analysis of behavioral factors

The behavioral factors investigated in this study are current smoking status, alcohol use, exercise, and hours of sleep. Frequency distribution used to distribute the data since these behavioral variables are all categorical.

Current smoking status is a binary variable with yes or no response. Table 8 and figure 9 show that greater number of non-smokers were depression free compared to depressive disorder patients (70% vs 14.59%).

**Table 8. Distribution of depressive disorder patients by current smoking status**

Current smoking status	Adult Patients of Depressive Disorder (ADDEPEV2)			
	Yes		No	
	Frequency	Percent%	Frequency	Percent%
Yes	20902	4.73	45064	10.20
No	64442	14.59	311192	70.47
Total	85344	19.33	356256	80.67

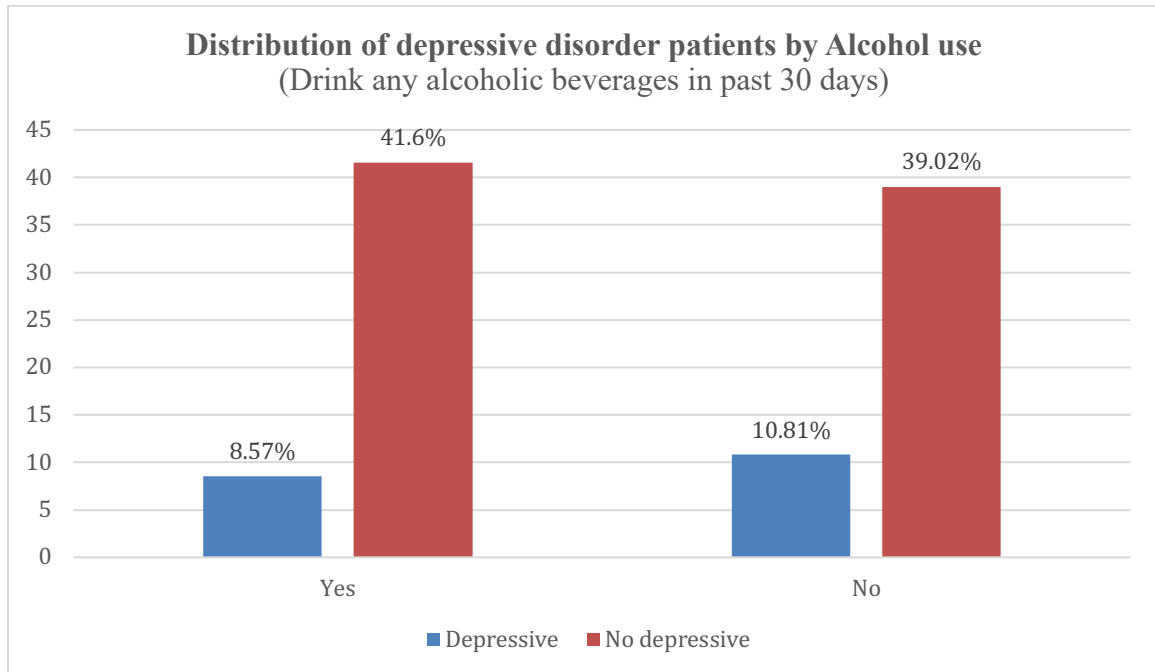


**Figure 9. Distribution of adult patients of depressive disorder by current smoking status**

Alcohol use is the second behavioral variable that refers to drinking any alcoholic beverages in the past 30 days. It is a categorical variable with yes and no responses. As shown in (table 9) and (figure 10) slightly greater number of adults who did not use alcohol has depressive disorder (10.8% vs 8.57%). This could indicate the numbing effect of alcohol though long-term use may indicate otherwise.

**Table 9. Distribution of Patients Had depressive disorder by Alcohol use**

Alcohol use	ADDEPEV2 (Ever told you had a depressive disorder)			
	Yes		No	
	Frequency	Percent%	Frequency	Percent%
Yes	37463	8.57	181942	41.60
No	47290	10.81	170683	39.02
Total	84753	19.38	352625	80.62



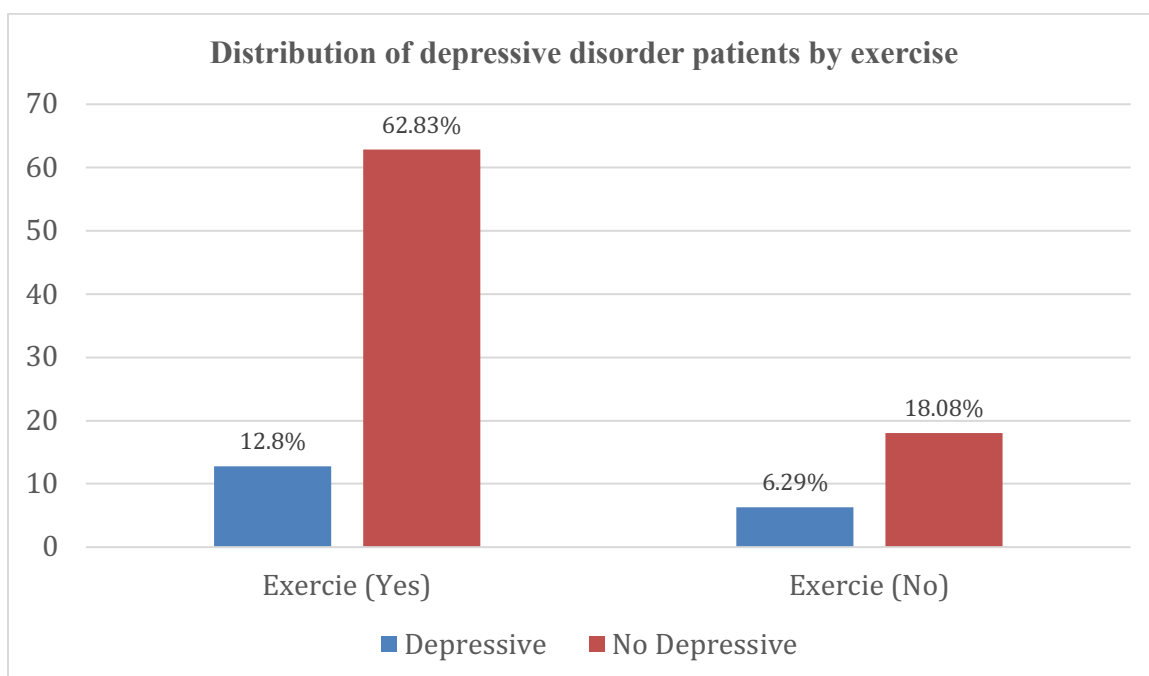
**Figure 10. Distribution of depressive disorder patients by alcohol use**

Exercise is the third behavioral factor which considered to be a positive behavioral factor regarding its positive influence in reducing depression feelings.

Exercise variable in the current studied data refers to either the patients exercise or not. Table 10 and figure 11 show that greater number of adults who exercise are depression free compared to those who have depressive disorder (62.8 % vs /12.8%).

**Table 10. Distribution of adult patients of depressive disorder by exercise**

Exercise	(ADDEPEV2) Adult Patients of Depressive Disorder			
	Yes		No	
	Frequency	Percent%	Frequency	Percent%
YES	58994	12.80	289579	62.83
No	28989	6.29	83301	18.08
Total	87983	19.09	372880	80.91

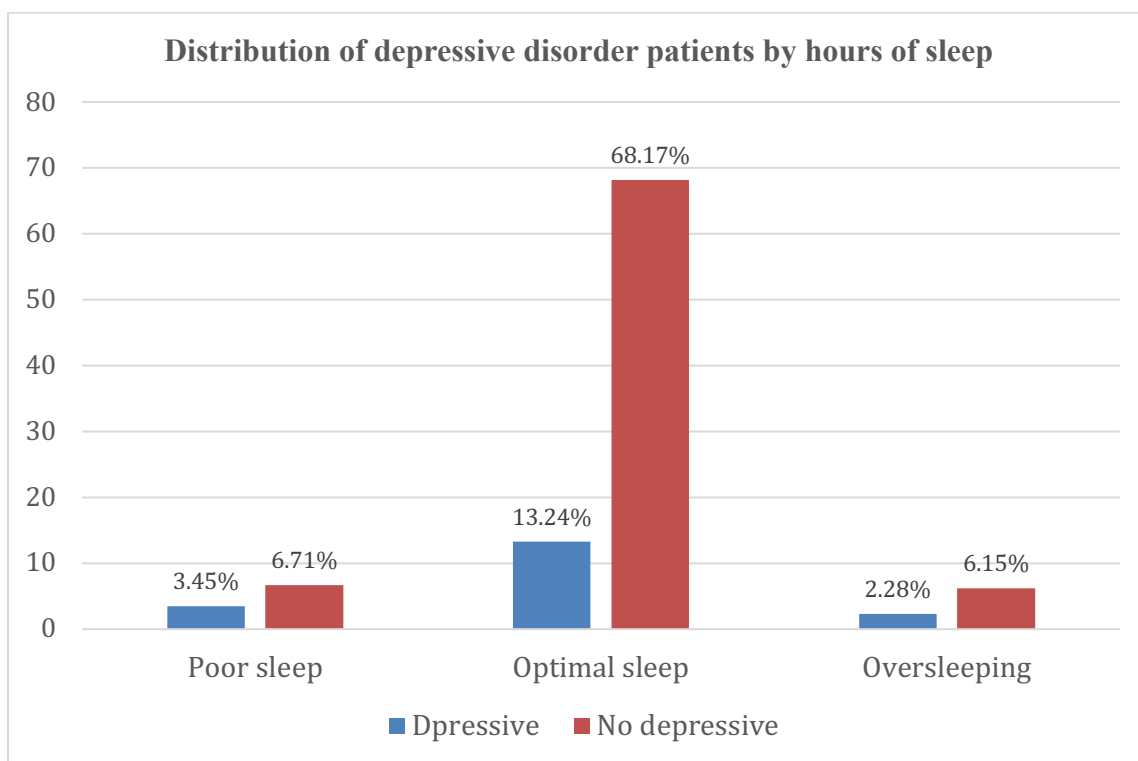


**Figure 11. Distribution of adult patients of depressive disorder by exercise**

Hours of sleep is the last behavioral factor and one of the most important associated behavioral factors due to its high influence on depressed patients. The hours of sleep variable refer to the number of hours that patients sleep during the day from 1 to 24 hours. As mentioned earlier in order to make evident distribution result, this variable was converted into three categories which include poor sleep (1-5 hours), optimal sleep (6 -9 hours), and over sleep (10 -24 hours). As shown in table 11 and figure 12 greater number of adults who have optimal sleep are depression free compared to adults with depressive disorder (68.17% vs 13.24%).

**Table 11. Distribution of depressive disorder patients by hours of sleep**

Hours of sleep	(ADDEPEV2) Adult Patients of Depressive Disorder			
	Yes		No	
	Frequency	Percent	Frequency	Percent
Poor sleep	15722	3.45	30627	6.71
Optimal sleep	60402	13.24	311039	68.17
Over sleep	10415	2.28	28045	6.15
Total	86539	18.97	369711	81.03



**Figure 12. Distribution of depressive disorder patients by hours of sleep**

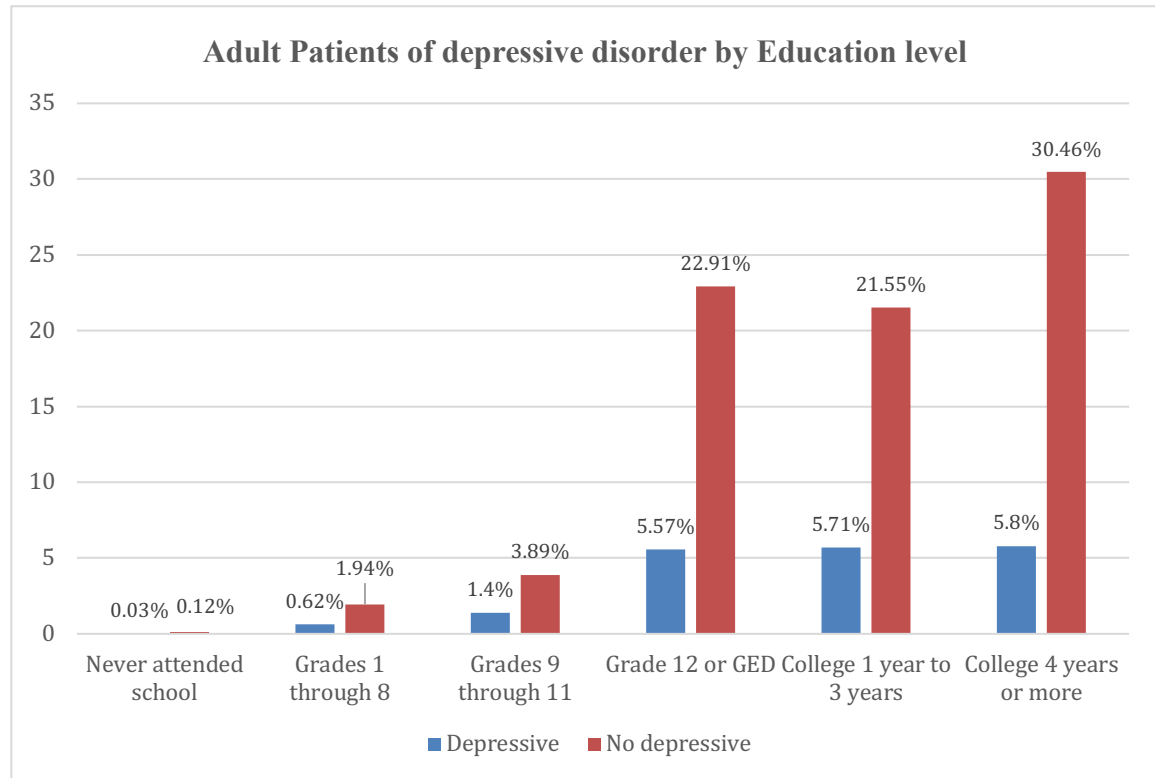
#### **4.1.4 Distributions of socio-economic factors**

In addition to the behavioral factors that may affect patients with depressive disorder, there are several socioeconomic associated factors that may have an important effect on the health-related quality of life of depressive disorder patients. The socioeconomic factors investigated in this study include education level, marital status, employment status, and income level.

Education level is a categorical variable that consists of six categories including: never attended school, grades 1 through 8, grades 9 through 11, grade 12 or GED, college 1 year to 3 years, and college 4 years or more. Table 12 and figure 13 indicate that greater number of adults with higher education level were depression free compared to those with depressive disorder (30.46% vs 5.8%).

**Table 12. Distribution of adult patients of depressive disorder by education level**

Education level	(ADDEPEV2) Ever told you had a depressive disorder			
	Yes		No	
	Frequency	Percent%	Frequency	Percent%
Never attended school	130	0.03	534	0.12
Grades 1 through 8	2829	0.62	8918	1.94
Grades 9 through 11	6443	1.40	17854	3.89
Grade 12 or GED	25557	5.57	105127	22.91
College 1 year to 3 years	26196	5.71	98910	21.55
College 4 years or more	26613	5.80	139772	30.46
Total	87768	19.13	371115	80.87



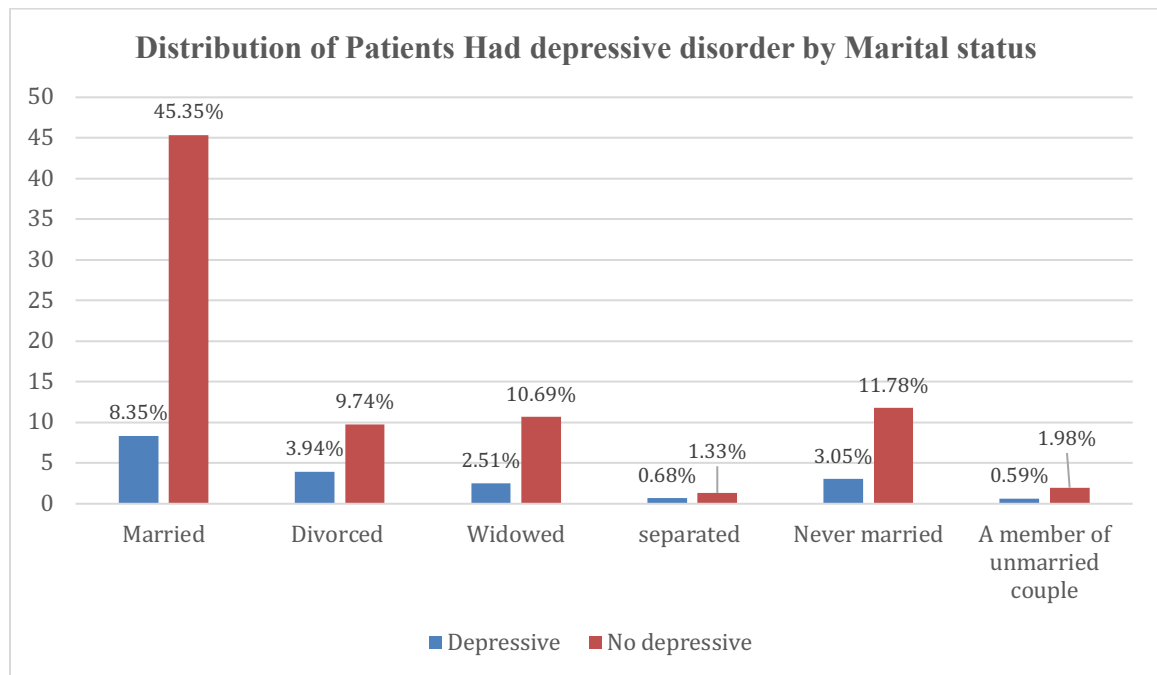
**Figure 13. Distribution of adult patients of depressive disorder by education level**

Marital status is also a categorical variable consists of six categories including: married, divorced, widowed, separated, never married, and a member of unmarried

couple. Table 12 and figure 14 show that greater number of adults with married status were depression free compared to those with depressive disorder (45.35% vs 8.35%).

**Table 13. Distribution of depressive disorder patients by marital status**

Marital status	(ADDEPEV2) Ever told you had a depressive disorder			
	Yes		No	
	Frequency	Percent%	Frequency	Percent%
Married	38286	8.35	207959	45.35
Divorced	18069	3.94	44670	9.74
Widowed	11513	2.51	49011	10.69
Separated	3116	0.68	6084	1.33
Never married	13997	3.05	54035	11.78
A member of unmarried couple	2728	0.59	9092	1.98
Total	87709	19.13	370851	80.87



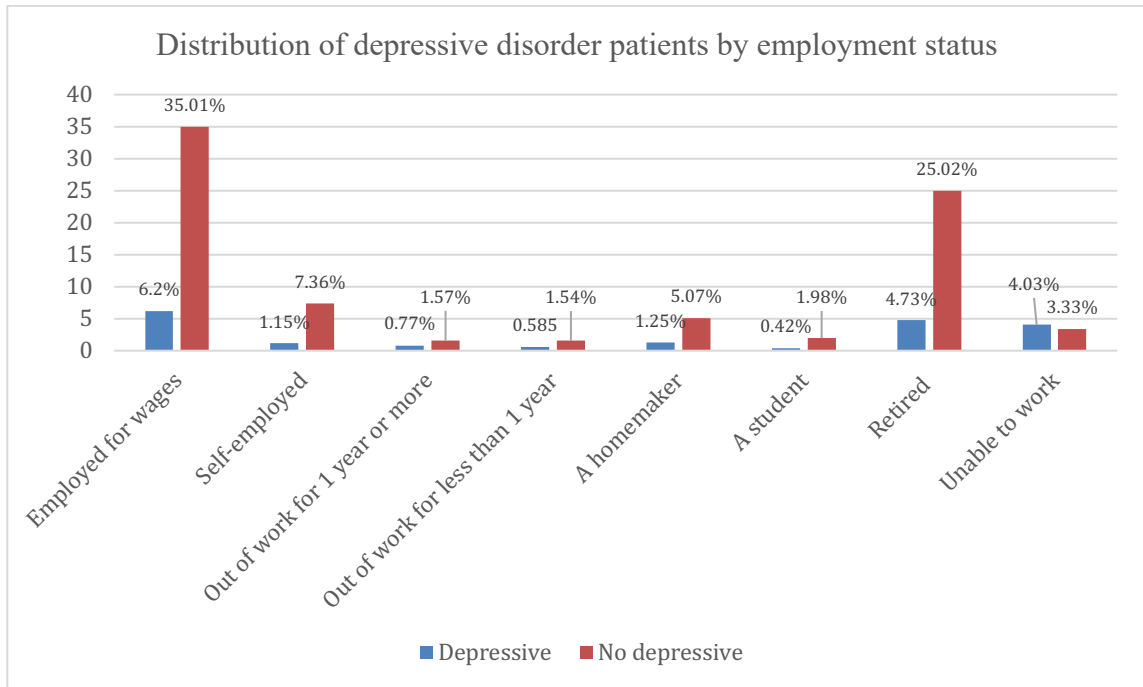
**Figure 14. Distribution of depressive disorder patients by marital status**

In addition to the marital status, employment status is one of the other socioeconomic factors that may have high effect on quality of life of depressive disorder

patients. It is a categorical variable consists of eight categories which include: employed for wages, self-employed, out of work for 1 year or more, out of work for less than 1 year, a homemaker, a student, retired, and unable to work. As seen in (table 14 and figure 15) the higher number of adults who are employed for wages were depression free compared to those with depressive disorder (35.01% vs 6.2%). Also, the percentage of adult patients of depressive disorder who are unable to work was 4.03% which is more than those with no depressive disorder 3.33% (table 14 and figure 15).

**Table 14. Distribution of depressive disorder patients by employment status**

Employment status	(ADDEPEV2) Adult Patients of Depressive Disorder			
	Yes		No	
	Frequency	Percent	Frequency	Percent
Employed for wages	28379	6.20	160191	35.01
Self-employed	5240	1.15	33697	7.36
Out of work for 1 year or more	3514	0.77	7163	1.57
Out of work for less than 1 year	2636	0.58	7054	1.54
A homemaker	5738	1.25	23178	5.07
A student	1908	0.42	9049	1.98
Retired	21636	4.73	114459	25.02
Unable to work	18446	4.03	15247	3.33
Total	87497	19.12	370038	80.88



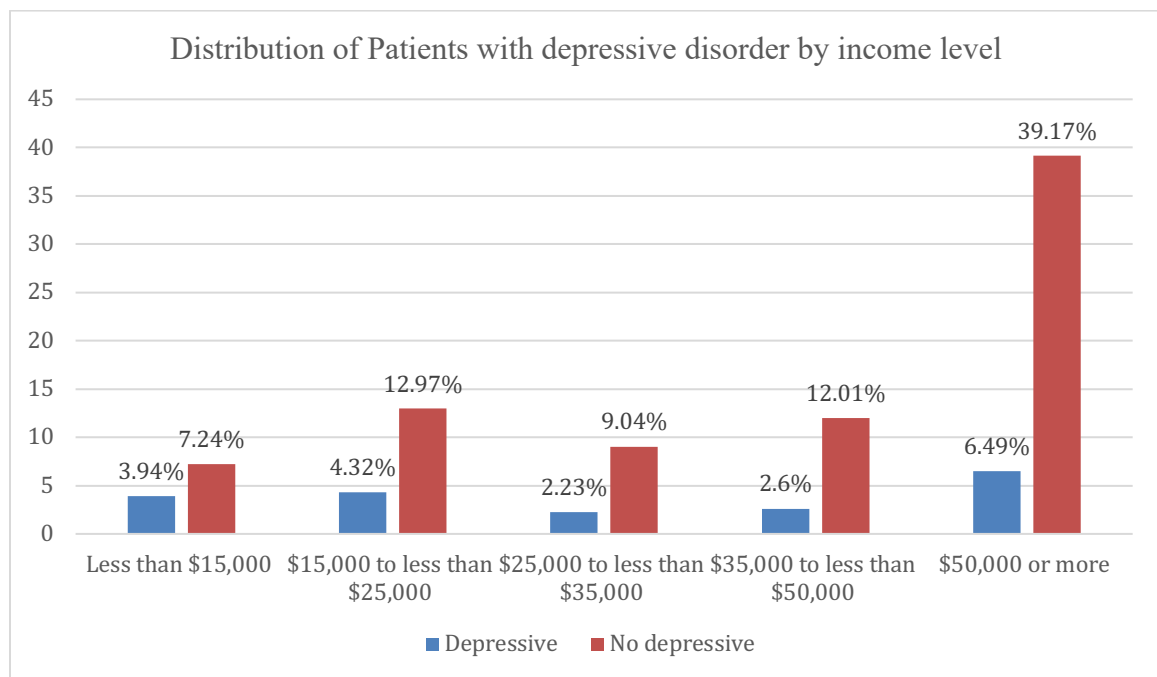
**Figure 15. Distribution of depressive disorder patients by employment status**

Income level is a categorical variable that consists of five categories include: less than \$15,000, \$15,000 to less than \$25,000, \$25,000 to less than \$35,000, \$35,000 to less than \$50,000, and \$50,000 or more. Table 15 and figure 16 indicate that greater number of adults with high income level were depression free (39.17%) compared to those with depressive disorder (6.49%).

**Table 15. Distribution of Patients with depressive disorder by income level**

Income level	(ADDEPEV2) Adult Patients of Depressive Disorder			
	Yes		No	
	Frequency	Percent	Frequency	Percent
Less than \$15,000	15424	3.94	28379	7.24
\$15,000 to less than \$25,000	16920	4.32	50820	12.97
\$25,000 to less than \$35,000	8742	2.23	35412	9.04

\$35,000 to less than \$50,000	10187	2.60	47085	12.01
\$50,000 or more	25445	6.49	153519	39.17
Total	76718	19.57	315215	80.43



**Figure 16. Distribution of Patients with depressive disorder by income level**

## 4.2 Inferential analysis

The inferential analysis can be used to infer the association between different variables. Since all the studied variables are categorical, Chi-Square test was performed to see if there is a statistically significant association among all the variables. The significance level was set to be 0.05. Regarding that, if the result shows that  $p$ -value is equal to 0.05 or less that means the null hypothesis is rejected and there is a statistically significant association between the tested variables. However, if the result shows that  $p$ -

value is more than 0.05 then the null hypothesis is accepted and there is no association between the tested variable.

#### **4.2.1 Association between depressive disorder and HRQoL outcomes**

A chi-square test was performed, and there was a significant association between depressive disorder and activity limitation,  $X^2(1, N = 445809) = 34903.14, P < .0001$ .

A chi-square test was performed, and there was a significant association between depressive disorder and physical health,  $X^2(2, N = 161728) = 4862.66, P < .0001$ .

A chi-square test was performed, and there was a significant association between depressive disorder and mental health,  $X^2(2, N = 136666) = 11792.63, P < .0001$ .

#### **4.2.2 Association between behavioral factors and HRQOL outcomes among depressive disorder patients**

##### **Current smoking status:**

A chi-square test was performed, and there was a significant association between current smoking status and activity limitation,  $X^2(1, N = 79905) = 917.6799, P < .0001$ .

A chi-square test was performed, and there was a significant association between current smoking status and physical health,  $X^2(1, N = 79905) = 476.2407, P < .0001$ .

A chi-square test was performed, and there was a significant association between current smoking status and mental health,  $X^2(1, N = 79905) = 752.1141, P < .0001$ .

##### **Alcohol use:**

A chi-square test was performed, and there was a significant association between alcohol use and activity limitation,  $X^2(1, N = 84142) = 2876.5691, P < .0001$ .

A chi-square test was performed, and there was a significant association between alcohol use and physical health,  $X^2(1, N = 80231) = 1281.8949, P < .0001$ .

A chi-square test was performed, and there was a significant association between alcohol use and mental health,  $X^2 (1, N = 80231) = 23.0249, P < .0001$ .

**Exercise:**

A chi-square test was performed, and there was a significant association between exercise and activity limitation,  $X^2 (1, N = 80098) = 4525.9548, P < .0001$ .

A chi-square test was performed, and there was a significant association between exercise and physical health,  $X^2 (1, N = 80098) = 2411.1500, P < .0001$ .

A chi-square test was performed, and there was a significant association between exercise and mental health,  $X^2 (1, N = 80098) = 385.6754, P < .0001$ .

**Hours of sleep:**

A chi-square test was performed, and there was a significant association between hours of sleep and activity limitation,  $X^2 (2, N = 80177) = 3446.1838, P < .0001$ .

A chi-square test was performed, and there was a significant association between hours of sleep and physical health,  $X^2 (2, N = 80177) = 2329.2818, P < .0001$ .

A chi-square test was performed, and there was a significant association between hours of sleep and mental health,  $X^2 (2, N = 80177) = 1676.1032, P < .0001$ .

**4.2.3 Association between socioeconomic factors and HRQOL outcomes in depressive disorder patients**

**Education level:**

A chi-square test was performed, and there was a significant association between education level and activity limitation,  $X^2 (5, N = 80214) = 1949.4875, P < .0001$ .

A chi-square test was performed, and there was a significant association between education level and physical health,  $X^2 (5, N = 80214) = 1131.7434, P < .0001$ .

A chi-square test was performed, and there was a significant association between education level and mental health,  $X^2 (5, N = 80214) = 320.9438, P < .0001$ .

**Marital status:**

A chi-square test was performed, and there was a significant association between marital status and activity limitation,  $X^2 (5, N = 80054) = 1540.7667, P < .0001$ .

A chi-square test was performed, and there was a significant association between marital status and physical health,  $X^2 (5, N = 80054) = 542.2646, P < .0001$ .

A chi-square test was performed, and there was a significant association between marital status and mental health,  $X^2 (5, N = 80054) = 1128.1481, P < .0001$ .

**Employment status:**

A chi-square test was performed, and there was a significant association between employment status and activity limitation,  $X^2 (7, N = 80094) = 18016.0040, P < .0001$ .

A chi-square test was performed, and there was a significant association between employment status and physical health,  $X^2 (7, N = 80094) = 7108.7325, P < .0001$ .

A chi-square test was performed, and there was a significant association between employment status and mental health,  $X^2 (7, N = 80094) = 3354.8071, P < .0001$ .

**Income level:**

A chi-square test was performed, and there was a significant association between income level and activity limitation,  $X^2 (4, N = 71435) = 6258.1391, P < .0001$ .

A chi-square test was performed, and there was a significant association between income level and physical health,  $X^2 (4, N = 71435) = 3179.4480, P < .0001$ .

A chi-square test was performed, and there was a significant association between income level and mental health,  $X^2 (4, N = 71435) = 1298.2740, P < .0001$ .

### 4.3 Predictive analysis

In this study, logistic regression was performed to predict the effects of the risk associated factors on HRQoL among depressive disorder patients. Odds ratio was derived from logistic regression for each variable.

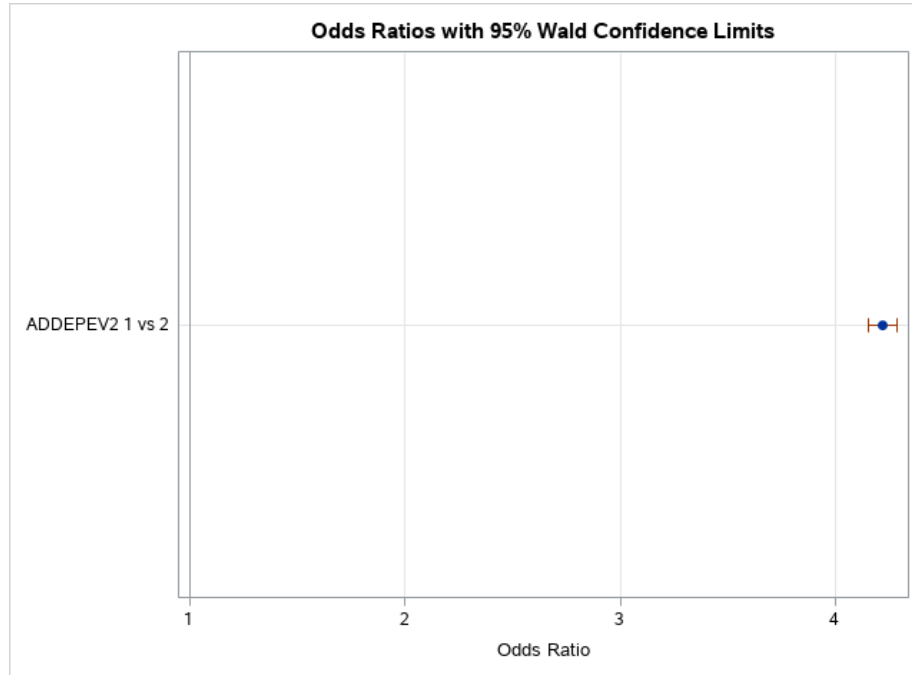
#### 4.3.1 Odds ratio of depressive disorder with HRQoL outcomes

##### 4.3.1.1 *Depressive disorder and activity limitation:*

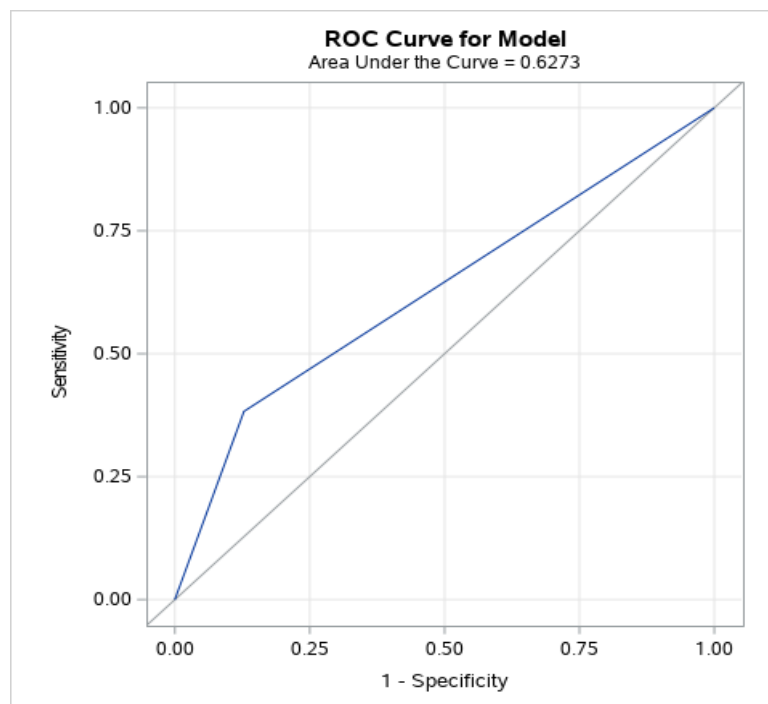
Logistic regression is performed to assess the effect of depressive disorder on activity limitation. As shown in table 16 and figure 17 the odds ratio of depressive disorder with activity limitation is 4.22. This result indicates that adults with depressive disorder have 4.22 times the odds of having activity limitation as the adults with no depressive disorder.

**Table 16. Odds ratio estimates and Wald confidence intervals for Depressive disorder and activity limitation**

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
Depressive (ADDEPEV2 1 vs 2)	4.218	4.150	4.286



**Figure 17. Odds ratio of depressive disorder with activity limitation**



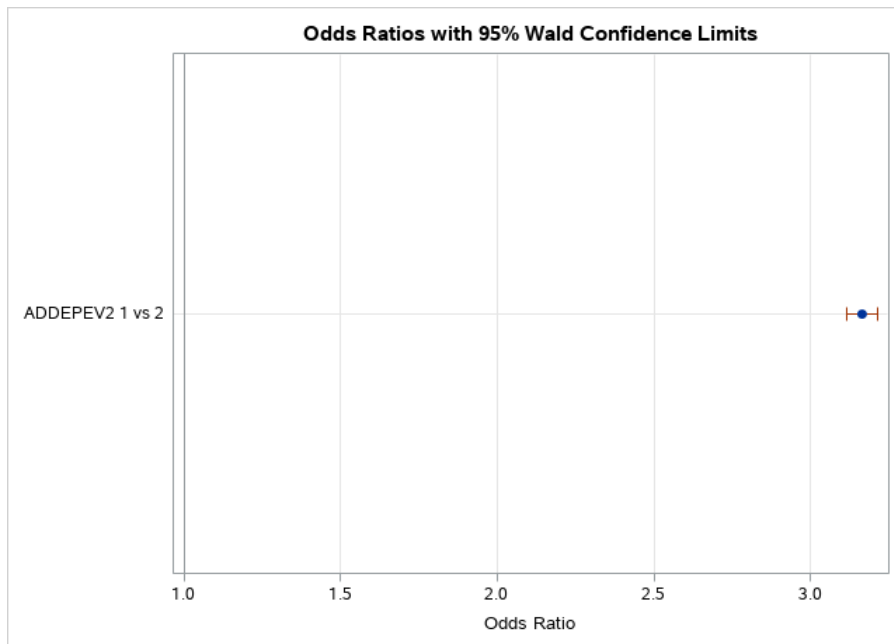
**Figure 18. Roc curve for model of association between depressive disorder and activity limitation**

#### 4.3.1.2 Depressive disorder and physical health problems:

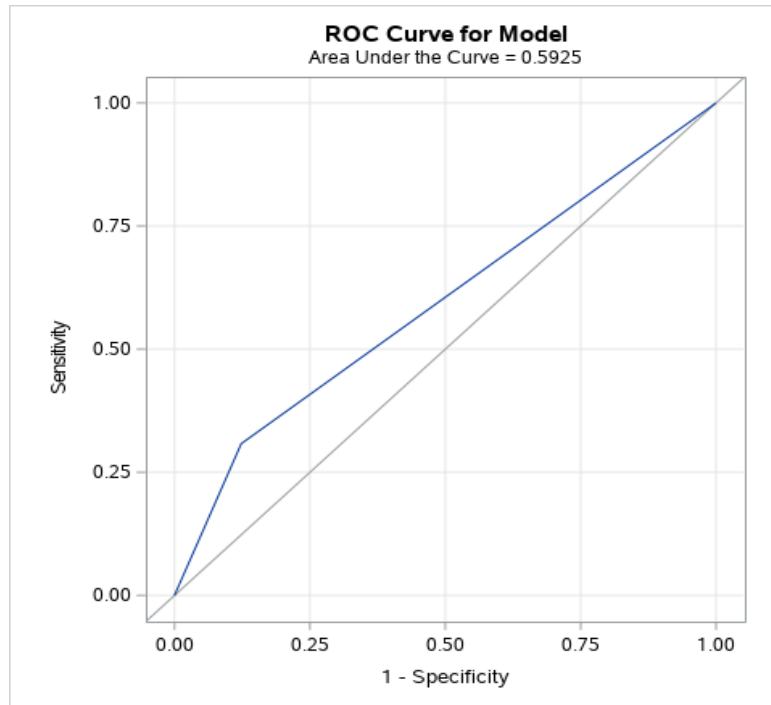
Logistic regression is preformed to assess the effect of depressive disorder on physical health problems. As shown in table 17 and figure 19 the odds ratio of depressive disorder with physical health problems is 3.17. This result indicates that adults with depressive disorder have 3.17 times the odds of having physical health problems as the adults with no depressive disorder.

**Table 17. Odds ratio estimates and Wald confidence intervals for Depressive disorder and physical health problems**

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
Depressive (ADDEPEV2 1 vs 2)	3.166	3.118	3.214



**Figure 19. Odds ratio of depressive disorder with physical health problems**



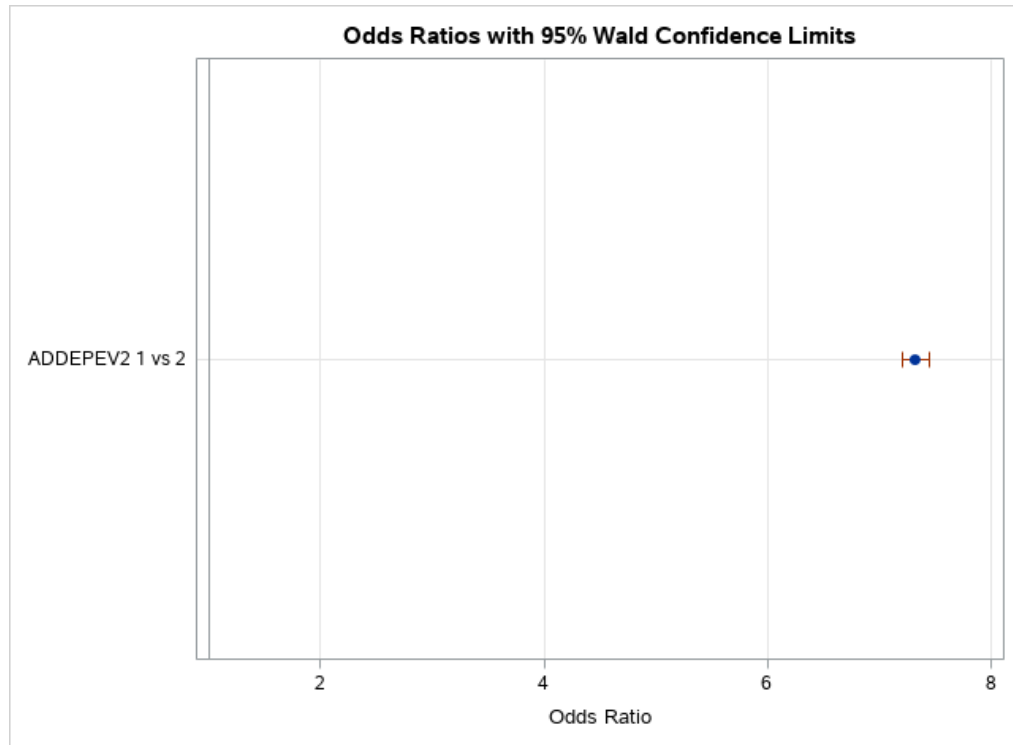
**Figure 20. Roc curve for model of association between depressive disorder and physical health problems**

#### ***4.3.1.3 Depressive disorder and mental health problems:***

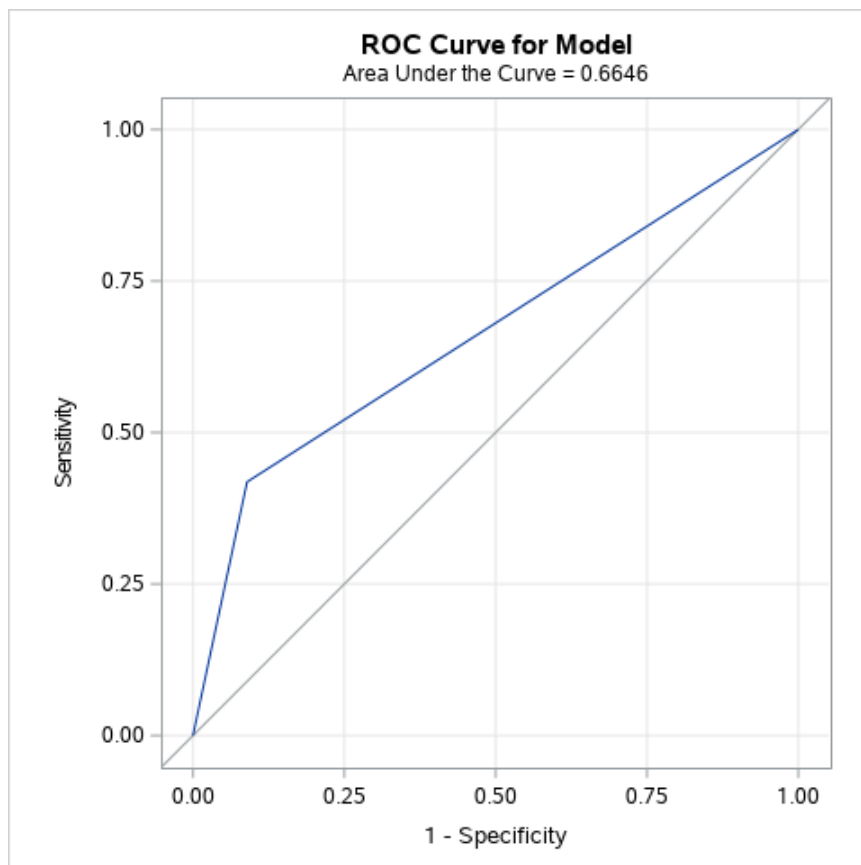
Logistic regression is preformed to assess the effect of depressive disorder on mental health problems. As shown in table 18 and figure 21 the odds ratio of depressive disorder with mental health problems is 7.33. This result indicates that adults with depressive disorder have 7.33 times the odds of having mental health problems as the adults with no depressive disorder.

**Table 18. Odds ratio estimates and Wald confidence intervals for Depressive disorder and mental health problems**

<b>Odds Ratio Estimates</b>			
<b>Effect</b>	<b>Point Estimate</b>	<b>95% Wald Confidence Limits</b>	
<b>Depressive (ADDEPEV2 1 vs 2)</b>	7.327	7.209	7.446



**Figure 21. Odds ratio of depressive disorder with mental health problems**



**Figure 22. Roc curve for model of association between depressive disorder and mental health problems**

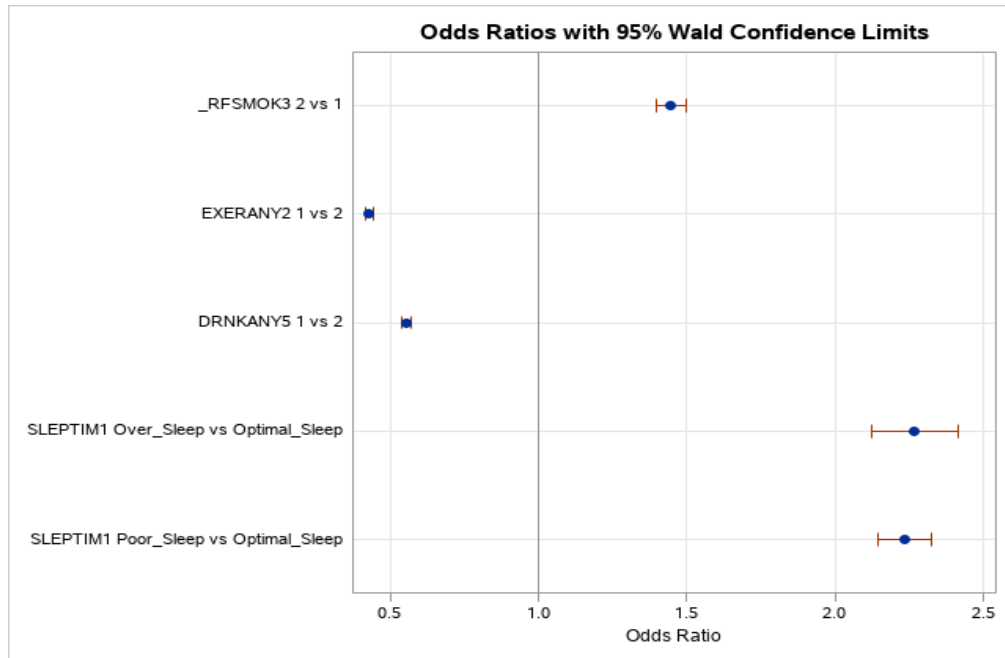
### 4.3.2 Odds ratio of behavioral associated factors

#### 4.3.2.1 Behavioral factors and activity limitation:

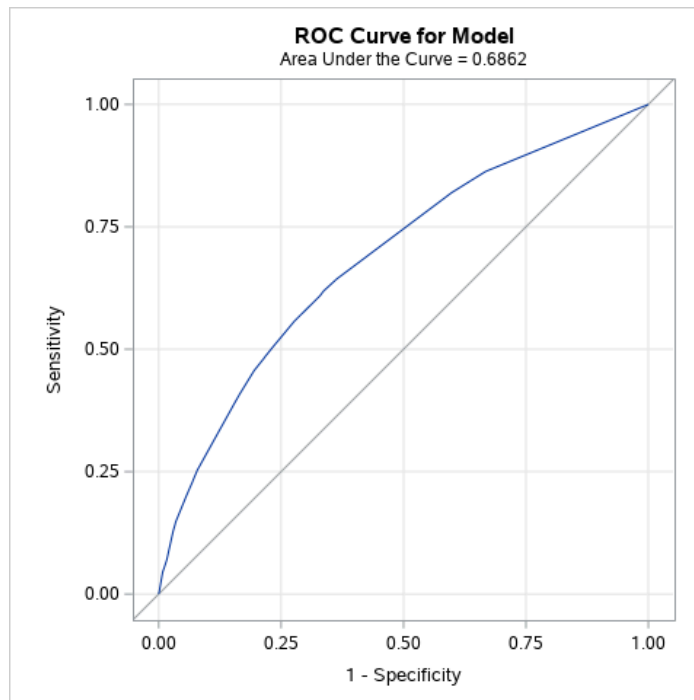
Logistic regression was employed to assess the effect of behavioral factors on activity limitation among depressive disorder patients. Table 19 and figure 23 show that the odds ratio of activity limitation with smoking status factor was 1.445 for adults with depressive disorder who are current smokers. Also, the odds ratio for activity limitation with alcohol use factor was 0.553 for adult with depressive disorder who drink alcohol (table 19 and figure 23). The odds ratio of activity limitation with exercise factor was 0.428 for adult patients of depressive disorder who do exercise (table 19 and figure 23). Moreover, as seen in table 19 and figure 23 adults with depressive disorder who have over sleep hours have the odds ratio of 2.265 for having activity limitation. Depressive disorder adults who have poor sleep hours have the odds ratio of 2.234 for having activity limitation (table 19 and figure 23).

**Table 19. Odds ratio estimates and Wald confidence intervals for behavioral factors and activity limitation in adult patients of depressive disorder**

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
_RFSMOK3 2 vs 1	1.445	1.396	1.497
EXERANY2 1 vs 2	0.428	0.414	0.442
DRNKANY5 1 vs 2	0.553	0.536	0.570
SLEPTIM1 Over_Sleep vs Optimal_Sleep	2.265	2.123	2.417
SLEPTIM1 Poor_Sleep vs Optimal_Sleep	2.234	2.145	2.326



**Figure 23. Odds ratio of behavioral factors with activity limitation in adults with depressive disorder**



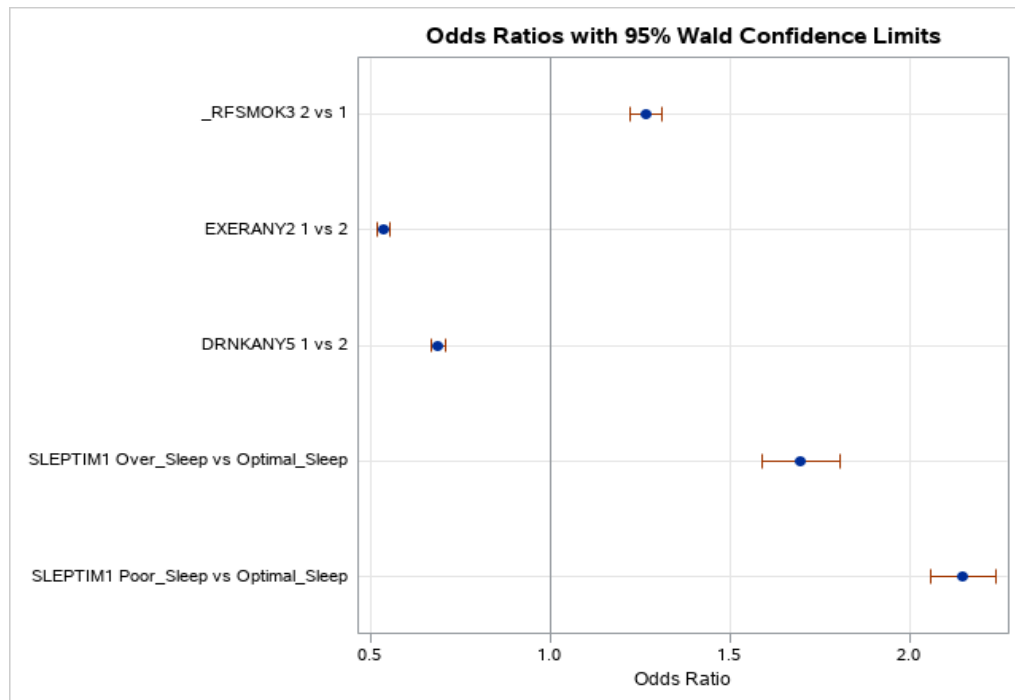
**Figure 24. Roc curve for model of association between behavioral factors and activity limitation in adults with depressive disorder**

#### 4.3.2.2 Behavioral factors and physical health problems:

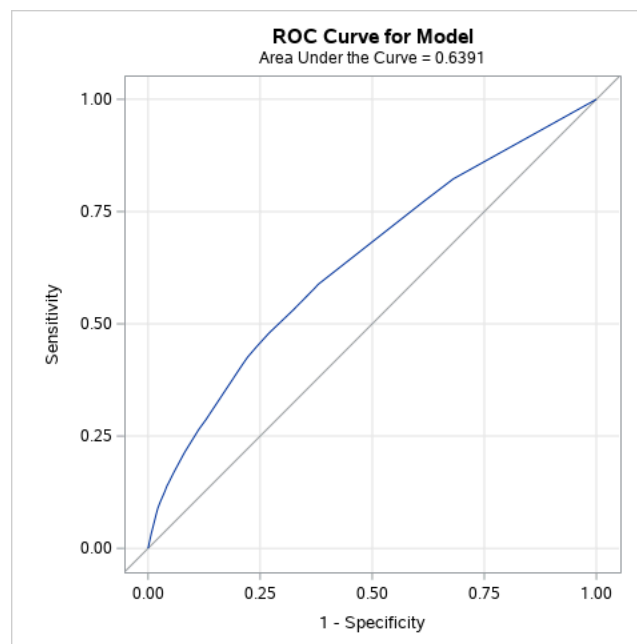
Logistic regression was employed to assess the effect of behavioral factors on physical health problems among depressive disorder adults. Table 20 and figure 25 show that the odds ratio for physical health problems with smoking status was 1.267 for the adults with depressive disorder who are current smokers. The result indicates that the odds ratio for adults with depressive disorder who drink alcohol was 0.689 for having physical health problems (table 20 and figure 25). Additionally, as seen in table 20 and figure 25 the odds ratio for adults with depressive disorder who exercise was 0.537 for having physical health problems. Also, the logistic regression result show that the odds ratio for adults with depressive disorder who have over sleep hours was 1.695 for having physical health problems compared to those adults with optimal sleep hours (table 20 and figure 25). In the other hand, the odds ratio for adults with depressive disorder who have poor sleep hours was 2.148 for having physical health problems compared to those adults with optimal sleep hours.

**Table 20. Odds ratio estimates and Wald confidence intervals for current behavioral factors and physical health problems in adult patients with depressive disorder**

<b>Odds Ratio Estimates</b>			
<b>Effect</b>	<b>Point Estimate</b>	<b>95% Wald Confidence Limits</b>	
<b>_RFSMOK3 2 vs 1</b>	1.267	1.224	1.313
<b>EXERANY2 1 vs 2</b>	0.537	0.519	0.555
<b>DRNKANY5 1 vs 2</b>	0.689	0.669	0.710
<b>SLEPTIM1 Over_Sleep vs Optimal_Sleep</b>	1.695	1.588	1.808
<b>SLEPTIM1 Poor_Sleep vs Optimal_Sleep</b>	2.148	2.060	2.241



**Figure 25. Odds ratio of behavioral factors with physical health problems in adults with depressive disorder**



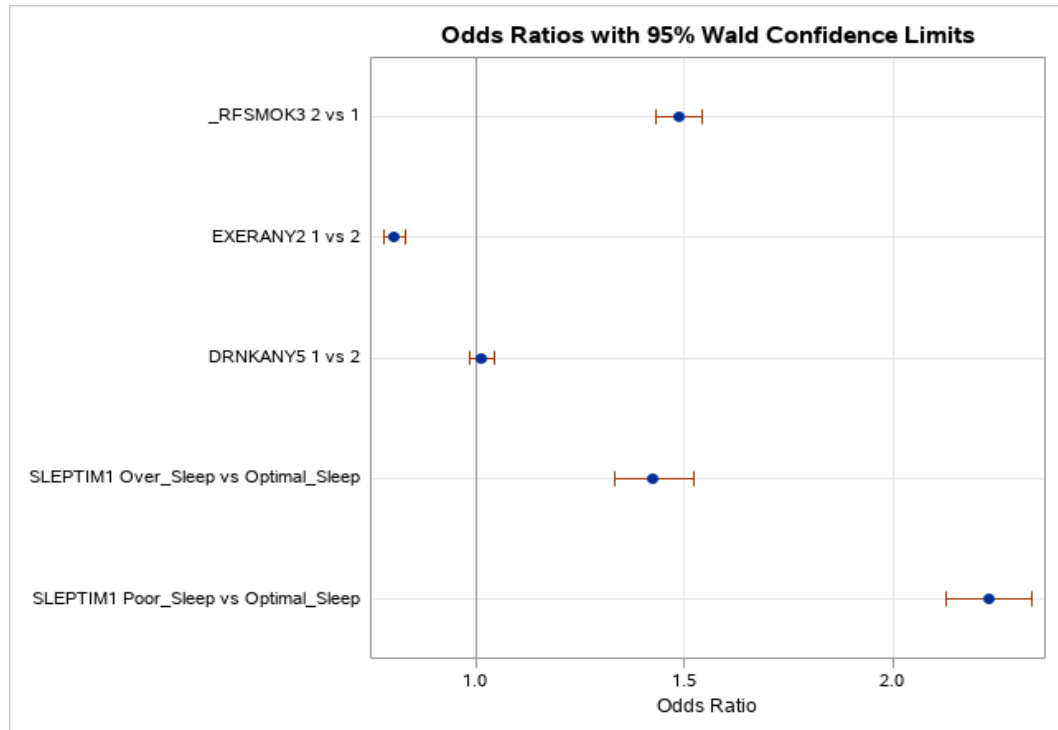
**Figure 26. Roc curve for model of association between behavioral factors and physical health problems in adults with depressive disorder**

#### 4.3.2.3 Behavioral factors and mental health problems:

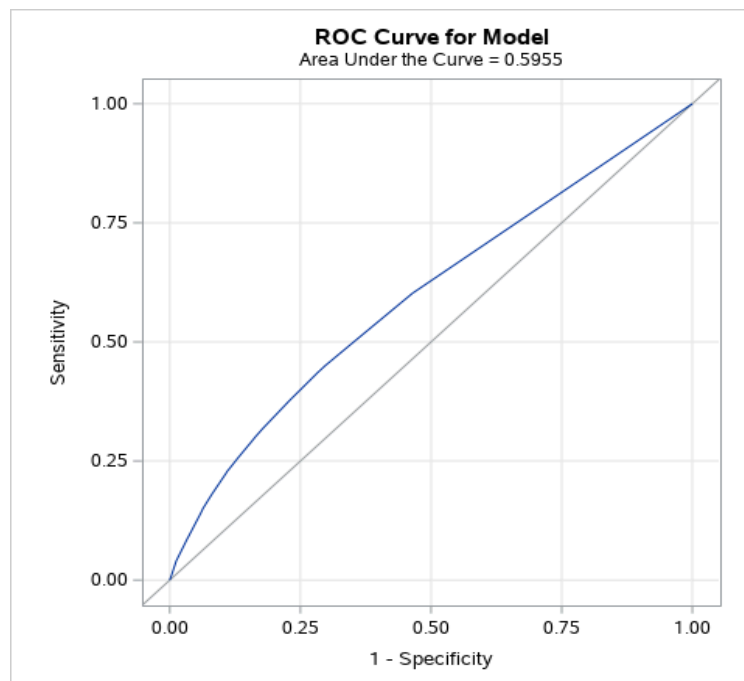
Logistic regression was employed to determine the effect of behavioral factors on mental health problems among depressive disorder adults. Table 21 and figure 27 show that the odds ratio for adults with depressive disorder who are current smokers was 1.486 for having mental health problems. The odds ratio of mental health with exercise factor was 0.806 for adults with depressive disorder who do exercise (table 21 and figure 27). Moreover, the result show that the association between alcohol use and mental health problems is not significant since the odds ratio for alcohol use is 1.015 (table 21 and figure 27). Also, as seen in table 21 and figure 27 the odds ratio for depressive disorder adults who have over sleep hours was 1.426 for having mental health problems compared to those adults with optimal sleep hours. As well as, the odds ratio for adults with depressive disorder who have poor sleep hours was 2.228 for having mental health problems compared to those adults with optimal sleep hours (table 21 and figure 27).

**Table 21. Odds ratio estimates and Wald confidence intervals for behavioral factors and mental health problems in adult patients with depressive disorder**

<b>Odds Ratio Estimates</b>			
<b>Effect</b>	<b>Point Estimate</b>	<b>95% Wald Confidence Limits</b>	
<b>_RFSMOK3 2 vs 1</b>	1.486	1.431	1.542
<b>EXERANY2 1 vs 2</b>	0.806	0.779	0.834
<b>DRNKANY5 1 vs 2</b>	1.015	0.984	1.047
<b>SLEPTIM1 Over_Sleep vs Optimal_Sleep</b>	1.426	1.335	1.523
<b>SLEPTIM1 Poor_Sleep vs Optimal_Sleep</b>	2.228	2.128	2.333



**Figure 27. Odds ratio of behavioral factors with mental health problems in depressive disorder patients.**



**Figure 28. Roc curve for model of association between behavioral and mental health problems in adults with depressive disorder**

### 4.3.3 Odds ratio of socioeconomic associated factors

#### 4.3.3.1 *Socioeconomic factors and activity limitation:*

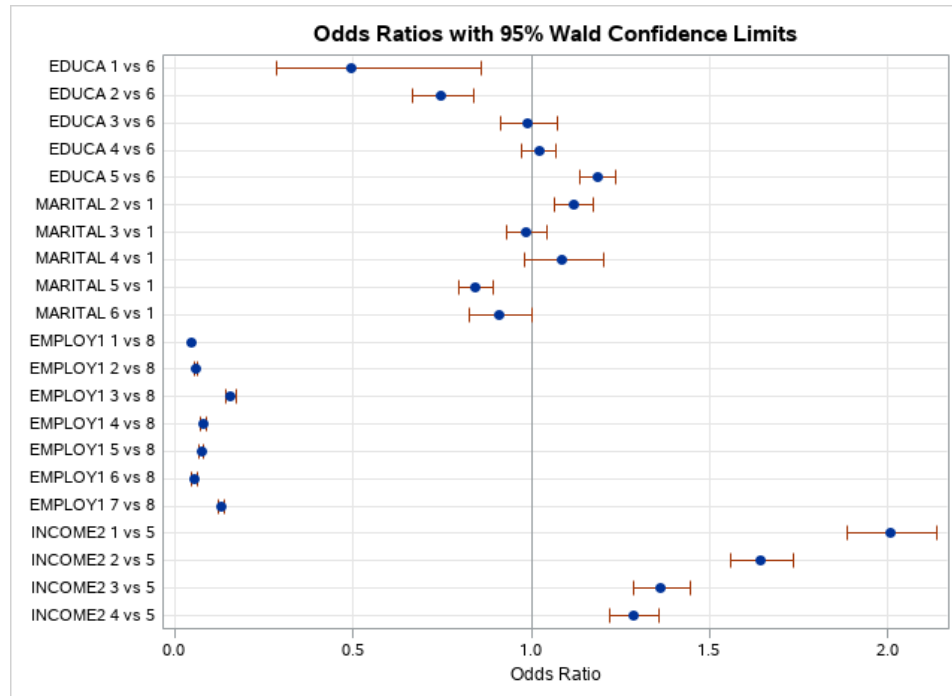
Logistic regression was employed to calculate the odds ratio and assess the effect of socioeconomic factors on activity limitation among adults with depressive disorder. As seen in table 22 and figure 29, the lowest odds ratio of activity limitation with education level among depressive disorder adults was 0.495 for those who never attended school and the highest odds ratio was 1.184 for those with education level of college 1 year to 3 years compared to depressive disorder adults with education level of collage 4 years or more (table 22 and figure 29).

The highest odds ratio of activity limitation with marital status was 1.117 for depressive disorder adults with divorced status and the lowest was 0.844 for those adults who are never married compared to depressive disorder adults with married status (table 22 and figure 29). In addition, the odds ratios of activity limitation with employment status were 0.047 for depressive disorder adults who were employed for wages, 0.076 for those who were students, and 0.131 for other depressive disorder adults who were retired compared to those who were unable to work (table 22 and figure 29). The odds ratio result for activity limitation with income level shows that the odds ratio for depressive disorder adults with the lowest income level (less than \$15.000) was 2.007 and for those with income level of \$35.00 to less than \$50.000 the odds ratio was 1.287 compared those adults with highest income level of \$50.000 or more (table 22 and figure 29).

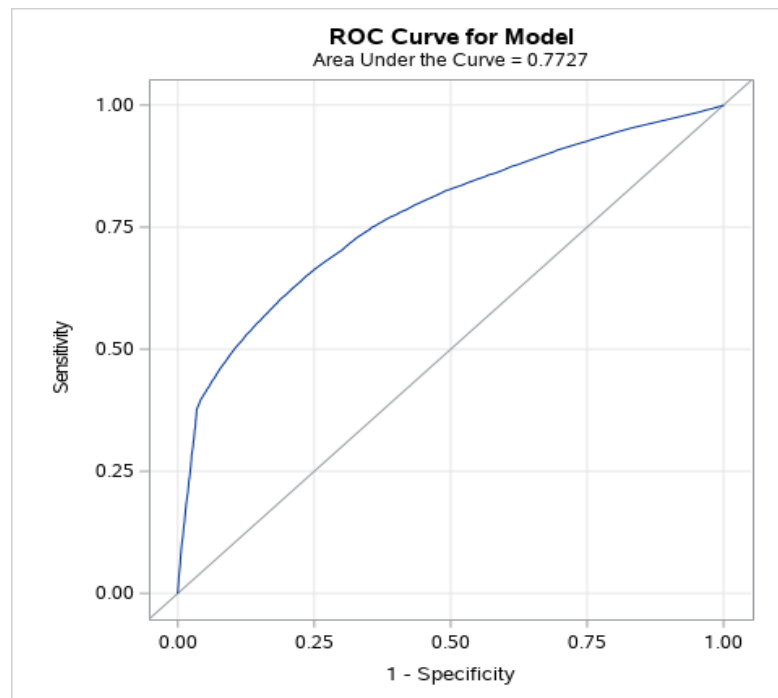
**Table 22. Odds ratio estimates and Wald confidence intervals for socioeconomic factors and activity limitation in adult patients of depressive disorder**

Odds Ratio Estimates		
Effect	Point Estimate	95% Wald Confidence Limits

<b>Odds Ratio Estimates</b>			
<b>Effect</b>	<b>Point Estimate</b>	<b>95% Wald Confidence Limits</b>	
<b>EDUCA 1 vs 6</b>	0.495	0.284	0.861
<b>EDUCA 2 vs 6</b>	0.747	0.665	0.838
<b>EDUCA 3 vs 6</b>	0.989	0.913	1.072
<b>EDUCA 4 vs 6</b>	1.021	0.974	1.070
<b>EDUCA 5 vs 6</b>	1.184	1.134	1.237
<b>MARITAL 2 vs 1</b>	1.117	1.064	1.173
<b>MARITAL 3 vs 1</b>	0.985	0.931	1.043
<b>MARITAL 4 vs 1</b>	1.086	0.982	1.201
<b>MARITAL 5 vs 1</b>	0.844	0.798	0.891
<b>MARITAL 6 vs 1</b>	0.910	0.825	1.004
<b>EMPLOY1 1 vs 8</b>	0.047	0.044	0.050
<b>EMPLOY1 2 vs 8</b>	0.060	0.055	0.066
<b>EMPLOY1 3 vs 8</b>	0.157	0.143	0.173
<b>EMPLOY1 4 vs 8</b>	0.079	0.071	0.088
<b>EMPLOY1 5 vs 8</b>	0.076	0.069	0.082
<b>EMPLOY1 6 vs 8</b>	0.055	0.048	0.062
<b>EMPLOY1 7 vs 8</b>	0.131	0.123	0.140
<b>INCOME2 1 vs 5</b>	2.007	1.886	2.137
<b>INCOME2 2 vs 5</b>	1.644	1.559	1.733
<b>INCOME2 3 vs 5</b>	1.363	1.285	1.445
<b>INCOME2 4 vs 5</b>	1.287	1.220	1.358



**Figure 29. Odds ratio of socioeconomic factors with activity limitation in depressive disorder patients.**



**Figure 30. roc curve for model of association between socioeconomic factors and activity limitation in adults with depressive disorder**

#### 4.3.3.2 Socioeconomic factors and physical health problems:

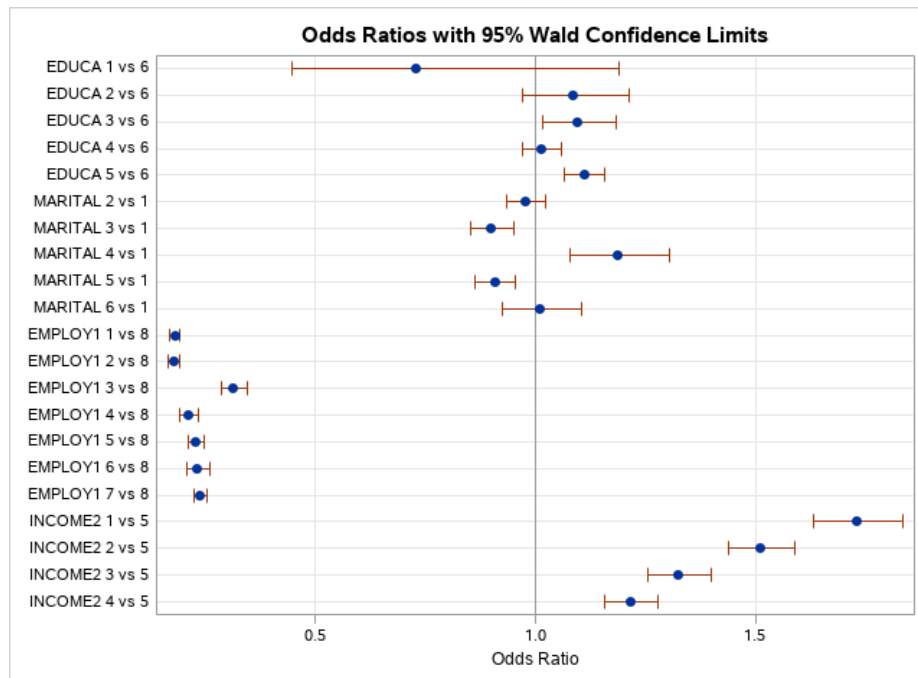
Logistic regression was performed to calculate the odds ratio and assess the effect of socioeconomic factors on physical health problems among adults with depressive disorder. Table 23 and figure 31 show that the lowest odds ratio for physical health problems with education level was 0.728 for depressive disorder adults who never attended school and the highest was 1.110 for those adults with education level of college 1 year to 3 years compared to depressive disorder adults with education level of collage 4 years or more. Moreover, the lowest odds ratio for physical health problem with marital status was 0.899 for depressive disorder adult with widowed status and the highest was 1.187 for those adults with separated status compared to other depressive disorder adults with married status (table 23 and figure 31).

As shown in table 23 and figure 31 the odds ratio for physical health problems with employment status was 0.179 for depressive disorder adults with employed for wages status and 0.238 for those adults with retired status compared to depressive disorder adult who were unable to work. The odds ratio for physical health problem with income level was 1.731 for depressive disorder adults with lowest income level (less than \$15.000) and 1.218 for those with income level of \$35.00 to less than \$50.000 compared those adults with highest income level of \$50.000 or more (table 23 and figure 31).

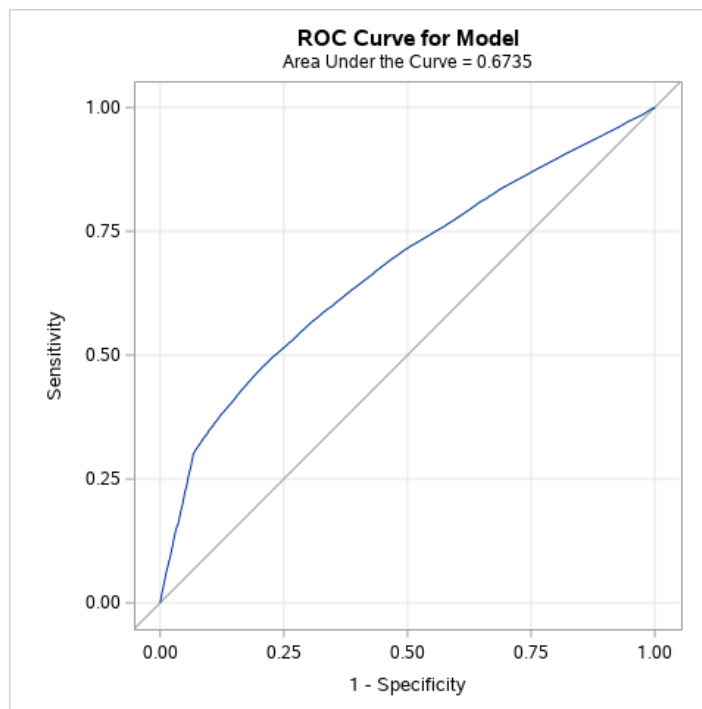
**Table 23. Odds ratio estimates and Wald confidence intervals for socioeconomic factors and physical health problems in adult patients with depressive disorder**

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
EDUCA 1 vs 6	0.728	0.445	1.190
EDUCA 2 vs 6	1.085	0.971	1.213
EDUCA 3 vs 6	1.096	1.016	1.183

<b>Odds Ratio Estimates</b>			
<b>Effect</b>	<b>Point Estimate</b>	<b>95% Wald Confidence Limits</b>	
<b>EDUCA 4 vs 6</b>	1.013	0.970	1.057
<b>EDUCA 5 vs 6</b>	1.110	1.066	1.156
<b>MARITAL 2 vs 1</b>	0.976	0.933	1.021
<b>MARITAL 3 vs 1</b>	0.899	0.851	0.950
<b>MARITAL 4 vs 1</b>	1.187	1.079	1.306
<b>MARITAL 5 vs 1</b>	0.907	0.862	0.953
<b>MARITAL 6 vs 1</b>	1.010	0.923	1.105
<b>EMPLOY1 1 vs 8</b>	0.179	0.169	0.190
<b>EMPLOY1 2 vs 8</b>	0.177	0.164	0.191
<b>EMPLOY1 3 vs 8</b>	0.313	0.286	0.343
<b>EMPLOY1 4 vs 8</b>	0.210	0.191	0.232
<b>EMPLOY1 5 vs 8</b>	0.227	0.210	0.245
<b>EMPLOY1 6 vs 8</b>	0.231	0.206	0.259
<b>EMPLOY1 7 vs 8</b>	0.238	0.224	0.252
<b>INCOME2 1 vs 5</b>	1.731	1.632	1.836
<b>INCOME2 2 vs 5</b>	1.511	1.438	1.588
<b>INCOME2 3 vs 5</b>	1.325	1.254	1.400
<b>INCOME2 4 vs 5</b>	1.218	1.158	1.280



**Figure 31. Odds ratio of socioeconomic factors with physical health problems in depressive disorder patients.**



**Figure 32. roc curve for model of association between socioeconomic and physical health problems in adults with depressive disorder**

#### 4.3.3.3 Socioeconomic factors and mental health problems:

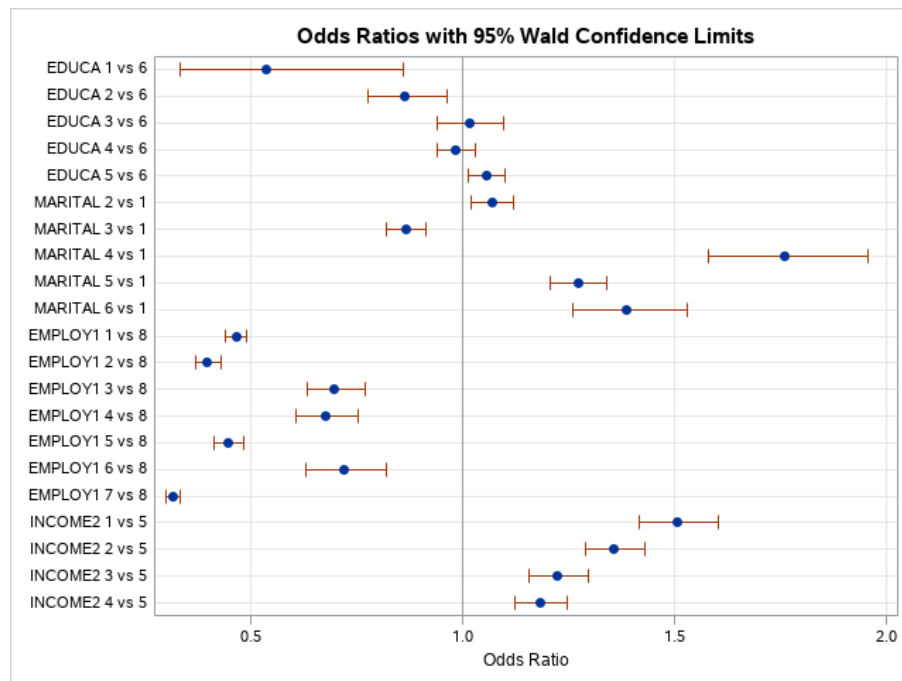
Logistic regression was performed to calculate the odds ratio and assess the effect of socioeconomic factors on mental health problems among adults with depressive disorder. Table 24 and figure 33 show that the lowest odds ratio for mental health problems with education level was 0.534 for depressive disorder adults who never attended school and the highest was 1.055 for those adults with education level of college 1 year to 3 years compared to depressive disorder adults with education level of collage 4 years or more. Also, the lowest odds ratio for mental health problem with marital status was 0.865 for depressive disorder adult with widowed status and the highest was 1.758 for those adults with separated status compared to other depressive disorder adults with married status (table 24 and figure 33).

As seen in table 24 and figure 33 the odds ratio for mental health problems with employment status was 0.464 for depressive disorder adults with employed for wages status and 0.315 for those adults with retired status compared to depressive disorder adult who were unable to work. The odds ratio for mental health problem with income level was 1.507 for depressive disorder adults with lowest income level of less than \$15.000 and 1.182 for those with income level of \$35.00 to less than \$50.000 compared those adults with highest income level of \$50.000 or more (table 24 and figure 33).

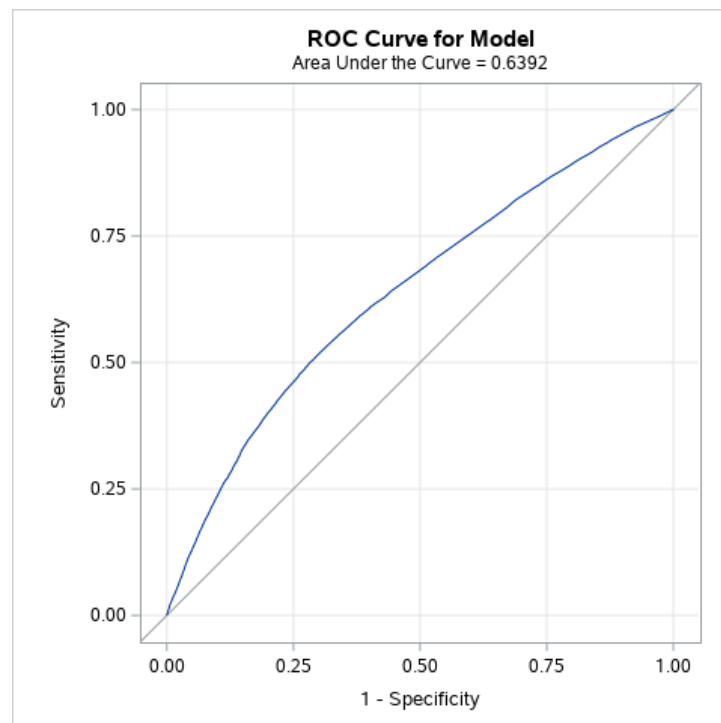
**Table 24. Odds ratio estimates and Wald confidence intervals for socioeconomic factors and mental health problems in adult patients of depressive disorder**

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limits	
<b>EDUCA 1 vs 6</b>	0.534	0.332	0.861
<b>EDUCA 2 vs 6</b>	0.864	0.775	0.963
<b>EDUCA 3 vs 6</b>	1.015	0.940	1.097

<b>Odds Ratio Estimates</b>			
<b>Effect</b>	<b>Point Estimate</b>	<b>95% Wald Confidence Limits</b>	
<b>EDUCA 4 vs 6</b>	0.983	0.941	1.028
<b>EDUCA 5 vs 6</b>	1.055	1.012	1.100
<b>MARITAL 2 vs 1</b>	1.068	1.019	1.118
<b>MARITAL 3 vs 1</b>	0.865	0.820	0.914
<b>MARITAL 4 vs 1</b>	1.758	1.581	1.956
<b>MARITAL 5 vs 1</b>	1.271	1.205	1.340
<b>MARITAL 6 vs 1</b>	1.388	1.259	1.530
<b>EMPLOY1 1 vs 8</b>	0.464	0.439	0.490
<b>EMPLOY1 2 vs 8</b>	0.397	0.367	0.429
<b>EMPLOY1 3 vs 8</b>	0.696	0.631	0.768
<b>EMPLOY1 4 vs 8</b>	0.675	0.605	0.754
<b>EMPLOY1 5 vs 8</b>	0.446	0.413	0.482
<b>EMPLOY1 6 vs 8</b>	0.718	0.629	0.820
<b>EMPLOY1 7 vs 8</b>	0.315	0.298	0.333
<b>INCOME2 1 vs 5</b>	1.507	1.417	1.601
<b>INCOME2 2 vs 5</b>	1.357	1.289	1.429
<b>INCOME2 3 vs 5</b>	1.224	1.157	1.295
<b>INCOME2 4 vs 5</b>	1.182	1.123	1.244



**Figure 33. Odds ratio of socioeconomic factors with mental health problems in depressive disorder patients.**



**Figure 34. Roc curve for model of association between socioeconomic factors and mental health problems in adults with depressive disorder**

## **CHAPTER V: DISCUSSION AND CONCLUSION**

### **5.1 Discussion:**

The purpose of this study was to identify the effect of behavioral and socioeconomic factors on health-related quality of life among adults with depressive disorder. This chapter includes a discussion of major findings as related to the literature on adults with depressive disorder in the United States. This chapter also contains discussion and future research possibilities to support the research hypothesis:

(H<sub>1</sub>) Behavioral factors that include smoking status, alcohol use, exercise, and hours of sleep have statistically significant effect on HRQoL outcomes, which include activity limitations, physical health, and mental health among adult patients of depressive disorder in the USA.

(H<sub>2</sub>) There is a statistically significant relation between socioeconomic factors that include (education level, marital status, employment status, and income level) and HRQoL outcomes, which include activity limitation, physical health, and mental health among adult patients of depressive disorder in the USA.

In this study, the number of depressive disorder adults is 88,233 and 69,842 of these adults are white non-Hispanic. The results found that depressive disorder was more prevalent in women with 13.31% than men with 5.76% (table 2 & figure 2). These findings are in accordance with findings reported by NIMH, which stated that the prevalence of depressive disorder is noted to be higher among adult females compared to males (NIMH, 2017). Moreover, the results showed that depressive disorder was higher among age group of 40 to 59 (table 4 & figure 4). The results of frequency distribution

showed that behavioral factors that include smoking status, alcohol use, exercise, and hours of sleep are associated with depressive disorder. The results indicate that greater number of non-smokers were the adults who are depression free by 70% compared to other adults with depressive disorder by 14.59%. These findings are directly in line with previous findings of CDC, 2013, which reported that adult with depressive disorder or any mental illness are usually smoke more than other adult without these disorders.

The results of frequency distribution also found that slightly greater number of adults who did not use alcohol has depressive disorder by 10.8% compared to other depressive disorder who drink alcohol by 8.57%. This could indicate the numbing effect of alcohol though long-term use may indicate otherwise. As well as, the results showed that greater number of adults who do exercise are depression free by 62.8% compared to adults who have depressive disorder by 12.8%. This is consistent with what has been found in previous study that stated that individuals with depressive disorder do not have a cardiac fitness neither willingness to be physically active, as compared to the individuals without mental disorders (Knapen et al., 2009). The frequency distribution results found that greater number of adults who have optimal sleep are depression free by 68.17% compared to adults with depressive disorder by 13.24%. Overall these findings are in accordance with findings reported that almost all the MDD patients are affected with sleep disturbances, since the regulation of sleep, mood, and circadian rhythms are strongly correlated (Kasper et al., 2010).

Furthermore, the frequency distribution results clarify that socioeconomic factors, which include education level, marital status, employment status, and income level have association with depressive disorder. This study results found that greater number of

adults with higher education level are depression free by 30.46% compared to adults with depressive disorder by 5.8%. This result indicates that lower education level is associated with depressive disorder. A similar pattern of results was obtained by Sharifi et al., (2015) who identified that the individuals with university-level education have fewer prospects for psychiatric disorders as compared to the ones with lower or no education. The present study found that higher percentage of adults with married status are depression free by 45.35% compared to other adults with depressive disorder by 8.35%. This result demonstrated that marital status is associated with depressive disorder. These findings are consistent with previous finding of Olfson et al., 2016, which reported that the patients who are divorced, widowed, or separated tend to reflect severe levels of depression as compared to the ones who are currently married. Additionally, the frequency distribution results of employment status showed that the higher number of adults who are employed for wages are depression free compared to adults with depressive disorder (35.01% vs 6.2%). Also, the percentage of adults with depressive disorder who are unable to work was 4.03% which is more than adults with no depressive disorder 3.33%. This result indicates that depressive disorder has a negative effect on patient's employment status. The result also found that greater number of adults with high income level were depression free by 39.17% compared to those with depressive disorder by 6.49%. This result clarifies that low-income level is associated with depressive disorder. According to the study of (Lim et al., 2014) the impacts of income level are significant on the severity of the depressive symptomatology among the individuals.

Previous studies have linked depressive disorder symptoms to worse health-related quality of life. The health-related quality of life measurements used in the present study are activity limitation, physical health problems, and mental health problems. The results of this study found that higher percentage of adults with no activity limitation are depression free (65.42%) compared to the adults who have depressive disorder (9.66%). These results demonstrated that adults with depressive disorder are more likely to have activity limitation than those with no depressive disorder which lead them to have worse HRQoL. This study also found that adults with depressive disorder were associated with higher level of physical health problems and mental health problems which lead them to have poor HRQoL. The results proved that 11.02% of depressive disorder adults had physical health problems, which is more than those adults with no physical health problems (7.93%). In addition, the percentage of depressive disorder adults with mental health problems was 12.58%, which is more than 6.26% for adults with no mental health problems. These findings support the associations reported in the literature review. For example, In the elderly, depression is the most common health problem that would significantly impact their quality of life (Blazer, 2003).

The current study aimed to go beyond the previous reports and determine the effect of behavioral and socioeconomic factors on health-related quality of life among adults with depressive disorder. The first aim was to test the association between behavioral factors (smoking, alcohol use, exercise, and hours of sleep) and HRQoL outcomes (activity limitation, physical health problems, and mental health problems) among adult with depressive disorder. The results demonstrated that there are statistically significant associations between each one of the behavioral factors and HRQoL outcomes

among adults with depressive disorder. The p-value calculated by chi-square test was  $<0.0001$  for each one of the behavioral factors, which confirmed their significant association with HRQoL outcomes.

The second aim of this study was to assess the association between socioeconomic factors (education level, marital status, employment status, and income level) and HRQoL outcomes (activity limitation, physical health problems, and mental health problems) among adults with depressive disorder. As expected, the results show that there are statistically significant associations between socioeconomic factors and HRQoL outcomes among adults with depressive disorder. The p-value calculated by chi-square test was  $<0.0001$  for each one of the socioeconomic factors, which evidenced the significant association between these factors and HRQoL outcomes.

The current study systematically investigated the effect of behavioral and socioeconomic factors on health-related quality of life among depressive disorder patients by employing the logistic regression model. Logistic regression model was used to get the odds ratio and predict the relation between both behavioral and socioeconomic factors and health-related quality of life among depressive disorder adults. In the studied population significant effects of both behavioral and socioeconomic factors on HRQoL was observed.

The results of logistic regression found that adults with depressive disorder have 80.84% higher chance of having activity limitation than those with no depressive disorder with the true population effect between 80.58% and 81.08%. In addition, adults with depressive disorder have 75.70% higher chance of having physical health problems than those with no depressive disorder with the true population effect between 75.72% and

76.27%. The adults with depressive disorder have 87.99% higher chance of having mental health problems than those with no depressive disorder with the true population effect between 87.82% and 88.16%. These findings confirmed that depressive disorder has a statistically significant association with health-related quality of life.

The result of the logistic regression of activity limitation with behavioral factors showed that adults with depressive disorder who are current smokers have 59.10% higher chance of having activity limitation than other depressive disorder adults who do not smoke with the true population effect between 58.26% and 59.92%. Also, the adult with depressive disorder who drink alcohol have 35.61% less chance of having activity limitation than other depressive disorder adults who do not drink alcohol. The result found that adults with depressive disorder who do exercise have 29.97% less chance of having activity limitation than other depressive disorder adults who do not exercise. Moreover, adults with depressive disorder who have over sleep hours have 69.37% higher chance of having activity limitation than other depressive disorder adults who have optimal sleep hours with the true population effect between 67.98% and 70.73%. Depressive disorder adults who have poor sleep hours have 69.08% higher chance of having activity limitation than those depressive disorder adults who have optimal sleep hours with true population between 68.20% and 69.93%.

The result of logistic regression of behavioral factors with physical health problems among depressive disorder adults indicated that adults with depressive disorder who are current smokers have 55.89% higher chance of having physical health problems than other depressive disorder adults who do not smoke. The odds ratio result indicated that adults with depressive disorder who drink alcohol have 40.79% less chance of having

physical health problems than other depressive disorder adults who do not drink alcohol. This may be due to the numbing effect of alcohol on these adults though long-term use may indicate otherwise. Additionally, the adults with depressive disorder who exercise have 34.94% less chance of having physical health problems than depressive disorder adults who do not exercise. Also, the adults with depressive disorder who have over sleep hours have 62.89% higher chance of having physical health problems than those adults with optimal sleep hours. In the other hand, the adults with depressive disorder who have poor sleep hours have 68.23% higher chance of having physical health problems than those adults with optimal sleep hours. These findings support the first hypothesis of this study that states that behavioral factors such as smoking, alcohol use, exercise, and hours of sleep have a statistically significant association with HRQoL among adults with depressive disorder.

This result of logistic regression of behavioral factors with mental health problems among depressive disorder adults showed that adults with depressive disorder who are current smokers have 59.77% higher chance of having mental health problems than other depressive disorder adults who do not smoke. This indicates that smoking has a negative effect on HRQoL among adults with depressive disorder. The odds ratio of mental health with exercise factor indicates that adults with depressive disorder who do exercise have 44.63% less chance of having mental health problems than other depressive disorder adults who do not exercise. This finding clarifies that exercise has a positive effect on HRQoL of adults with depressive disorder. Moreover, this study found no significant differences in mental health between depressive disorder adults who drink alcohol and who do not drink alcohol. Also, the depressive disorder adults who have over

sleep hours have 58.78% higher chance of having mental health problems than those adults with optimal sleep hours. As well as, adults with depressive disorder who have poor sleep hours have 69.02% higher chance of having mental health problems than those adults with optimal sleep hours. These findings prove that hours of sleep have a statistically significant association with HRQoL among depressive disorder.

In the current study, logistic regression was employed to calculate the odds ratio and assess the effect of socioeconomic factors on activity limitation among adults with depressive disorder. The results showed that the lowest odds ratio of activity limitation with education level among depressive disorder adults was 0.495 for those who never attended school and the highest odds ratio was 1.184 for those with education level of college 1 year to 3 years compared to depressive disorder adults with education level of collage 4 years or more. This result indicated that adults with depressive disorder who never attended school have 33.11% less chance of having activity limitation than other depressive disorder adults with education level of collage 4 years or more. in the other hand depressive disorder adults with education level of collage 1 year to 3 years have 54.21% higher chance of having activity limitation than other depressive disorder adults with education level of collage 4 years or more. These findings demonstrate that education level has a statistically significant effect on HRQoL among adults with depressive disorder.

The highest odds ratio of activity limitation with marital status was 1.117 for depressive disorder adults with divorced status and the lowest was 0.844 for those adults who are never married compared to depressive disorder adults with married status. This result signified that depressive disorder adults with divorced status have 52.67% higher

chance of having activity limitation than other depressive disorder adults with married status. On contrary, adults with depressive disorder who are never married have 45.77% less chance of having activity limitation than other depressive disorder who are married. These findings prove that marital status has a statistically significant association with HRQoL among adults with depressive disorder. In addition, the odds ratios of activity limitation with employment status were 0.047 for depressive disorder adults who are employed for wages, 0.076 for those who are students, and 0.131 for other depressive disorder adults who are retired compared to those who were unable to work. In terms of probability, depressive disorder adults who are employed for wages have 4.49% less chance of having activity limitation than adults with depressive disorder who are unable to work. Adults with depressive disorder who are students have 7.06% less chance of having activity limitation than adults with depressive disorder who are unable to work. As well as, adults with depressive disorder who are retired have 11.58% less chance of having activity limitation than adults with depressive disorder who are unable to work. These findings clarify that employment status has a statistically significant association with HRQoL among adults with depressive disorder.

The odds ratio result for activity limitation with income level showed that the odds ratio for depressive disorder adults with the lowest income level of less than \$15.000 was 2.007 and for those with income level of \$35.00 to less than \$50.000 the odds ratio was 1.287 compared those adults with highest income level of \$50.000 or more. In terms of probability, depressive disorder adults with low income level of less than \$15.000 have 66.74% higher chance of having activity limitation than other depressive disorder with high income level of \$50.000 or more. Also, depressive disorder

adults with income level of \$35.00 to less than \$50.000 have 56.27% higher chance of having activity limitation than other depressive disorder with high income level of \$50.000 or more. These results confirmed that low income level has a negative effect on HRQoL of adults with depressive disorder.

In the present study, logistic regression was performed to calculate the odds ratio and assess the effect of socioeconomic factors on physical health problems among adults with depressive disorder. The results showed that the lowest odds ratio for physical health problems with education level was 0.728 for depressive disorder adults who never attended school and the highest was 1.110 for those adults with education level of collage 1 year to 3 years compared to depressive disorder adults with education level of collage 4 years or more. In terms of probability, depressive disorder adults who never attended school have 42.13% less chance of having physical health problems than depressive disorder adults with education level of collage 4 years or more. However, depressive disorder adults with education level of collage 1 year to 3 years have 52.61% higher chance of having physical health problems than depressive disorder adults with education level of collage 4 years or more. These results identify that education level has a significant association with HRQoL outcomes among adults with depressive disorder. Moreover, the lowest odds ratio for physical health problem with marital status was 0.899 for depressive disorder adult with widowed status and the highest was 1.187 for those adults with separated status compared to other depressive disorder adults with married status. As a result, depressive disorder adults with widowed status have 47.34% less chance of having physical health problems than depressive disorder adults who are married. In the other hand, depressive disorder adults with separated status have 54.28%

higher chance of having physical health problems than depressive disorder adults who are married. These findings confirm that marital status has a significant association with HRQoL outcomes among depressive disorder adults.

The odds ratio for physical health problems with employment status was 0.179 for depressive disorder adults with employed for wages status and 0.238 for those adults with retired status compared to depressive disorder adult who were unable to work. This means that depressive disorder adults who are employed for wages have 8.21% less chance of having physical health problems than depressive disorder adults who are unable to work. depressive disorder adults who are retired have 19.22% less chance of having physical health problems than depressive disorder adults who are unable to work. These findings demonstrate that employment status has a significant association with HRQoL outcomes among adults of depressive disorder. Furthermore, the odds ratio for physical health problem with income level was 1.731 for depressive disorder adults with lowest income level (less than \$15.000) and 1.218 for those with income level of \$35.00 to less than \$50.000 compared those adults with highest income level of \$50.000 or more. The result showed that adults of depressive disorder with low income level of less than \$15.000 have 63.38% higher chance of having physical health problems than those adults with high income level of \$50.000 or more. Also, depressive disorder adults with income level of \$35.00 to less than \$50.000 have 54.91% higher chance of having physical health problems than those adults with high income level of \$50.000 or more. This result indicates that low income level has a negative effect on HRQoL among adults with depressive disorder.

Logistic regression was performed also to calculate the odds ratio and assess the effect of socioeconomic factors on mental health problems among adults with depressive disorder. The lowest odds ratio for mental health problems with education level was 0.534 for depressive disorder adults who never attended school and the highest was 1.055 for those adults with education level of college 1 year to 3 years compared to depressive disorder adults with education level of collage 4 years or more. In terms of probability, depressive disorder adults who never attended school have 34.81% less chance of having mental health problems than those adults with education level of collage 4 years or more. on contrary, depressive disorder adults with education level of college 1 year to 3 years have 51.34% higher chance of having mental health problems than those adults with education level of collage 4 years or more. This result confirmed that education level has a significant association with HRQoL outcomes among adults of depressive disorder.

Additionally, the lowest odds ratio for mental health problem with marital status was 0.865 for depressive disorder adult with widowed status and the highest was 1.758 for those adults with separated status compared to other depressive disorder adults with married status. This means that depressive disorder adult with widowed status have 46.38% less chance of having mental health problems than other depressive disorder adults with married status. As well as, depressive disorder adult with separated status have 63.74% higher chance of having mental health problems than other depressive disorder adults with married status. From these results it is obvious that marital status has a significant association with HRQoL outcomes among depressive disorder adults.

The odds ratio for mental health problems with employment status was 0.464 for depressive disorder adults with employed for wages status and 0.315 for those adults with

retired status compared to depressive disorder adult who are unable to work. These findings showed that depressive disorder adults with employed for wages status have 31.69% less chance of having mental health problems than depressive disorder adult who are unable to work. Also, depressive disorder adult who are retired have 23.95% less chance of having mental health problems than depressive disorder adult who are unable to work. The results indicate that employment status has a significant association with HRQoL among adults of depressive disorder. Moreover, the odds ratio for mental health problems with income level was 1.507 for depressive disorder adults with lowest income level of less than \$15.000 and 1.182 for those with income level of \$35.00 to less than \$50.000 compared those adults with highest income level of \$50.000 or more. The result showed that depressive disorder adults with low income level of less than \$15.000 have 60.11% higher chance of having mental health problems than those adults with high income level of \$50.000 or more. Adults with depressive disorder with income level of \$35.00 to less than \$50.000 have 54.17% higher chance of having mental health problems than those adults with high income level of \$50.000 or more. These findings demonstrate that low income level has a negative effect on HRQoL of adults with depressive disorder. As shown in the study of (Chisholm et al., 2016) that mentioned the need for income support among the individuals encountering severe health impacts, as there are certain limitations towards the accessibility of healthcare settings. The current result supports the second hypothesis of this research, which states that socioeconomic factors such as education level, marital status, employment status, and income level have a statistically significant association with HRQoL outcomes among adults with depressive disorder.

## **5.2 Conclusion:**

There is a dramatic relationship between depressive disorder and poor health-related quality of life. This relation comes from the impact of depression on individual's satisfaction with life and well-being. Measuring and assessing the association between both behavioral and socioeconomic factors associated with depressive disorder and health-related quality of life would be effective for the clinical trial, important for improving patients' quality of care, and for providing information for the policymaker.

The present study found that depressive disorder has a statistically significant association with health-related quality of life. Adults with depressive disorder have 80.84% higher chance of having activity limitation than other adults with no depressive disorder with the true population effect between 80.58% and 81.08%. In addition, adults with depressive disorder have 75.70% higher chance of having physical health problems than other adults with no depressive disorder with the true population effect between 75.72% and 76.27%. Adults with depressive disorder have 87.99% higher chance of having mental health problems than those with no depressive disorder with the true population effect between 87.82% and 88.16%.

The primary focus of this research was to examine the impact of behavioral and socioeconomic factors on HRQoL of depressive disorder patients. The investigated behavioral factors included smoking status, alcohol use, exercise, and hours of sleep. Education level, marital status, employment status, and income level were the studied socioeconomic factors. The measurements that were used to measure the HRQoL among adults with depressive disorder are activity limitation, physical health problems, and mental health problems.

The current study identified several behavioral and socioeconomic factors that had significant effect on health-related quality of life of adults with depressive disorder. Based on the result of this study, the behavioral and socioeconomic factors contributed either positively or negatively to HRQoL of adults with depressive disorder. Some of the major negative behavioral factors were smoking status and hours of sleep. Depressive disorder patients with positive smoking status have higher chance of having activity limitation by 59.10%, physical health problems by 55.89%, and mental health problems by 59.77% than others with negative smoking status. Depressive disorder patients with over sleep hours have higher chance of having activity limitation by 69.37%, physical health problems by 62.89%, and mental health problems by 58.78% than depressive disorder patients with optimal sleep hours. Depressive disorder patients with poor sleep hours have higher chance of having activity limitation by 69.08%, physical health problems by 68.23%, and mental health problems by 69.02% than depressive disorder patients with optimal sleep hours. Among the studied behavioral factors, daily exercise status had a great positive effect on HRQoL of adults with depressive disorder. Depressive disorder patients who do exercise have less chance of having activity limitation by 29.97%, physical health problems by 34.94%, and mental health problems by 44.63% than depressive disorder patients who do not exercise.

One of the most negative socioeconomic factors that has a great effect on HRQoL among depressive disorder patients is low income level. According to the result of this study, depressive disorder patients with low income level had higher chance of having activity limitation by 66.74%, physical health problems by 63.38%, and mental health problems by 60.11% than depressive disorder patients with high income level. As well as,

all other investigated socioeconomic factors have a statistically significant association with health-related quality of life of adults with depressive disorder.

Finally, these positive and negative factors can be changed and can have wide scale implications on current and future health-related quality of life. Most importantly, the current study emphasizes the need for educating patients with these factors associated with depressive disorder and the need for active participation of the patients in the decision-making process, which would improve their HRQoL and direct their intention to seek treatment.

### **5.3 Limitation and future research recommendations:**

The current study is limited to Behavioral Risk Factor Surveillance System (BRFSS) 2014 database, which is based on patients' self-reports, not clinical diagnosis, and therefore the results might be underestimated. In addition, this study is based on a U.S. population. Therefore, generalizing the results to other countries must be interpreted carefully.

Some depressive disorder types are potentially a long-term or even lifelong condition. So, this study can also be further performed by longitudinal study design for the same group of patients over the years. Performing longitudinal study design would be very beneficial for providing significant results on how mental disorders associated factors could affect patients' quality of life.

This study has analyzed the association between both behavioral and socioeconomic factors and depressive disorder. The result of this analysis found that depressive disorder may be more prevalent in one race compared to another. Consequently, future studies may want to consider the region of the patients, for better

understanding how these mental illnesses may be affected by genes, dietary intake, as well as climate. Considering the region of depressive disorder patients will also be helpful in terms of investigating socioeconomic factor that will have different effect from one region to another.

Another aspect that can be further studied is the effect of behavioral and socioeconomic factors that associated with depressive disorder on pregnant women and how that may affect the fetus. As well as, the effect of clinical factors can be included in the future studies of health-related quality of life among depressive disorder patients, which would be very useful for providing complete and comprehensive picture of the condition in purpose of controlling and preventing these types of mental illnesses.

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