ACCESS FACTORS ASSOCIATED WITH THE USE OF ST. JOHN'S

WORT AMONG ADULTS WITH DEPRESSIVE SYMPTOMS

By

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the thesis of Chung-Hsuen Wu find it satisfactory and recommend that it be accepted.

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Chair

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ACCESS FACTORS ASSOCIATED WITH THE USE OF ST. JOHN'S WORT AMONG ADULTS WITH DEPRESSIVE SYMPTOMS

Abstract

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Background:

St. John's wort is one of the top 20 selling herbs in the United States. An estimated 4.4 million adults reported using St. John's wort in the past 12 months (Ni, Simile, & Hardy, 2002). Some studies suggest that the rise in the use of Complementary and Alternative Medicine (CAM) including herbal medications like St. John's wort may reflect the increasing lack of access to conventional medical care (Kennedy, 2005; Pagan & Pauly, 2005). However, empirical research on the use of specific herbal remedies such as St. John's wort and its treatment of clinical conditions like depression has not been conducted.

Objective:

To examine the association between access to conventional healthcare and the use of St. John's wort among adults who report depressive symptoms.

Study Design:

Secondary analysis of the Complimentary and Alternative Medicine Supplement to the 2002 National Health Interview Survey (NHIS).

Study Population:

Adults who report depressive symptoms and used St. John's wort (sample, n=246) were compared to nonusers (sample, n=5,111).

Results:

Depressed people who delay their medical care because of cost are more likely to use St. John's wort (8.0% vs. 4.1%, P<0.001). People who cannot afford needed medical care (7.47% vs. 4.37%, P=0.002) or cannot afford mental health care or counseling (9.26% vs. 4.42%, P=0.003) are more likely to use St. John's wort than those who can. After controlling for various sociodemographic and socioeconomic factors, people who could not afford needed medical care due to cost were nearly two times (OR 1.92, CI 1.38 – 2.67) more likely to use St. John's wort than those who could afford conventional medical care.

Conclusion:

The growing use of complimentary and alternative therapies in the U.S. is widely interpreted as evidence of changing consumer tastes and dissatisfaction with conventional medical treatment for chronic conditions like depression. However, the rising costs of conventional therapies and diminishing access to health insurance may also play a role.

Implications for Policy, Delivery or Practice:

The growing use of complimentary or alternative therapies like St. John's wort should be viewed in the context of rising costs and shrinking access. From a clinical

perspective, self-treatment with herbal preparations is a potentially risky alternative to conventional treatment. Depression is a serious but treatable chronic illness. For patients to make truly informed treatment decisions, access to conventional medical care should also be assured.

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Chapter One: Introduction/Significance of Study

This chapter introduces the study and describes the specific problem to be examined. It consists of five parts: the introduction, problem statement, purpose/specific objectives, hypothesis, and importance/significance of the study.

I.   Introduction

The use of complimentary and alternative medicine (CAM) in the United States has become more and more popular. During the past decade, Americans have become more eager to seek complementary and alternative medicine, because they feel it would be safer, cheaper, and more efficient (Astin, 1998). Herbal medicine is one of the most popular forms of CAM (Ni et al., 2002). St. John's wort has been used as an antidepressant since early human history. The annual sales between 1995 and 1997 for St. John's wort increased from 20 million to 200 million dollars (Gaster & Holroyd, 2000), and it is now one of the top 20 selling herbs in the U.S. (Raman, Patino, & Nair, 2004) .

Factors associated with the use of CAM included dissatisfaction with the brief and transactional relationships common in conventional medical practice (Sobel, 1999), and need for personal control and philosophical congruence (Astin, 1998). In addition, the use of complementary and alternative medicines may be a reflection of the growing financial barriers to conventional care (Pagan & Pauly, 2004, 2005). People who have delayed or

could not afford needed care because of cost are more likely to use herbal medicines

(Kennedy, 2005). Therefore, the growing use of St. John's wort may be due in part to

high prices for conventional therapies.

II. Purpose and Specific Objectives

The purpose of this study is to examine the association between access related cost

factors of conventional therapies for depression and the use of St. John's wort among

adults in the U.S. National research showed that around 40 million people in the U.S.

used herbal medicines in 2002, and more than 10% of these users took St. John's wort

(Barnes, Powell-Griner, McFann, & Nahin, 2004). Many studies have examined the

association between socio-demographic characteristics and the use of CAM (Mackenzie,

Taylor, Bloom, Hufford, & Johnson, 2003; Sleath & Shih, 2003; Yu, Ghandour, & Huang,

2004). However, little is known about the association between the relative high price of

conventional therapies for conditions like depression and the use of alternative treatments

like St. John's wort. In addition, this study will identify sociodemographic and

socioeconomic factors associated with the use of the St. John's wort.

III. Problem Statement

The problem to be examined in this study is the association between the high cost of

conventional therapies for a disease like depression, which resulted in a shrinking access

to health care, and the use of St. John's wort. Out-of-pocket costs are the most commonly

reported barrier to treatment of depression (Simon, Fleck, Lucas, & Bushnell, 2004). In

1995, more than five million people are diagnosed with depression in the U.S. (Gaster &

Holroyd, 2000), and approximately 11.3% of all adults are afflicted during any one year

(Laakmann, Schule, Baghai, & Kieser, 1998). However, fewer than one-third of patients with depressive disorders receive a prescription antidepressant (Simon et al., 2004). St. John's wort is a popular over-the-counter antidepressant. Studies have suggested that St. John's wort is efficient in the treatment for mild and moderate depression (Chatterjee, Bhattacharya, Wonnemann, Singer, & Muller, 1998; Glisson, Crawford, & Street, 1999; Lecrubier, Clerc, Didi, & Kieser, 2002; Linde et al., 1996; Wagner et al., 1999). Therefore, there might be a potential association between access to the conventional care such as depression and the use of St. John's wort.

IV. Hypothesis

Patients can obtain St. John's wort without prescription, and it is relatively inexpensive compared to other anti-depression prescription medicines (Gaster & Holroyd, 2000). In addition, users have reported the effectiveness of treatment and mild side-effects of St. John's wort (Boehnlein & Oakley, 2002). Thus, it is hypothesized that people who have financial barriers which prevent their access to conventional medical care are more likely to use St. John's wort, because of its easy access, and lower cost (Kennedy, 2005; Pagan & Pauly, 2005).

V. Importance/Significant of Study

This study investigates the potential relationship between access to conventional therapies for depression and the use of St. John's wort. Kennedy (2005) found that there were large and statistically significant differences herbal medicine use between those reporting financial difficulties in obtaining medical care versus those reporting no cost barriers. Therefore, this study extends the link by focusing on a specific clinical condition,

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depression, and a specific herbal propensity, the use of St. John's wort.

Chapter Two: Theoretical Basis/Literature Review

This Chapter first describes the literature research methodology in the study. Then, the theoretical framework and literature review will be discussed in the chapter. Finally, this chapter will end with what is the unique contribution of this particular study.

I.   Literature Research Methodology

A.   Inclusion and exclusion criteria

Online reference databases used to conduct this literature review included MEDLINE, EMBASE, and Proquest, and the website of the National Institute of Mental Health, the U.S. Department of Health and Human Services, and the Center for Disease Control and Prevention. The key constructs included in the literature search were the use of St. John's wort, prevalence of depression, and cost related factors associated with the use of herbal medicines. Studies which related to CAM, herbal medicines, depression, and St. John's wort were included. Studies examining St. John's wort's molecule structures have been excluded.

B.   Search Keywords

MEDLINE was searched using the following keywords: "St. John's wort," "Hypericum perforatum," "depression," "effectiveness," "efficacy," "health economics," "pharmacoeconomics," "selective serotonin reuptake inhibitors," "cost," "financial burden," "expenditure," "out-of-pocket," "decision making," "antisdepressants,"

"perception," "NHIS," and "policy implications." Reference lists of previous reviews and articles were reviewed to identify other articles of interest (Pelletier, 2005; Town, Kane, Johnson, & Butler, 2005). Seventy-two articles were identified as relevant to this topic.

II. Theoretical Framework

The Andersen's Behavioral Model of Health Services Utilization served as the conceptual framework for this study (Andersen, 1995; Lemming & Calsyn, 2004). This model has been widely used to predict health service utilization (Lemming & Calsyn, 2004; Tsao, Dobalian, Myers, & Zeltzer, 2005). The Behavioral Model consists of four parts: environment, population characteristics, health behavior and outcomes. A part of Behavioral Model, such as population characteristics, is used in this study. Population characteristics classify predisposing, enabling, and need variables (Andersen, 1995). The theoretical framework asserts that certain predisposing, enabling, and need factors can predict the use of healthcare services (Akinci & Sinay, 2003; Andersen & Newman, 1973). Figure 1 shows a broad picture of the concept of a partial representation of the Behavior Model of Health Service Utilization.

Figure 1.

Predisposing Characteristics	→	Enabling Characteristics	→	Need	→	Use of Health Services
Age, Gender, Ethnicity		Personal/Family Income		Health Status		
		Insurance				
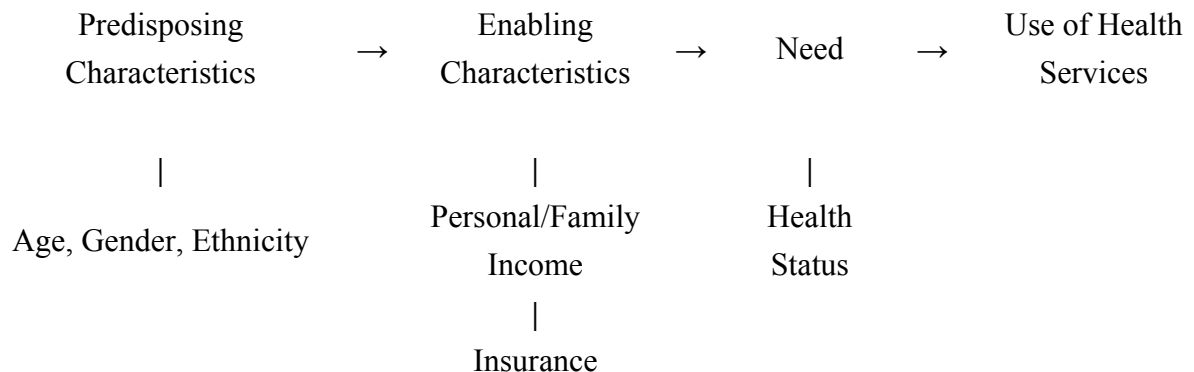
Partial Representation of the Andersen's Behavioral Model of Health Services Utilization, adapted from reference (Andersen, 1995).

III. Literature Review

A.   Nature and Prevalence of Herbal Medicine Use

Complementary and alternative medicine (CAM) is defined by the National
Institutes of Health as a wide range of therapies and health supplements that are not
considered to be conventional medicine (Yu et al., 2004). The population using CAM in
the U.S. increased from 33.8% (60 million people) to 42.1% (83 million people) between
1990 and 1997 (Eisenberg et al., 1998). From 1997 to 2002, the greatest increases in
CAM use were seen for herbals (Tindle, Davis, Phillips, & Eisenberg, 2005). Users
perceive CAM offers more self-control of their own health. (Astin, 1998). CAM fits
peoples perception of being safe, natural, efficient and having fewer side effects than
conventional therapies (Astin, 1998).

Herbal medicine is one of the most popular forms of CAM. Around 38.2 million
adults in the U.S. used natural herbs in 2002 (Ni et al., 2002). In 1997, 5.1 billion dollars
were spent on herbal medicines (Eisenberg et al., 1998). The five top-selling herbal
medicinal products in the U.S. in 1998 are Ginkgo biloba ($151 million), St. John's wort
($140 million), ginseng ($96 million), garlic ($84 million), and Echinacea ($70 million)
(Ernst, 2002). Thus, the use of herbal medicines has become significant in the U.S.
society.

B.   Prevalence of the Use of St. John's Wort

St. John's wort is an over-the-counter herbal antidepressant which can be easily
obtained without a prescription. It has gained popularity because of its natural

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antidepressant quality (Lantz, Buchalter, & Giambanco, 1999) and tolerable side-effects (Ernst, 2002). The market for St. John's wort in 1995 was $20 million and increased dramatically to $200 million in 1997 (Boehnlein & Oakley, 2002). An estimated $86 million was spent for purchase of St. John's wort in the U.S. market in 2000 (Lecrubier et al., 2002). In the 2002 National Health Interview Survey among people using herbal medicines in the past 12 months, more than ten percent had used St. John's wort to treat their own health problems (Barnes et al., 2004).

Moreover, efficacy and access are strongly associated with the use of herbal medicine like St. John's wort(Lecrubier et al., 2002). From the efficacy perspective, according to the meta-analysis of randomized clinical trials of St. John's wort, it is superior to the placebo (odds ratio = 2.65; 95% confidence interval, 1.78 - 4.01) (Linde et al., 1996). Although the efficiency of treatment for severe depression is still arguable, studies have proved that St. John's wort is effective for treating mild or moderate depression (Heiligenstein & Guenther, 1998). In addition, patients who took St. John's wort reported relatively fewer side effects compared to conventional antidepressants (Glisson et al., 1999). From the access perspective, people are able to easily obtain St. John's wort from grocery stores, or drug stores without a prescription. People may therefore diagnose themselves as depressed and take St. John's wort a treatment (Wagner et al., 1999).

C. Safety of St. John's Wort

St. John's wort is a common name for the *Hypericum Perforatum*, which is a perennial weed growing in much of the U.S. (Gaster & Holroyd, 2000). Hypericum Perforatum has long been used to treat depression, insomnia, enuresis and nervous. During the Middle Ages, European peasants gathered Hypericum Perforatum on St.

John's Eve (June 23rd) and burned the herb. It was meant to purify the air which was contaminated by the evil spirits (Heiligenstein & Guenther, 1998).

"Natural" does not mean "Harmless". An herbal medicine like St. John's wort is not free from drug-drug interaction or side effects. Evidence of efficiency of St. John's wort is mixed (Kirsch, 2003; Lecrubier et al., 2002; Linde et al., 1996; Werneke, Horn, & Taylor, 2004; Whiskey, Werneke, & Taylor, 2001). Although the pharmacological mechanism of action of St. John's wort is unclear, its active ingredients for treating depression are hypericin and pseudohypericin (Wong, Smith, & Boon, 1998). Hypericin extractions show affinity in neurotransmitter receptors which exist in the synapse. Hypericin is considered to act the same as serotonin (one neurotransmitter) reuptake inhibitor whose function is like the traditional SSRI (selective serotonin reuptake inhibitor) antidepressant (Wong et al., 1998).

The safety issue and efficacy for the use of St. John's wort is mixed (Gaster & Holroyd, 2000; Glisson et al., 1999; Wagner et al., 1999). In addition, the U.S herbal supplement market is not regulated by the federal government (Klepser & Klepser, 1999). Practitioners without any license qualifications can sell herbal remedies in the community. This increases the probability of abusing herbal medicines like St. John's wort. Therefore, adults who use herbal medicine have a potential risk for a variety of serious drug interactions. Another safety issue to be concerned with is the warning label for the herbal medicine. Product labels are found to vary in the information provided among brands (Krochmal et al., 2004). Labels often vary with regard to dosage and type of maker compound (Krochmal et al., 2004). Without obtaining consulting with professional health care providers, a consistent warning label is the only information that customers have.

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Therefore, appropriate regulations for labeling St. John's wort are necessary because they can prevent patients from over dosage and potential drug-drug interaction.

The highly prevalent use of herbal medicines has not resulted in increasing professional training in dealing with herbal medicines and CAM. For example, the number of U.S. pharmacy schools offering courses addressing herbal therapies has declined in the past decade (Klepser & Klepser, 1999). Professional heath care providers tend to ignore the popularity of herbal medicines, and this may increase the potential risks for patients (Klepser & Klepser, 1999).

Moreover, because of the lower rate of disclosure regarding the use of herbal medicines to the primary health care providers (Kennedy, 2005), patients may take herbal medicines and conventional medications at the same time (Boehnlein & Oakley, 2002). Patients with depression are more likely to have a drug over dose and suffer complications from the drug-drug interaction because they may have already taken St. John's wort before they sought help (Pies, 2000). Therefore, primary health care providers who are treating depression should not only actively ask their patients whether they are taking St. John's wort but also educate them to the potential risks of taking St. John's wort in order to avoid the drug-drug interaction (Beckman, Sommi, & Switzer, 2000).

Thus, the safety issue should be considered in future policy making because of the increased population using St. John's wort and the lower rate of disclosure.

D.   Prevalence of Depression in the U.S.

According to National Institute of Mental Health (NIMH), approximately ten percent of the U.S. population suffers from depression at any given time (NIMH, 2003).

Many people and families suffer from this disease without seeking help (Harman, Edlund, & Fortney, 2004; Manber, Allen, & Morris, 2002). Due to advanced medications and psychosocial therapies, most depressive illness can be treated or controlled. Most people with depression do not seek help (Manber et al., 2002). This has made it difficult to treat the depressed population. Depression might come from a family history or the environment or both. Genetic makeup does not absolutely trigger the illness (NIMH, 2003). Additional factors such as stress can also play an important role (NIMH, 2003). With the growing numbers of uninsured people, depressed patients have a high probability for not obtaining adequate treatment. Depressed patients are less likely to seek help, but financial barriers may be more important than the stigma as impediments to appropriate care (Simon et al., 2004). Depression is one of the most common disorders treated in primary care (Gaster & Holroyd, 2000). More than 17% of Americans have experienced depression in their lifetime (Parker & Brown, 2000). However, many of them are under diagnoses.

E.   **Demographic and health insurance status and depression**

A typical indicator of access to health care is the insurance coverage (McKusick, Mark, King, Coffey, & Genuardi, 2002). A large number of uninsured people face access barriers to depression medications (Pleis, Schiller, & Benson, 2003). Many socio-demographic factors such as gender, age and income can influence access to depression medications (Sleath & Shih, 2003). For example, females are more likely to report depression and receive adequate care than males (NIMH, 2003). Elderly people are less likely to receive adequate psychiatric care than younger people (Harman et al., 2004). Regretless of the insurance coverage, adults who can not pay for their medical care may

look for an alternative treatment such as St. John's wort. Significantly, people without health insurance are less likely to have psychiatrists than those who have private insurance (Harman et al., 2004). In addition, physicians will consider patients' health insurance status when they prescribe antidepressants (Reichert, Simon, & Halm, 2000). Self-paying patients are less likely to receive an antidepressant prescription compared to those having private health insurance (Sleath & Shih, 2003). Therefore, patients suffering from depression but without insurance coverage may not receive care for their depression and may have a poorer quality of life. These groups of people might seek another way to deal with their depression problem. Consequently, they are more likely to use St. John's wort, which can be easily obtained over the counter at a lower price than other prescribed antidepressants (Gaster & Holroyd, 2000).

F.   Economic Evaluation for Depression Treatment in the U.S.

The reason that people with depression do not seek help may be because of the high cost of conventional therapies (Simon et al., 2004). Depression is not only a prevalent, but it is also a costly disease in the U.S. The average per lifetime cost is $624,785 based on 1998 values (Manning, 2005). The average annual cost of depression in the U.S. was estimated at $43.7 billion (Laakmann et al., 1998). The use of prescription antidepressants increased 73.4 % between 1990 and 1995 (Sleath & Shih, 2003). The growth in expenditures associated with pharmaceutical treatment of depression has become an increasingly important policy issue. Therefore, access to health care for depressed population has become more and more critical.

High out-of-pocket costs commonly stop depression patients from using conventional therapies (Simon et al., 2004). The average cost for thirty days of selective

serotonin reuptake inhibitor (SSRI) is around $65 (Parker & Brown, 2000). St. John's wort may cost half the price of imipramine, and one tenth the price of fluoxetine (Prozac[®]) (Manber et al., 2002). Using St. John's wort costs much less compared to using standard antidepressant therapies such as SSRI (selective serotonin reuptake inhibitors) (Gaster & Holroyd, 2000). Therefore, St. John's wort is more affordable for depression patients.

Pharmacoeconomics is an evaluation of the net costs and consequences associated with pharmaceutical agent selection in health care programs (Casciano, 2003). A successful treatment should be measured by both process and outcomes. A pharmaceoeconomic evaluation examines process and outcomes by using cost-effectiveness and cost-benefit analyses (Casciano, 2003).

Tricyclic antidepressants (TCA) are cheaper compared to SSRI (Stewart, 1998). However, the patients' compliance for using TCA is low because the side effects. The high cost of health care for depression, such as more physician visits and hospitalization days, can increase the overall cost for treatment. The prevalence of depression and the high costs associated with its treatment have increased the importance in pharmacoeconomic evaluations (Frank, Revicki, Sorensen, & Shih, 2001). Therefore, a pharmaceoeconomic evaluation for herbal drug treatments is necessary (Sclar, Skaer, Robison, & Stowers, 1998).

A pharmaceoeconomic evaluation of herbal medicines has become urgent because of the growing population using them. Most expenditures for herbal medicines are out-of-pocket. A cost-effectiveness analysis is difficult to apply with herbal medicines because of the lack of research information (De Smet et al., 2000). Studies can be conducted to whether the use of herbal medicine such as St. John's wort has an impact on

decreasing health care costs and increasing health outcomes for the depressed population (De Smet et al., 2000). Related studies should be executed to learn whether people choose to use St. John's wort because of the high cost of conventional treatments.

G. Population Factors and the Use of Herbal Medicines

The increased use of herbal medicines has received significant attention in recent years (Yu et al., 2004). Socio-demographic characteristics such as age, gender, education and income, and socioeconomic factors such as family income, are important factors that are associated with the use of herbal medicines. With the concept of the Behavior Model, predisposing characteristics such as gender and education can be used to predict the herbal medicine and other CAM use. For example, females are more likely to use CAM than males (Eisenberg et al., 1993; Hung et al., 1997; Mackenzie et al., 2003; Schaffer, Gordon, Jensen, & Avins, 2003; Yu et al., 2004). People with a higher education tend to be more likely to use CAM (Gunther, Patterson, Kristal, Stratton, & White, 2004; Klepser et al., 2000; Lyle, Mares-Perlman, Klein, Klein, & Greger, 1998; Palinkas & Kabongo, 2000; Yu et al., 2004). Enabling variables such as family income and insurance coverage also may exhibit a small positively correlated prediction of CAM use (Lemming & Calsyn, 2004; Mackenzie et al., 2003). Finally, health status which is qualified as the need characteristics can have an also association with the use of CAM.

Financial difficulty may act as an important factor on the use of St. John's wort. Adults have difficulty accessing health care will try to use St. John's because they can not afford traditional medical care. People having financial barriers for obtaining needed medical care may be more likely to use herbal medicine (Kennedy, 2005).

H.   Contribution of This Study

The major gap in the literature is that there is no specific study examining the association between the cost related access factors and the use of herbal medicine such as St, John's wort for treatment of specific conditions like depression. Many studies have examined the association between sociodemographic and socioeconomic factors and herbal use. However, no study has investigated the association between the growing cost of conventional therapies for depression and the use of St. John's wort. This study used the recent data from the CAM Supplement of 2002 National Health Interview Survey to improve understanding and provide a broader picture of the association between the cost related factors of conventional therapies for depression and the use of St. John's wort after controlling for age, gender, education, ethnicity, income, health status and type of insurance.

Chapter Three: Methodology

I. Data source

The data used in this study are from the 2002 National Health Interview Survey (NHIS), which is a continuing probability survey of households conducted by the National Center for Health Statistics (NCHS). Approximately 100,000 persons are surveyed each calendar year (Davidoff, 2004). The NHIS is widely considered as the most comprehensive secondary data source on health in the U.S. Its questionnaire is composed of three main components: the Family Core, the Sample Adult Core, and the Sample Child Core (Kennedy, Coyne, & Sclar, 2004). Alternative Health/Complimentary and Alternative Medicine (ALT) File is under the 2002 Sample Adult Core, which is the secondary data resource for this study. Additional information is obtained from the Person section of the Family Core. The sample in this study consisted of 31,044 cases in the Alternative Health/Complimentary and Alternative Medicine (ALT) File. After missing data, including "don't know" and refuse responses were excluded, the sample size was then reduced to 646 cases that reported using St. John's wort for health reasons.

II. Measurement

A. Operational Definitions of the Depressed Population

The depressed population is identified with the following question, "During the past 12 months, have you been frequently depressed or anxious?" The sample size of people

who admitted they were depressed or anxious is 5,357. After combining this group of people with those who admitted to using St. John's wort for health reasons, the sample was reduced to 246 cases.

B. Dependent Variable

The dependent variable, a major outcome measure, in this study is whether respondents used St. John's wort for health reasons during the past 12 months. The dependent variable was defined as follow:

- 1= used St. John's wort for health reasons in the past 12 months (n = 246).
- 2= other than those who admitted the use of St. John's wort for health reasons of the depressed population in the past 12months (n = 5111).

Table 1 shows the sociodemographic and socioeconomic factors of the study sample, which shows the sample using St, John's wort in the depressed population (n = 246). Nearly five percent of the depression population (4.6%) had taken St. John's wort within the past 12 months. More than two-thirds of the women (66.5%) had reported that they have been frequently depressed or anxious during the past 12 months. It shows that depression is prevalent in the female population. This result is comparable to the other estimates found in the literature (Remick, 2002).

Insert Table 1 Here

C. Independent Variables

Cost-associated access factors

The difference in perception of cost related access factors between users and nonusers of St. John's wort will be examined in the study.

The key questions of the independent variables were defined as follows:

- During the past 12 months, has medical care been delayed for [you] because of worry about the cost? (n Yes = 92, No = 154)

- During the past 12 months, was there any time when [you] needed medical care, but did not get it because [you] couldn't afford it? (n Yes = 67, No = 179)

- During the past 12 months, was there any time when you needed any of the following, but didn't get it because you couldn't afford it? (n Yes = 77, No = 167)

- During the past 12 months, was there any time when you needed mental health care or counseling, but didn't get it because you couldn't afford it? (n Yes = 47, No = 197)

This study aimed at analyzing whether those who said that they could not afford health care because of the cost were also more likely to use St. John's wort during the same year. "Could not afford health care due to cost" was operationally defined as followings:

- 1 = could not afford medical care due to cost, including delayed medical care due to cost, did not get needed medical care due to cost, can not afford prescription medicines due to cost, or can not afford mental care/counseling due to cost. (n = 121)

- 2 = could afford medical care, including not delayed medical care due to cost, could get needed medical care, can afford prescription medicines, or can afford mental care/counseling. (n = 125)

D. Controlling Variables

This study evaluated the association between cost related access factors and the use of St. John's wort. In the multivariable model, age, gender, ethnicity, education, health status and type of insurance have been controlled in order to analyze the association between the key hypothesis test variable and the dependent variable.

Insert Table 2 Here

III. Statistical analysis

This study used SUDAAN software to correct for the survey stratification and clustering (SUDAAN, 1998). SUDAAN CROSSTABS was used to generate standard errors for all population prevalence estimates. Chi-square analysis was used to compare variables in specific subgroups.

SUDAAN RLOGIST was used to test the association among variables. The odds ratios (OR) and the 95 percent confidence intervals were calculated independently and simultaneously. The mathematic concept of the multivariate logistic analysis is defined as follows:

$$y = \varepsilon + \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$$

y: Dependent variable

X: Independent variables

ε: Error

β: coefficient

The key hypothesis of this study is that people who could not afford health care due to high cost are more likely to use St. John's wort. The chi-square analysis and logistic regression analysis are used to test this key hypothesis in this study. The result of the study will be described in the next chapter.

Chapter Four: Results

This chapter discusses the association between cost-associated access barriers to conventional medical treatment and the use of St. John's wort. It ends with a discussion of how cost-associated access factors and other sociodemographic and socioeconomic factors explain people's use of St. John's wort.

I. Sociodemographic and Socioeconomic Difference and St. John's Wort Use

Table 3 shows sociodemographic and socioeconomic characteristics of the comparison between the use of St. John's wort in the depressed population. Adults with higher than high school education are more likely to use St. John's wort (7.1% vs 2.6%, P < 0.001). Adults with higher income are more likely to use St. John's wort than those who have a lower income (5.8 vs. 3.0%, P < 0.001). In addition, non-Hispanic whites are more likely to use St. John's wort (P = 0.001) compared to Hispanic and non-Hispanic Black. These findings are consistent with a previous study (Eisenberg et al., 1993), which the study showed that non-Black persons who had relatively more education and a higher income are more likely to use complementary and alternative medicines. Those with public insurance reported lower use rates (3.1%), whereas those with public insurance and without insurance have higher use rates (5.8%).

Insert Table 3 Here

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II. Health Factors Distribution

Adults with realizably good health status includes excellent, very good and good, are more likely to use St. John's wort than those who are in poor heath status (5.7% vs 3.0%, P < 0.001). Adults who have not used any over-the-counter (OTC) medications are less likely to use St. John's wort than those who have used any OTC medication in the past year (3.5% vs. 5.2%, P = 0.017). Adults who have a psychiatrist visit are more likely to use St. John's wort than those who do not have a psychiatrist visit (6.4% vs. 4.5%, P = 0.029). However, there is no significant difference associated between prescription medication users and nonusers.

Insert Table 4 Here

III. Cost-Associated Barriers Factors

Table 5 shows cost-associated access barrier factors associated with the use of St. John's wort. Adults, whose medical care has been delayed in the past year due to cost, are more likely to use St. John's wort than those who have not been delayed by cost (8.0% vs. 4.1%, P < 0.001). Adults who could not afford needed medical care because of cost are more likely to use St. John's wort than those who could afford medical care (7.5% vs. 4.4%, P = 0.002). Those who can afford prescription medications are less likely to use St. John's wort than those who can not afford medications (4.1% vs. 7.9%, P = 0.001). Those who could not afford needed mental or health consultation in the past 12 months are more likely to use St. John's wort than those who could afford it (9.3% vs. 4.4%, P = 0.003).

Finally, those who reported any cost problems are more likely to use St. John's wort than those who could afford medical care without any cost problems (7.0% vs. 3.8%, P < 0.001).

Insert Table 5 Here

IV. Logistic Regression Analysis

Table 6 shows the results of logistic regression analysis in bivariate models and multivariate models. The dependent variable in this model is whether adults have used St. John's wort for health reasons in the past 12 months.

A. Bivariate Models

Adults whose age is less than 45 years are more likely to use St. John's wort. Adults with higher than high school education are 2.9 times more likely to use St. John's wort. People with higher income are nearly twice more likely to use St. John's wort (OR = 1.98, 95% CI = 1.41 – 2.78). Non-Hispanic whites are more likely to use St. John's wort. Adults with good health status are 1.9 times more likely to use St. John's wort (OR = 1.92, 95% CI = 1.37 – 2.69). Type of insurance is also a significant variable in the bivariate model. Adults who have not used prescription medication in the past 12 months are more likely to use St. John's wort (OR = 1.48, 95% CI = 1.03 – 2.11) than those who have used prescription medication. Finally, adults who could not afford medical care due to cost are 1.9 times more likely to use St. John's wort (OR = 1.90, 95% CI = 1.45 – 2.50).

B. Multivariate Model

After controlling for gender, education, family income, ethnicity, health status, and type of insurance, the logistic regression results showed that Non-Hispanic White adults with higher education (OR = 2.47, 95% CI = 1.70 – 3.58), higher income (OR = 1.59, 95% CI = 1.07 – 2.35), good health status (OR = 1.64, 95% CI = 1.10 – 2.43), and can not afford medical care are 1.92 times (OR = 1.95, 95% CI = 1.38 – 2.67) more likely to use St. John's wort than those who can afford medical care. The Goodness-of-fit statistic is 3.33, with a p-value of 0.912, which indicated a good fit (Hosmer, Taber, & Lemeshow, 1991).

Insert Table 6 Here

Chapter Five: Discussion/Limitation of the Study/Recommendations

This chapter will begin with the discussion of key study findings and study limitations. Policy implications will be assessed, and the chapter will end with a discussion of implications for future research.

I. Discussion

Based on the Behavior Model described in Chapter 2, the predisposing factors (age, gender, and ethnicity), need factors (health status), and enabling factors (family income, type of insurance, and cost related access barriers) were included in the logistic regression. In the multivariable model (Table 6), adults who could not afford medical care due to cost were 1.9 times more likely to use St. John's wort (OR = 1.9, CI = 1.4 – 2.7) after controlling age, gender, education, family income, ethnicity, health status, and type of insurance. Type of insurance was significantly associated with the use of St. John's wort in bivariate analyses, but was not significant when controlling for other enabling factors in the multivariate model. Higher income and education were associated with use in both the bivariate and multivariate models.

Self-assessed health status was positively associated with the use of St. John's wort. It is possible that adults in good health were more mildly depressed, and therefore more likely to seek out less costly and more self directed treatments such as the use of St. John's wort. Two predisposing factors in the model, age and gender, were not strongly associated with use, but some racial and ethnic minorities (i.e. Hispanics and non-Hispanic blacks) were less likely to use St. John's Wort.

II. Limitations

Surprisingly, this study found that the majority of St. John's wort users, an estimated 2.9 million adults, did not consider themselves anxious or depressed. There a variety of possible explanations for this finding. Self-report of a stigmatizing condition like depression may lead to undercounting. On the other hand, the fact that there is no independent clinical assessment may mean that some of this population would not meet the medical criteria for depression, leading to some overcounting. In one sense, anyone using an antidepressant, even a self-administered herbal antidepressant like St. John's wort, could be considered depressed, since they have depressive symptoms which they believe require treatment. It is also possible that users are taking St. John's wort for other nervous conditions such as insomnia (Gaster & Holroyd, 2000). The 12 month reference period for both the depression and use questions may also lead to some recall bias (Yu et al., 2004).

III. Policy and Clinical Implications

From policy perspective, the rising use of St. John's wort can be attributed in part to declining insurance coverage and growing co-payments for physician visits and prescription drugs, including conventional antidepressants. In this environment, St. John's wort is a relatively inexpensive and easily accessible alternative treatment for depression. This does not mean it is a clinically appropriate treatment for a serious condition like depression, however.

Depression is a treatable disease. Patients with depression should have access to conventional health care, especially mental care. Pharmacological treatment of depression,

with either prescription or herbal medications, should take place under the supervision of a qualified medical professional. St. John's wort appears effective for mild to moderate depression (Lecrubier et al., 2002), and based on patient preferences and professional judgment, it may be an appropriate treatment option. However, it is not risk free simply because it is "natural." Drug-drug interactions and side effects are an important consideration in the use of St. John's wort (Izzo, 2004). At the very least, health care providers should ask whether their patients are taking St. John's wort and inform them about the potential risks and benefits of this treatment choice (Klepser et al., 2000). Pharmacists can also provide patient education about the use of herbal medicines like St. John's wort (Kennedy, 2005). Finally, greater regulation of biologically active preparations like St. John's wort may be required. It is disingenuous to claim that such preparations are innocuous dietary supplements, rather than powerful drugs (Rousseaux & Schachter, 2003).

IV. Future Research

This study provides better understanding of the association between the use of St. John's wort and access factors, but it raises a number of important new research questions. Reasons for using St. John's wort must be clearly identified. Is it a matter of personal preference, cost constraints, health beliefs, perceived severity of depression, or some combination of these factors? Is St. John's wort used in conjunction with, or instead of, conventional prescription antidepressants? What is the perceived efficacy of this treatment? Are some users taking St. John's wort as a preventative treatment? A detailed, population-based survey of current St. John's wort users would be a valuable compliment to clinical trials comparing St. John's wort to prescription drugs and/or a placebo.

Pharmacoeconomic evaluations and cost-effectiveness analyses of St. John's wort would also be useful (Sullivan et al., 2003). If it is effective and inexpensive, St. John's wort could be an inexpensive alternative way to treat mild to moderate depression, but a systematic analysis of the costs and benefits of this treatment modality has not been completed. Use of herbal preparations is an important and poorly understood aspect of health behavior, and more research in this area is needed to encourage effective and efficient treatment of chronic conditions.

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Table 1: Sociodemographic and Socioeconomic Characteristics of Depressed and not Depressed Adult Respondents

	Depressed		Not Depressed	
	Sample Frequency	Column Percentage	Sample Frequency	Column Percentage
STJ use				
Yes	246	4.6%	399	1.6%
No	5,111	95.4%	25,176	98.4%
Age				
18-44y	2,435	45.5%	13,246	51.8%
45-64y	1,908	35.6%	7,516	29.4%
≥65	1,014	18.9%	4,813	18.8%
Gender				
Male	1,794	33.5%	11,654	45.6%
Female	3,563	66.5%	13,921	54.4%
Education				
≤High School	2,666	50.3%	11,042	43.7%
>High School	2,637	49.7%	14,216	56.3%
Family Income				
<20000	2,020	40.0%	5,739	24.0%
≥20000	3,035	60.0%	18,157	76.0%
Ethnicity				
Non-Hispanic White	3,574	66.7%	16,787	65.6%
Hispanic	909	17.0%	4,355	17.0%
Non-Hispanic Black	741	13.8%	3,426	13.4%
Non-Hispanic Others	133	2.5%	1,007	3.9%
Region				
Northwest	1,018	19.0%	4,645	18.2%
Midwest	1,195	22.3%	5,906	23.1%
South	2,002	37.4%	9,437	36.9%
West	1,142	21.3%	5,587	21.9%
U.S. Born				
Yes	4,633	86.5%	21,215	83.1%
No	722	13.5%	4,325	16.9%
Health Status				
Good	3,598	67.3%	23,074	90.3%
Poor	1,748	32.7%	2,473	9.7%
Usual source of care				

Yes	4,269	93.7%	20,282	94.5%
No	286	6.3%	1,173	5.5%
Type of Insurance				
Private	2,193	41.2%	14,793	58.2%
Public	2,068	38.9%	6,609	26.0%
None	1,059	19.9%	4,034	15.9%
Smoker				
Current	1,746	32.8%	5,148	20.4%
Former	1,228	23.1%	5,540	21.9%
Never	2,342	44.1%	14,614	57.8%
Physician Visit				
none	628	12.0%	5,285	21.0%
1--9	2,961	56.5%	16,955	67.4%
>9	1,650	31.5%	2,902	11.5%
Psychiatrist Visit				
Yes	1,218	22.9%	831	3.3%
No	4,093	77.1%	24,499	96.7%
Hospitalization				
Yes	1,001	18.7%	2,312	9.1%
No	4,346	81.3%	23,231	91.0%

Source: National Center for Health Statistics (2002)

Table 2: Variables for Analysis

Dependent variable	Definition
During the past 12 month, did you use any of the following natural herbs, St. John's wort, for health reasons?	1 = Yes 2 = No

Independent variable

Age	1 = 18 - 44; 2 = 45 - 64 year; 3 ≥ 65
Gender	1 = Male; 2 = Female
Ethnicity	1 = Non-Hispanic White; 2 = Hispanic; 3 = Non-Hispanic Black; 4 = Non-Hispanic Others
Education	1 = Lower than high school and high school; 2= Higher than high school
Annual family income	1= Equal and lower than $20,000; 2 = Higher than $20,000
U.S. Born	1 = Yes; 2= No
Type of insurance	1 = Private; 2 = Public; 3 = None;
Health Status	1 = Good; 2 = Poor
Usual source of care	1 = Yes; 2= No
Use prescription drugs	1 = Yes; 2= No
Use OTC medicine	1 = Yes; 2= No
Physician visits	1 = None; 2 = 1-9; 3 = More than 9
Psychiatrist visit	1 = Yes; 2= No
Hospitalization	1 = Yes; 2= No

Table 3: Use of St. John's Wort among Depressed Adult Respondents in the U.S. Sociodemographic and Socioeconomic Differences.

	Use SJW		Not Use SJW			
	Estimated Population (1000s)	Row Percentage	Estimated Population (1000s)	Row Percentage	X^2	P
Age					**17.69**	**<0.001**
18-44y	854	5.5%	14,583	94.5%		
45-64y	597	5.1%	11,002	94.9%		
≥65	123	2.3%	5,168	97.7%		
Gender					0.00	0.976
Male	605	4.9%	11,780	95.1%		
Female	969	4.9%	18,973	95.1%		
Education					**37.37**	**<0.001**
≤High School	413	2.6%	15,429	97.4%		
>High School	1,148	7.1%	15,010	92.9%		
Family Income					**17.86**	**<0.001**
<20000	274	3.0%	8,762	97.0%		
≥20000	1,246	5.8%	20,128	94.2%		
Ethnicity					**17.92**	**0.001**
Non-Hispanic White	1,321	5.5%	22,783	94.5%		
Hispanic	99	2.9%	3,374	97.1%		
Non-Hispanic Black	99	2.6%	3,659	97.4%		
Non-Hispanic Others	55	5.5% †	937	94.5%		
U.S. Born					**4.35**	**0.038**
Yes	1,460	5.1%	27,301	94.9%		
No	114	3.2%	3,446	96.8%		
Type of Insurance					**17.32**	**<0.001**
Private	866	5.8%	14,011	94.2%		
Public	321	3.1%	10,076	96.9%		
None	364	5.8%	5,961	94.2%		

Source: Complementary and Alternative Medicine Supplement (CAMS), National Center for Health Statistics (2002)

Notes: All comparisons use SUDDAN CHISQ

"†" Estimated population/SE Weighted >30%

Table 4: Health Factors Associated with the Use of St. John's Wort Among Depressed Adult Respondents

	Use SJW		Not Use SJW			
	Estimated Population	Row Percentage	Estimated Population	Row Percentage	X^2	P
Health Status					**18.63**	**<0.001**
Good	1,274	5.7%	21,127	94.3%		
Poor	300	3.0%	9,558	97.0%		
Usual source of care					1.84	0.176
Yes	1,175	4.5%	24,698	95.5%		
No	114	7.1%	1,491	92.9%		
Use prescription medication in the past year					3.43	0.065
Yes	1,197	4.6%	25,016	95.4%		
No	368	6.6%	5,203	93.4%		
Use OTC medication in the past year					**5.74**	**0.017**
Yes	1,374	5.2%	24,910	94.8%		
No	191	3.5%	5,281	96.5%		
Physician Visit					0.10	0.952
none	198	5.2%	3,582	94.8%		
1--9	870	4.8%	17,195	95.2%		
>=9	485	4.9%	9,313	95.1%		
Psychiatrist Visit					**4.81**	**0.029**
Yes	460	6.4%	6,715	93.6%		
No	1,114	4.5%	23,783	95.5%		
Hospitalization					0.88	0.348
Yes	243	4.2%	5,553	95.8%		
No	1,328	5.0%	25,140	95.0%		

Source: Complementary and Alternative Medicine Supplement (CAMS), National Center for Health Statistics (2002)

All comparisons use SUDDAN CHISQ

Table 5: Access Barriers Associated with the Use of St. John's Wort among Depressed Adult Respondents

	Use SJW		Not Use SJW			
	Estimated Population	Estimated Population	Estimated Population	Estimated Population	X^2	P
Medical care delayed in past 12mos due to cost					16.60	**<0.001**
Yes	530	8.0%	6,123	92.0%		
No	1,045	4.1%	24,597	95.9%		
Did not get needed medical care because of cost					9.73	**0.002**
Yes	392	7.5%	4,862	92.5%		
No	1,182	4.4%	25,831	95.6%		
Could not afford to fill prescription due to cost					12.23	**0.001**
Yes	501	7.9%	5,871	92.1%		
No	1,056	4.1%	24,647	95.9%		
Could not afford mental care/counsel due to cost					9.16	**0.003**
Yes	283	9.3%	2,776	90.7%		
No	1,281	4.4%	27,720	95.6%		
Could not afford medical care due to cost*					18.60	**<0.001**
Yes	735	7.0%	9,699	93.0%		
No	839	3.8%	21,049	96.2%		

Source: Complementary and Alternative Medicine Supplement (CAMS), National Center for Health Statistics (2002)

All comparisons use SUDDAN CHISQ

* If adult respondents admitted any one of cost related factors, then they are classified into admitting they could not afford medical care due to cost.

Table 6: Logistic Regression Model:

Factors Associated with the Use of St. John' wort in Depressed Adults - Logistic Model

		Bivariate models		Multivariate model*	
		OR (95% CI)	P- value (Wald F)	OR (95% CI)	P- value (Wald F)
Age			**0.009**		0.438
	18-44y	**referent**		referent	
	45-64y	**0.93 (0.70 - 1.28)**		1.06 (0.74 - 1.52)	
	≥65	**0.41 (0.23 - 0.72)**		0.66 (0.32 - 1.38)	
Gender			0.976		0.716
	Male	1.01 (0.71 - 1.41)		0.94 (0.65 - 1.34)	
	Female	referent		referent	
Education			**<0.001**		**<0.001**
	<High School	**referent**		**referent**	
	≥High School	**2.86 (2.00 - 4.08)**		**2.47 (1.70 - 3.58)**	
Family Income			**<0.001**		**0.021**
	≤20000	**referent**		**referent**	
	>20000	**1.98 (1.41 - 2.78)**		**1.59 (1.07 - 2.35)**	
Ethnicity			**0.003**		**0.019**
	Non-Hispanic White	**referent**		**referent**	
	Hispanic	**0.51 (0.33 - 0.79)**		**0.57 (0.35 - 0.91)**	
	Non-Hispanic Black	**0.47 (0.28 - 0.79)**		**0.50 (0.29 - 0.85)**	
	Non-Hispanic Others	**1.01 (0.45 - 2.25)**		**0.93 (0.40 - 2.14)**	
Health Status			**<0.001**		**0.015**
	Good	**1.92 (1.37 - 2.69)**		**1.64 (1.10 - 2.43)**	
	Poor	**referent**		**referent**	
Type of Insurance			**0.002**		0.923
	Private	**1.01 (0.71 - 1.45)**		0.92 (0.60 - 1.41)	
	Public	**0.52 (0.34 - 0.81)**		0.92 (0.53 - 1.59)	
	None	**referent**		referent	
Could not afford medical care due to cost			**<0.001**		**<0.001**
	Yes	**1.90 (1.45 - 2.50)**		**1.92 (1.38 - 2.67)**	
	No	**referent**		**referent**	

Source: Complementary and Alternative Medicine Supplement (CAMS), National Center for Health Statistics (2002)

* H-L Chi Square: 3.33, H-L P-Value: 0.912

All comparisons use SUDDAN RLOGIST