Milliman Research Report

Prepared by:

Steve Melek, FSA, MAAA
Michael Halford, ASA, MAAA
Daniel Perlman, ASA, MAAA

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Depression treatment: The impact of treatment persistence on total healthcare costs

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SUMMARY

Depression is a prevalent and costly disorder. Existing research has shown that many patients suffering from behavioral health conditions, including depression, receive inadequate or no treatment for these disorders. Inadequate treatment often occurs when patients discontinue their prescribed courses of treatment. The purpose of this research report is to attempt to quantify the impact of depression treatment persistence on post-treatment healthcare costs. Is persistent treatment associated with future healthcare cost savings? In other words, do patients who receive more (and/or continue to receive) depression treatment—whether through psychotherapy only, pharmacotherapy only, or a combination of both therapies—have lower total healthcare cost growth post-treatment than those who received less (or discontinued treatment)?

We conducted a study from a large national medical claims database to address the research questions above. We selected treated depressed patients and placed them in different cohorts depending on their treatment paths. After analyzing baseline clinical and demographic characteristics, we compared the relative change in total healthcare cost from the pre-treatment period to the post-treatment period by cohort.

For the population of all treated depressed patients, we found that the relationship between treatment persistence and healthcare cost growth is mixed. In some comparisons, persistently treated members experienced lower healthcare cost growth; in other cases, they experienced higher healthcare cost growth. However, when we focused only on patients with certain chronic comorbid medical conditions, there is evidence that persistent treatment is associated with slower growth in total healthcare costs.

The entire cohort of members treated with persistent pharmacotherapy only had slightly lower post-treatment cost growth than their nonpersistent counterparts. The opposite was true for the persistent psychotherapy-only group—they had slightly higher post-treatment cost growth than the nonpersistent psychotherapy group. Interestingly, the combination cohort (psycho- and pharmacotherapy) treatment results depended on which therapy was persistent. When the prescription drug treatments were persistent, lower post-treatment cost growth was observed. When the psychotherapy was persistent, higher post-treatment cost growth was observed.

The greatest reduction in the growth of post-treatment healthcare costs was observed when depression was comorbid with chronic medical conditions and treatment was persistent. Cost growth reductions were observed for these conditions and treatments:

- Persistent pharmacotherapy only: asthma, arthritis, diabetes, hypertension
- Persistent psychotherapy only: asthma, arthritis, diabetes
- Persistent combination treatment: asthma, arthritis, diabetes, hypertension

The results suggest that there is a relationship between persistent treatment for depression and future healthcare cost trend reductions for certain treatment paths and patient cohorts. Additionally, our results call into question whether persistent treatment will always lead to such healthcare cost trend reductions. For example, persistent treatment that does not result in clinical improvement, for whatever reason, may not reduce healthcare costs. The *quality* of treatment (for example, effectiveness of psychotherapy or selection of the right dosage of the right antidepressant for a given patient) is important as well. We conclude with a discussion of the results and of suggestions for future research on this topic.

INTRODUCTION

PREVALENCE AND COSTS OF DEPRESSION

Depression affects many Americans. For healthy persons, the lifetime risk of developing a depressive disorder is 10%-25% for women and 5%-12% for men. However, that risk increases to 25%-33% for persons suffering from chronic illnesses.[1]

Not only do a significant number of people suffer from depression, this disease results in considerable healthcare, employer, and societal costs. In 2000, the total estimated cost attributed to depression was $83.1 billion. Of this $83.1 billion, $26.1 billion was spent on medical costs, $5.4 billion was related to suicide (death) costs, and $51.5 billion were associated with workplace expenses, including absences and loss of productivity.[2]

Treating depression has shifted significantly from hospital and talk-based therapies to pharmaceutical treatments. From 1996 to 2005, the percentage of persons who used antidepressants within the past year almost doubled from 5.8% to 10.1%.[3] According to a News and Numbers report from the Agency for Healthcare Research and Quality, spending on antidepressants also doubled from 1997 to 2004.[4] More than three dozen antidepressants are approved by the FDA;[5] as the number of available drugs (and direct-to-consumer advertising) increases, spending on antidepressants may continue to rise. The portion of total mental health costs attributed to prescription drugs is also growing; from 1986 to 2003 the percentage of spending on prescription drugs went from 7% to 23% of total mental health costs, and is expected to rise to 30% by 2014.[6]

While depression is a prevalent and costly condition, many patients do not receive timely treatment, if they receive treatment at all. A 2005 study found that among patients who experienced major depressive disorder in the previous year, only 33% received treatment during that same time period from a mental health specialist, and only about half of patients with major depression received any mental health treatment from any kind of healthcare provider. Figures are slightly higher for dysthymia patients.[7] The median delay from onset of the condition to beginning of treatment has been estimated at eight years for major depression and seven years for dysthymia.[8] This report focuses on healthcare cost outcomes for commercially insured people who receive treatment for depression; it is important to remember that this is only a subset of the entire universe of patients with depression.

TREATMENT AND INSURANCE COVERAGE GUIDELINES

There are formal guidelines available regarding the effective treatment of depression. The American Psychiatric Association, for example, has published Practice Guidelines for the Treatment of Patients with Major Depressive Disorder, which includes guidelines for evaluating whether specific psychotherapy and/or medication should be provided, and if electroconvulsive therapy (ECT) is necessary.[9] For the National Comorbidity Survey Replication, a definition of "minimally adequate treatment" was proposed. This treatment definition included pharmacotherapy for at least two months, in combination with more than four concurrent visits to any type of physician, or psychotherapy for at least eight visits with each visit lasting, on average, 30 minutes or more.[10]

The Surgeon General's report on mental health in 1999 outlined a list of services related to behavioral care that should be covered by insurance, including, but not limited to, community and crisis outreach services, medical management of comorbidities, and psychotherapy.[11] More recently, the Patient Protection and Accountable Care Act of 2010 (PPACA) included "mental health and substance use disorder services, including behavioral health treatment" in its list of essential health benefits that qualified health plans are required to provide.[12] The law also requires that plans cover (without member cost sharing) services with an "A" or "B" recommendation from the United States Preventive Task Force; depression screening for both adults and adolescents falls under this recommendation.[13]

CHRONIC ILLNESS AND DEPRESSION

Depression is often hard to diagnose, especially when depressive symptoms are compounded by a chronic medical condition. Because it can be difficult to accurately diagnose depression in such patients, there may be unnecessary time and expense incurred while depression is not properly diagnosed.[14]

The relationship is further complicated by the fact that symptoms of depression are, in some cases, not caused by depression at all, but by a different physical condition such as thyroid problems or cancer.[15] While it may not always be clear whether depression is the cause of more severe chronic illnesses or the result of them, it is evident that they are linked to increased healthcare expenditures.

Some highly prevalent chronic illnesses commonly associated with depression are:

- Cardiac/pulmonary-related (e.g., hypertension, heart disease)
- Asthma
- Diabetes
- Cancer
- Stroke
- Arthritis

Depression is so strongly correlated to cardiac disease that the American Heart Association recommends screening for depression in all cardiac patients.[16] One national health and nutrition survey showed that suffering from depression resulted in an increased risk for developing heart disease greater than 70% in both men and women.[17] The risk of developing hypertension has been estimated as twice as high for patients suffering from depression or anxiety compared to the general population.[18] A study on the relationship between asthma and depression showed that about half of asthma patients show symptoms of depression.[19] A study on diabetes showed that the annual number of prescription medications filled and money spent to be more than double in depressed patients versus non-depressed patients. This same study showed that depressed patients with diabetes had more ambulatory care visits as well.[20] Depression is both a known predictor and an all-too-common side effect in stroke patients; depression not only lengthens recovery time but also increases mortality rates in the two years after the stroke.[21] The prevalence of depression among cancer patients has been estimated at 21%, with higher rates for more advanced cancer patients.[22] Arthritis has been shown to be associated with depression, especially among patients with disabling arthritis.[23]

MEDICAL COSTS RELATED TO DEPRESSION

There are a number of reasons why comorbid depression is associated with higher overall medical costs. In addition to the treatment required for depression, barriers to treatment may exacerbate health problems, and thus increase costs. Failure to follow through on physician recommendations is a common problem across all patients; however, research has shown it to be a particularly serious problem among patients with depression.[24] One study has estimated that depressed patents have 1.76 times higher odds of failing to adhere to a prescribed medication regimen compared to non-depressed patients.[25] In addition, chronic medical illnesses often require a lifestyle change (a new restricted diet and daily insulin shots for patients with diabetes, for example), and depression has been shown to interfere with the adaptation required for the new lifestyle. It has also been shown that symptoms associated with chronic illnesses tend to be more intense and actually last longer in depressed patients, prolonging care needs and increasing medical expenditures.[26]

In 2008, we completed research comparing medical costs for comorbid chronic illnesses with and without treated depression. Total healthcare costs were shown to be substantially higher in the patients that were treated for depression, with only 20% of the increase attributed to behavioral health costs.[27] It is clear that ignoring the compounding effects of depression and comorbid chronic illness on healthcare costs would be unwise.

STUDY METHODS

DATA SOURCE

We performed this analysis using the Thomson Reuters MarketScan® Commercial Claims and Encounters (CCAE) database. This database contains data from approximately 100 contributors, encompassing both employers and health plans. There are more than 500 million historical claims in the MarketScan databases. Our study analyzed data from 2000 to 2009, a period during which there were approximately 73 million unique lives appearing in the database at some point (53 million of whom had at least 12 months of data). Nearly all lives in this database are under age 65.

The CCAE database contains full healthcare utilization data (inpatient, outpatient, and prescription drugs) for members in the database. The source of the data is healthcare claim records. As a result, the type of information contained in the CCAE database reflects categories of information that are useful for processing claims. Financial variables include allowed charges, paid charges, and member cost-sharing amounts. Clinical variables include diagnosis codes, procedure codes, revenue codes, diagnosis-related group (DRG) codes (for inpatient claims), and national drug codes (NDC) for pharmaceutical claims. Basic demographic information is available as well: age, sex, employee/dependent status, and location of residence.

DEPRESSION TREATMENT COHORT SELECTION

To separately analyze the impact of psychotherapy and pharmacotherapy for the treatment of depression, we defined the following three treatment cohorts of members with diagnosed depression:

- Pharmacotherapy (antidepressant) treatment only
- Psychotherapy treatment only
- Combination of pharmacotherapy and psychotherapy

Each treatment cohort was mutually exclusive. For all cohorts, we identified a treatment start date (index date) and a treatment end date for each person. All members were required to have continuous exposure of at least 18 months prior to the index date through at least 24 months after the treatment end date. The following subsections discuss the inclusion requirements for each cohort.

PHARMACOTHERAPY-TREATMENT-ONLY COHORT

Any patient with an antidepressant claim and a depression diagnosis was a candidate for this cohort. We defined antidepressants as any drug identified in Redbook[29] as an antidepressant. Patients with a psychotherapy claim were excluded from this cohort (but remained candidates for the combination cohort). The index date was defined as the date when the first antidepressant claim was filled. We considered members to be continually using antidepressants as long as there was no gap of at least 50 days between the end of one prescription (defined by the claim's days of supply) and the beginning of the next. The treatment end date was defined as the date of the last antidepressant claim, plus the days of supply from that claim. The following example illustrates the criteria:

- Claim 1: April 1, 30-day supply
- Claim 2: May 15, 90-day supply
- Claim 3: September 1, 30-day supply
- Claim 4: December 15, 90-day supply

In this example, the index date is April 1. The treatment end date is September 30. While Claims 1-3 are each separated by less than 50 days, there is a gap of more than 50 days between the end of Claim 3

(September 30) and the beginning of Claim 4 (December 15). The treatment period thus terminates with the end of Claim 3.

PSYCHOTHERAPY-TREATMENT-ONLY COHORT

Members in the psychotherapy treatment cohort were required to have at least one claim for psychotherapy; service codes used to identify psychotherapy can be found in Appendix A. We identified all psychotherapy claims for each patient and excluded the patient if, at any point between the first and last psychotherapy claims, there was a treatment gap of more than six months. We also excluded patients if none of the psychotherapy claims had a depression diagnosis on it. (See Appendix B for a list of ICD-9 codes defining depression.) Anyone with a claim for an antidepressant was excluded from this cohort (but remained a candidate for the combination cohort).The index and treatment end dates were defined by the dates of the first and last psychotherapy claims, respectively.

COMBINATION COHORT

Any member who satisfied the requirements above for therapy *and* antidepressants was a candidate for the combination cohort. To be included in the combination cohort, the time periods of psychotherapy treatment and antidepressant treatment must overlap or be separated by no more than 30 days. (Anyone who had claims for psychotherapy and pharmacotherapy, but not concurrently, was excluded from this study.) The earlier of the psychotherapy and antidepressant index dates was the index date for the combination cohort. The later of the psychotherapy and antidepressant treatment end dates was the treatment end date for the combination cohort.

PERSISTENT TREATMENT

In each cohort, we identified each member's treatment duration. In the pharmacotherapy-treatment-only cohort, duration was defined as the number of days of supply of antidepressants plus allowed gap days (less than 50). In the psychotherapy-treatment-only cohort, duration was defined as the number of psychotherapy visits during the treatment period. Members in the combination cohort have both duration metrics identified.

Persistent psychotherapy was defined as at least eight visits, consistent with the "minimally adequate treatment" definition from the National Comorbidity Survey. Persistent antidepressant treatment was defined as at least 180 days of supply (with no gaps in coverage exceeding 50 days).

ANALYSIS

After stratifying members in each treatment cohort by treatment duration, we calculated a variety of demographic, clinical, and healthcare cost metrics. These results are presented in the following sections. Definitions for comorbid conditions are based on ICD-9 definitions used in Milliman's Medical Underwriting Guidelines™. All cost values in this report have been trended to 2011 levels. Because our data covers a long period of time, trending costs to a consistent point in time ensures that differences in total healthcare expenditures are not simply due to price inflation during the study period, but rather are due to actual changes in utilization.

BASELINE CHARACTERISTICS OF THE COHORTS

In a retrospective claims-based study, it is important to analyze the baseline characteristics of the study population prior to the beginning of the event of interest (in this case, the index date, representing the date treatment of depression begins). There are several reasons:

- To provide context for the results. If two groups have different cost or clinical outcomes after the end of treatment, could these differences have been caused by differences that existed even before treatment began?
- To validate the cohort selection criteria. Do the criteria described above produce study cohorts with reasonable age distributions, reasonable prevalence rates of comorbid conditions, etc., relative to existing published literature?
- To provide information about the propensity of members to undergo different types of treatment. Are there differences between men and women in their propensity to use psychotherapy vs. pharmacotherapy? Are there age differences in members who are treatment-persistent vs. non-treatment-persistent?

DEMOGRAPHIC CHARACTERISTICS

The tables in Figures 1-4 provide demographic information on our three treatment cohorts.

FIGURE 1: PHARMACOTHERAPY-TREATMENT-ONLY COHORT DEMOGRAPHIC CHARACTERISTICS

		LENGTH OF PHARMACOTHERAPY TREATMENT	
	FULL SAMPLE	1-179 DAYS OF TREATMENT	180+ DAYS OF TREATMENT
Count	34,699	21,820	12,879
% Male	34.8%	36.3%	32.2%
REGION			
%Northeast	8.0%	7.8%	8.4%
%North-Central	30.7%	29.6%	32.4%
%South	22.2%	22.9%	21.0%
%West	39.0%	39.4%	38.1%
URBAN/RURAL RESIDENCE			
%Urban	76.7%	77.3%	75.8%
%Rural	23.3%	22.7%	24.2%
EMPLOYEE/DEPENDENT STATUS			
%Employee	53.7%	53.1%	54.7%
%Spouse	28.1%	26.2%	31.3%
%Other Dependent	18.2%	20.7%	14.0%
AGE AT DIAGNOSIS			
Average	39	38	41
Median	41	40	43
% <18	11.8%	12.8%	10.0%
% 19-30	14.8%	16.9%	11.2%
% 31-40	21.8%	21.9%	21.6%
% 41-50	26.1%	24.5%	28.9%
% 51-64	25.5%	23.9%	28.3%
% >64	0.0%	0.0%	0.0%

FIGURE 2: PSYCHOTHERAPY-TREATMENT-ONLY COHORT DEMOGRAPHIC CHARACTERISTICS

		LENGTH OF PSYCHOTHERAPY TREATMENT	
	FULL SAMPLE	1-7 VISITS	8+ VISITS
Count	32,650	22,222	10,428
% Male	46.3%	46.2%	46.5%
REGION			
%Northeast	13.3%	12.3%	15.4%
%North-Central	29.1%	28.9%	29.6%
%South	27.9%	26.2%	31.4%
%West	29.4%	32.1%	23.4%
URBAN/RURAL RESIDENCE			
%Urban	88.2%	87.2%	90.3%
%Rural	11.8%	12.8%	9.7%
EMPLOYEE/DEPENDENT STATUS			
%Employee	46.8%	46.2%	48.1%
%Spouse	18.3%	18.4%	18.2%
%Other Dependent	34.9%	35.5%	33.7%
AGE AT DIAGNOSIS			
Average	34	33	34
Median	35	34	36
% <18	29.5%	29.5%	29.6%
% 19-30	12.8%	13.8%	10.7%
% 31-40	18.4%	18.4%	18.5%
% 41-50	21.1%	20.5%	22.4%
% 51-64	18.1%	17.7%	18.8%
% >64	0.0%	0.0%	0.0%

FIGURE 3: COMBINATION TREATMENT COHORT DEMOGRAPHIC CHARACTERISTICS (STRATIFIED BY ANTIDEPRESSANT DURATION)

		LENGTH OF COMBINATION TREATMENT, PHARMACOTHERAPY	
	FULL SAMPLE	1-179 DAYS OF TREATMENT	180+ DAYS OF TREATMENT
Count	10,530	6,350	4,180
% Male	39.2%	40.0%	38.1%
REGION			
%Northeast	9.5%	8.7%	10.7%
%North-Central	30.7%	30.9%	30.4%
%South	26.5%	26.8%	25.9%
%West	32.8%	32.8%	32.8%
URBAN/RURAL RESIDENCE			
%Urban	84.4%	84.6%	84.0%
%Rural	15.6%	15.4%	16.0%
EMPLOYEE/DEPENDENT STATUS			
%Employee	46.1%	44.8%	48.0%
%Spouse	21.0%	20.1%	22.3%
%Other Dependent	32.9%	35.1%	29.6%
AGE AT DIAGNOSIS			
Average	35	34	37
Median	37	36	39
% <18	25.6%	26.3%	24.5%
% 19-30	13.6%	15.5%	10.8%
% 31-40	18.0%	18.3%	17.7%
% 41-50	21.8%	21.2%	22.9%
% 51-64	20.9%	18.8%	24.1%
% >64	0.0%	0.0%	0.0%

FIGURE 4: COMBINATION TREATMENT COHORT DEMOGRAPHIC CHARACTERISTICS (STRATIFIED BY PSYCHOTHERAPY DURATION)

	LENGTH OF COMBINATION TREATMENT, PSYCHOTHERAPY		
	FULL SAMPLE	1-7 VISITS	8+ VISITS
Count	10,530	5,536	4,994
% Male	39.2%	40.5%	37.9%
REGION			
%Northeast	9.5%	8.3%	10.8%
%North-Central	30.7%	29.4%	32.2%
%South	26.5%	26.0%	26.9%
%West	32.8%	35.4%	29.8%
URBAN/RURAL RESIDENCE			
%Urban	84.4%	83.1%	85.9%
%Rural	15.6%	16.9%	14.1%
EMPLOYEE/DEPENDENT STATUS			
%Employee	46.1%	48.0%	44.0%
%Spouse	21.0%	22.3%	19.6%
%Other Dependent	32.9%	29.7%	36.5%
AGE AT DIAGNOSIS			
Average	35	36	34
Median	37	38	36
% <18	25.6%	20.8%	30.9%
% 19-30	13.6%	16.2%	10.8%
% 31-40	18.0%	19.2%	16.7%
% 41-50	21.8%	21.7%	21.9%
% 51-64	20.9%	22.0%	19.7%
% >64	0.0%	0.0%	0.0%

Within each cohort, demographic characteristics are relatively similar for all levels of persistency of treatment. For example, Figure 2 shows that the full sample is 46.3% male, and there is little variation from that average in either of the ranges of psychotherapy treatment persistency (1-7 visits, 8+ visits).

Between cohorts, the most notable difference is that members treated with pharmacotherapy only are older and more likely to be female than members treated with psychotherapy only. Members treated with pharmacotherapy only are also more likely to live in rural areas (23%) than people treated with psychotherapy only (12%). Members in the combination cohort have demographic averages that generally fall in between the psychotherapy-only and pharmacotherapy-only cohorts.

What is somewhat troublesome from these metrics is the low frequency of depressed patients treated using both psychotherapy and pharmacotherapy in light of the scientific evidence and treatment guidelines for this approach. Our results show that only 13.5% of the members received treatment followed the combination treatment approach, with 41.9% treated with only psychotherapy, and 44.6% treated with only pharmacotherapy. The differences by gender are interesting. Males were distributed 13.2% combination treatment, 48.3% psychotherapy only, and 38.5% pharmacotherapy only, while females were distributed 13.7% combination treatment, 37.7% psychotherapy only, and 48.6% pharmacotherapy only. Residents of urban areas were distributed 44.8% psychotherapy only, 41.4% pharmacotherapy only, and 13.8% combination treatment, while residents of rural areas were distributed 28.4% psychotherapy only, 59.5% pharmacotherapy only, and 12.1% combination treatment.

A propensity to be persistently treated is broadly similar when stratified by the demographic characteristics shown in the tables above.

CLINICAL CHARACTERISTICS

The tables in Figures 5-8 provide baseline prevalence rates for a variety of comorbid medical and behavioral conditions for each treatment cohort. These prevalence rates are determined based on the

presence of particular ICD-9 codes in the claims data. It should be noted that the first occurrence of a depression diagnosis is likely not the true point at which the patient first became depressed. When depression is present, it has frequently not been successfully diagnosed in primary care settings (or any other settings), partially because patients' complaints are often of physical symptoms that could indicate other medical problems. A recent study estimated that approximately two-thirds of depressed patients are not properly diagnosed by their primary care providers and receive no treatment.[29] Because of the lag that typically exists between depression's onset and initial diagnosis, we calculated comorbid medical and behavioral condition prevalence rates for two time periods:

- A 12-month period beginning 18 months prior to the index date (baseline comorbidities)
- A six-month period ending the day before the index date (six-months-prior comorbidities)

FIGURE 5: PHARMACOTHERAPY-ONLY COMORBID CONDITION PREVALENCE RATES

	FULL SAMPLE	1-179 DAYS	180+ DAYS
Count	34,699	21,820	12,879
BASELINE COMORBIDITIES: PREVALENCE			
Diabetes	3.7%	3.7%	3.7%
CHF	0.3%	0.3%	0.3%
CAD	1.8%	1.8%	2.0%
Cancer	2.2%	2.0%	2.6%
Asthma	3.8%	3.8%	3.8%
Hypertension	10.7%	10.4%	11.2%
Stroke	0.4%	0.4%	0.5%
Arthritis	13.6%	13.6%	13.6%
COPD	2.8%	2.9%	2.7%
Neurotic Disorders	6.1%	6.4%	5.7%
Schizophrenia	0.1%	0.1%	0.1%
Other Psychotic Disorders	0.6%	0.6%	0.6%
Substance Abuse	0.4%	0.5%	0.2%
Alcoholism	0.6%	0.7%	0.4%
Fibromyalgia	2.1%	2.0%	2.3%
Chronic Pain	1.2%	1.1%	1.6%
Comorbid MH condition	6.7%	6.9%	6.3%
Comorbid SA condition	0.9%	1.1%	0.6%
Comorbid MH/SA condition	7.4%	7.7%	6.7%
SIX-MONTHS-PRIOR COMORBIDITIES: PREVALENCE			
Diabetes	3.5%	3.5%	3.4%
CHF	0.4%	0.4%	0.3%
CAD	1.8%	1.8%	1.9%
Cancer	1.9%	1.7%	2.3%
Asthma	2.5%	2.5%	2.5%
Hypertension	9.2%	8.8%	9.9%
Stroke	0.6%	0.5%	0.6%
Arthritis	9.2%	9.2%	9.3%
COPD	1.8%	1.9%	1.6%
Neurotic Disorders	15.7%	15.0%	17.0%
Schizophrenia	0.2%	0.2%	0.2%
Other Psychotic Disorders	2.0%	2.1%	1.7%
Substance Abuse	1.0%	1.3%	0.6%
Alcoholism	1.4%	1.7%	0.8%
Fibromyalgia	1.6%	1.6%	1.6%
Chronic Pain	2.0%	1.7%	2.5%
Comorbid MH condition	17.2%	16.6%	18.2%
Comorbid SA condition	2.1%	2.6%	1.3%
Comorbid MH/SA condition	18.5%	18.2%	19.0%

FIGURE 6: PSYCHOTHERAPY-ONLY COMORBID CONDITION PREVALENCE RATES

	FULL SAMPLE	1-7 VISITS	8+ VISITS
Count	32,650	22,222	10,428
BASELINE COMORBIDITIES: PREVALENCE			
Diabetes	3.0%	3.1%	2.8%
CHF	0.2%	0.3%	0.2%
CAD	1.2%	1.2%	1.2%
Cancer	1.6%	1.7%	1.6%
Asthma	3.3%	3.3%	3.3%
Hypertension	6.5%	6.5%	6.4%
Stroke	0.2%	0.2%	0.2%
Arthritis	9.1%	9.2%	8.8%
COPD	1.5%	1.6%	1.4%
Neurotic Disorders	1.4%	1.5%	1.0%
Schizophrenia	0.0%	0.0%	0.0%
Other Psychotic Disorders	0.2%	0.2%	0.2%
Substance Abuse	0.1%	0.1%	0.1%
Alcoholism	0.2%	0.2%	0.1%
Fibromyalgia	1.1%	1.0%	1.3%
Chronic Pain	0.4%	0.4%	0.4%
Comorbid MH condition	1.5%	1.6%	1.3%
Comorbid SA condition	0.3%	0.3%	0.2%
Comorbid MH/SA condition	1.8%	1.9%	1.4%
SIX-MONTHS-PRIOR COMORBIDITIES: PREVALENCE			
Diabetes	3.0%	3.2%	2.7%
CHF	0.2%	0.2%	0.2%
CAD	1.1%	1.1%	1.0%
Cancer	1.6%	1.6%	1.5%
Asthma	2.5%	2.6%	2.4%
Hypertension	6.2%	6.5%	5.6%
Stroke	0.3%	0.3%	0.2%
Arthritis	7.5%	7.4%	7.7%
COPD	1.1%	1.2%	1.0%
Neurotic Disorders	9.1%	7.6%	12.3%
Schizophrenia	0.1%	0.1%	0.1%
Other Psychotic Disorders	1.3%	1.3%	1.3%
Substance Abuse	0.6%	0.5%	0.6%
Alcoholism	0.8%	0.8%	0.9%
Fibromyalgia	0.9%	1.0%	0.8%
Chronic Pain	0.9%	0.9%	0.9%
Comorbid MH condition	10.2%	8.7%	13.4%
Comorbid SA condition	1.3%	1.2%	1.4%
Comorbid MH/SA condition	11.1%	9.6%	14.4%

FIGURE 7: COMBINATION COHORT COMORBID CONDITION PREVALENCE RATES (STRATIFIED BY ANTIDEPRESSANT DURATION)

	FULL SAMPLE	1-179 DAYS	180+ DAYS
Count	10,530	6,350	4,180
BASELINE COMORBIDITIES: PREVALENCE			
Diabetes	4.1%	4.1%	4.0%
CHF	0.3%	0.3%	0.3%
CAD	2.0%	1.8%	2.2%
Cancer	2.0%	1.8%	2.4%
Asthma	4.3%	4.2%	4.4%
Hypertension	8.9%	8.7%	9.3%
Stroke	0.5%	0.5%	0.5%
Arthritis	12.4%	12.3%	12.5%
COPD	2.2%	2.5%	1.7%
Neurotic Disorders	2.5%	2.6%	2.3%
Schizophrenia	0.0%	0.0%	0.0%
Other Psychotic Disorders	0.2%	0.2%	0.3%
Substance Abuse	0.2%	0.3%	0.1%
Alcoholism	0.3%	0.4%	0.1%
Fibromyalgia	1.9%	2.0%	1.8%
Chronic Pain	0.8%	0.7%	1.1%
Comorbid MH condition	2.7%	2.8%	2.5%
Comorbid SA condition	0.4%	0.6%	0.2%
Comorbid MH/SA condition	3.1%	3.4%	2.7%
SIX-MONTHS-PRIOR COMORBIDITIES: PREVALENCE			
Diabetes	3.8%	3.8%	3.9%
CHF	0.4%	0.3%	0.5%
CAD	1.7%	1.7%	1.8%
Cancer	1.7%	1.4%	2.2%
Asthma	3.1%	3.0%	3.3%
Hypertension	8.0%	7.6%	8.7%
Stroke	0.6%	0.5%	0.8%
Arthritis	8.5%	8.3%	8.8%
COPD	1.6%	1.8%	1.4%
Neurotic Disorders	15.4%	15.5%	15.4%
Schizophrenia	0.1%	0.1%	0.1%
Other Psychotic Disorders	2.0%	2.3%	1.6%
Substance Abuse	1.2%	1.4%	0.7%
Alcoholism	1.3%	1.7%	0.6%
Fibromyalgia	1.3%	1.1%	1.5%
Chronic Pain	1.3%	1.0%	1.9%
Comorbid MH condition	17.0%	17.2%	16.7%
Comorbid SA condition	2.3%	2.9%	1.3%
Comorbid MH/SA condition	18.5%	19.1%	17.7%

FIGURE 8: COMBINATION COHORT COMORBID CONDITION PREVALENCE RATES (STRATIFIED BY PSYCHOTHERAPY DURATION)

	FULL SAMPLE	1-7 VISITS	8+ VISITS
Count	10,530	5,536	4,994
BASELINE COMORBIDITIES: PREVALENCE			
Diabetes	4.1%	4.4%	3.7%
CHF	0.3%	0.3%	0.3%
CAD	2.0%	2.1%	1.8%
Cancer	2.0%	2.2%	1.8%
Asthma	4.3%	4.0%	4.5%
Hypertension	8.9%	9.6%	8.2%
Stroke	0.5%	0.4%	0.5%
Arthritis	12.4%	12.4%	12.4%
COPD	2.2%	2.4%	2.0%
Neurotic Disorders	2.5%	2.7%	2.3%
Schizophrenia	0.0%	0.0%	0.0%
Other Psychotic Disorders	0.2%	0.2%	0.2%
Substance Abuse	0.2%	0.1%	0.3%
Alcoholism	0.3%	0.3%	0.3%
Fibromyalgia	1.9%	1.9%	1.9%
Chronic Pain	0.8%	0.9%	0.8%
Comorbid MH condition	2.7%	2.8%	2.5%
Comorbid SA condition	0.4%	0.4%	0.5%
Comorbid MH/SA condition	3.1%	3.2%	2.9%
SIX-MONTHS-PRIOR COMORBIDITIES: PREVALENCE			
Diabetes	3.8%	4.1%	3.5%
CHF	0.4%	0.4%	0.3%
CAD	1.7%	2.0%	1.5%
Cancer	1.7%	1.9%	1.5%
Asthma	3.1%	3.0%	3.2%
Hypertension	8.0%	8.5%	7.5%
Stroke	0.6%	0.7%	0.5%
Arthritis	8.5%	8.5%	8.5%
COPD	1.6%	1.5%	1.7%
Neurotic Disorders	15.4%	13.3%	17.8%
Schizophrenia	0.1%	0.1%	0.1%
Other Psychotic Disorders	2.0%	2.0%	2.0%
Substance Abuse	1.2%	1.1%	1.3%
Alcoholism	1.3%	1.1%	1.4%
Fibromyalgia	1.3%	1.2%	1.3%
Chronic Pain	1.3%	1.5%	1.2%
Comorbid MH condition	17.0%	14.9%	19.3%
Comorbid SA condition	2.3%	2.0%	2.5%
Comorbid MH/SA condition	18.5%	16.3%	21.0%

These tables show that within a treatment cohort, there is little difference in the long-term (six to 18 months pretreatment) prevalence rate of these conditions across various durations of treatment. However, there are several notable differences between:

- The near-term (zero to six months pretreatment) prevalence rates of comorbid *behavioral* conditions are much higher than the long-term (six to 18 months pretreatment) prevalence rates of those same conditions within each cohort. This is in spite of a shorter period of time over which to observe the conditions. This is potentially an indication that depression frequently co-occurs with other behavioral conditions, and the conditions begin to manifest themselves prior to the beginning of treatment for (or formal diagnosis of) depression.

- Across cohorts, there are differences in the prevalence rates of the behavioral comorbidities. In the psychotherapy-only cohort, 1.8% of cohort members had a comorbid behavioral condition in the period six to 18 months before treatment. In the pharmacotherapy-only cohort, the comparable value is 7.4%. In the combination cohort, the prevalence rate is in between those two values (3.1%). Differences between cohorts are relatively minor for prevalence of the medical (non-behavioral) comorbidities.

- When stratifying by psychotherapy treatment duration (in either the psychotherapy-only or combination cohorts), members who had more treatment persistence had a higher prevalence rate of comorbid behavioral conditions during the six-month period immediately preceding the start of psychotherapy. In other words, more persistent patients are more likely to have additional behavioral conditions observed during the period immediately prior to the start of treatment (and may therefore represent more complex patients).

TREATMENT CHARACTERISTICS

An important question is the way in which some members are more persistent in their treatments than others. For example, a member could be more persistent by attending psychotherapy at shorter intervals between visits (more intense treatment). Alternatively, a member could be more persistent by attending psychotherapy for a longer period of time (longer-lasting treatment). The table in Figure 9 shows that members are, on average, treated with similar intensity (measured by days between visits). More persistent members continue psychotherapy for a much longer period of time.

FIGURE 9: THERAPY INTERVALS (PSYCHOTHERAPY-ONLY COHORT)

	MEAN TREATMENT DURATION (WEEKS)	MEAN TREATMENT INTERVAL (EAYS)
Full sample (N=32,650)	**15.3**	**14.5**
1-4 visits (N=16,860)	**3.3**	**13.1**
5-7 visits (N=5,362)	**12.4**	**17.9**
1-7 visits (N=22,222)	**5.5**	**14.2**
8+ visits (N=10,428)	**36.3**	**15.0**

For pharmacotherapy, we investigated whether there are differences in the number of different antidepressant drugs used by persistent members compared to nonpersistent members. As the table in Figure 10 shows, members with persistent pharmacotherapy tended to use more unique antidepressant drugs, in addition to a longer total duration of therapy.

FIGURE 10: PRESCRIPTION PATTERNS (PHARMACOTHERAPY-ONLY COHORT)

	PERSISTENT	NOT PERSISTENT
1 unique antidepressant	65%	86%
2 unique antidepressants	25%	13%
3 unique antidepressants	7%	2%
4 unique antidepressants	2%	<1%
>4 unique antidepressants	1%	<1%
Mean days supply	434	69

COST OUTCOMES

We analyzed healthcare cost data for each treatment cohort to estimate whether there is a difference between healthcare cost growth changes following the conclusion of persistent depression treatment and healthcare cost changes following the conclusion of non-persistent treatment. After conducting this comparison for the three treatment cohorts listed above, we performed the analysis on subsets of the population with particular comorbid medical conditions. This section presents the results of our analyses. The next section will provide a more in-depth discussion of the implications of our results.

COSTS FOR ALL TREATMENT COHORT MEMBERS

The tables in Figures 11-14 present per member per month (PMPM) healthcare costs (trended to 2011 levels, and including prescription drugs) for the three treatment cohorts. The tables present PMPM costs for several time intervals: pretreatment, during treatment, and post-treatment of depression. The ratios at the bottom of the tables compare the weighted average ratios of PMPM costs between the time periods indicated.

FIGURE 11: SUMMARY OF PMPM COSTS: PHARMACOTHERAPY-ONLY COHORT

	FULL SAMPLE	1-179 DAYS	180+ DAYS
Count	34,699	21,820	12,879
PMPM: PRETREATMENT			
Average	$489	$471	$522
Median	$235	$220	$258
PMPM: DURING TREATMENT			
Average	$840	$949	$810
Median	$340	$319	$380
PMPM: POST-TREATMENT			
Average	$569	$549	$603
Median	$278	$255	$320
PMPM Ratio: During/Pre-	1.72	2.02	1.55
PMPM Ratio: Post-/During	0.68	0.58	0.74
PMPM Ratio: (During + Post-)/Pre-	1.24	1.21	1.26
PMPM Ratio: Post-/Pre-	1.16	1.17	1.15

FIGURE 12: SUMMARY OF PMPM COSTS: PSYCHOTHERAPY-ONLY COHORT

	FULL SAMPLE	1-7 VISITS	8+ VISITS
Count	32,650	22,222	10,428
PMPM: PRETREATMENT			
Average	$332	$337	$323
Median	$132	$133	$130
PMPM: DURING TREATMENT			
Average	$667	$690	$660
Median	$562	$670	$449
PMPM: POST-TREATMENT			
Average	$361	$362	$360
Median	$153	$153	$155
PMPM Ratio: During/Pre-	2.01	2.05	2.04
PMPM Ratio: Post-/During	0.54	0.52	0.55
PMPM Ratio: (During + Post-)/Pre-	1.15	1.10	1.26
PMPM Ratio: Post-/Pre-	1.09	1.07	1.11

FIGURE 13: SUMMARY OF PMPM COSTS: COMBINATION COHORT (STRATIFIED BY ANTIDEPRESSANT DURATION)

	FULL SAMPLE	1-179 DAYS	180+ DAYS
Count	10,530	6,350	4,180
PMPM: PRETREATMENT			
Average	$445	$414	$494
Median	$199	$189	$219
PMPM: DURING TREATMENT			
Average	$1,016	$1,105	$969
Median	$539	$535	$542
PMPM: POST-TREATMENT			
Average	$505	$484	$539
Median	$222	$199	$256
PMPM Ratio: During/Pre-	2.29	2.67	1.96
PMPM Ratio: Post-/During	0.50	0.44	0.56
PMPM Ratio: (During + Post-)/Pre-	1.37	1.36	1.35
PMPM Ratio: Post-/Pre-	1.14	1.17	1.09

FIGURE 14: SUMMARY OF PMPM COSTS: COMBINATION COHORT (STRATIFIED BY PSYCHOTHERAPY DURATION)

	FULL SAMPLE	1-7 VISITS	8+ VISITS
Count	10,530	5,536	4,994
PMPM: PRETREATMENT			
Average	$445	$451	$437
Median	$199	$203	$194
PMPM: DURING TREATMENT			
Average	$1,016	$979	$1037
Median	$539	$453	$625
PMPM: POST-TREATMENT			
Average	$505	$501	$511
Median	$222	$218	$224
PMPM Ratio: During/Pre-	2.29	2.17	2.37
PMPM Ratio: Post-/During	0.50	0.51	0.49
PMPM Ratio: (During + Post-)/Pre-	1.37	1.26	1.48
PMPM Ratio: Post-/Pre-	1.14	1.11	1.17

All cohorts exhibit a pattern where PMPM costs are higher during treatment than either pre- or post-treatment. This can be attributed both to the cost of the treatment itself and also to the generally worse health status of patients whose depression requires active treatment. When stratified by antidepressant persistence (Figures 11 and 13), more persistence is associated with somewhat lower cost growth from pre- to post-treatment. When stratified by psychotherapy persistence (Figures 12 and 14), PMPM costs grow somewhat more from pre- to post-treatment for members with persistent treatment compared to members with nonpersistent treatment.

COSTS FOR POPULATION SUBSETS OF INTEREST

The tables in Figures 5-8 above presented prevalence rates of various medical and behavioral comorbidities for members of the three cohorts. We replicated the cost analysis from the tables in Figures 11-14 in order to determine if the impact of persistent treatment is different among people also diagnosed with certain of these comorbid conditions. The table in Figure 15 is a summary of our most important cost metric: ratio of PMPM costs post-treatment to PMPM costs pretreatment.

FIGURE 15: SUMMARY OF PMPM RATIOS (POST-TREATMENT TO PRETREATMENT)

	PHARMACOTHERAPY-ONLY COHORT		PSYCHOTHERAPY-ONLY COHORT		COMBINATION COHORT			
					ANTIDEPRESSANT PERSISTENCE		PSYCHOTHERAPY PERSISTENCE	
CONDITION	PERSISTENT (180+ DAYS) PERSISTENT	NOT PERSISTENT (1-179 DAYS)	PERSISTENT (8+ VISITS) PERSISTENT	NOT PERSISTENT (1-7 VISITS)	PERSISTENT (180+ DAYS) PERSISTENT	NOT PERSISTENT (1-179 DAYS)	PERSISTENT (8+ VISITS) PERSISTENT	NOT PERSISTENT (1-7 VISITS)
Asthma	1.09	1.16	0.89	1.03	1.08	1.13	1.26	1.00
p-value of difference	0.26		0.07*		0.37		0.08*	
Arthritis	1.07	1.17	1.02	1.04	0.95	1.15	1.08	1.03
p-value of difference	0.03**		0.43		0.04**		0.34	
Hypertension	1.08	1.11	1.19	1.08	1.17	1.22	1.15	1.23
p-value of difference	0.36		0.19		0.34		0.27	
Diabetes	0.99	1.26	0.97	1.02	1.21	1.23	1.09	1.33
p-value of difference	0.01**		0.36		0.47		0.08*	
Any MH/SA condition	1.17	1.12	1.05	0.95	1.02	1.07	1.10	1.00
p-value of difference	0.22		0.10*		0.33		0.17	
No MH/SA condition	1.15	1.20	1.15	1.10	1.15	1.24	1.23	1.18
p-value of difference	0.11		0.18		0.09*		0.24	
Any non-MH/SA condition	1.09	1.14	1.07	1.05	1.06	1.14	1.14	1.08
p-value of difference	0.11		0.34		0.16		0.23	
No non-MH/SA conditions	1.32	1.24	1.23	1.17	1.20	1.23	1.26	1.18
p-value of difference	0.05**		0.18		0.38		0.16	

* Significant at 10%

** Significant at 5%

P-values shown in Figure 15 were calculated using bootstrap techniques to estimate the standard error of the difference between the PMPM cost ratios for persistent and non-persistent members. All p-values shown are one-sided. To illustrate the meaning of the p-value, consider the diabetes subgroup in the pharmacotherapy-only cohort. In this population, persistently treated members exhibited a 1% reduction in PMPM cost (ratio = 0.99) while non-persistently treated members exhibited a 26% increase in PMPM cost (ratio = 1.26). The one-sided p-value for the difference between these ratios is 0.01. This means that if the true difference between persistently treated and non-persistently treated members was zero, there would only be a 1% chance of observing a difference in the two ratios as large as 0.27.

The results show that persistent pharmacotherapy use is associated with slower growth in total spending for members with a number of chronic medical conditions (asthma, arthritis, hypertension, diabetes, and the other chronic conditions listed in the tables in Figures 5-8). This is true both for people who receive no psychotherapy (pharmacotherapy-only cohort) and those who receive psychotherapy in addition to pharmacotherapy (combination cohort). For members with comorbid behavioral disorders, we observe larger cost growth associated with persistent treatment. The latter result may be due to the fact that members who remain in pharmacotherapy longer do so because they have greater disease severity.

There is little difference in average cost growth for persistent and non-persistent members who are treated with psychotherapy only. The difference between the ratios has a low level of statistical significance for all comorbidity subgroups except for asthma (p = 0.07), where persistently treated members exhibit slower cost growth, and members with any other behavioral condition (p = 0.10), where

persistently treated members exhibit higher cost growth. The latter result may be due to the fact that members who remain in psychotherapy longer do so because they have greater disease severity.

The combination cohort has several interesting results. This cohort can be classified based on members' persistence for their psychotherapy treatments or based on their persistence for their pharmacological treatments. In many comorbidity subgroups, persistent pharmacological treatment is associated with lower cost growth while the opposite is true for persistent psychotherapy treatment (arthritis patients are an example).

DISCUSSION

The tables above present a variety of information about characteristics of patients undergoing various courses of depression treatment and the cost outcomes of those different courses of treatment. The objective of this study is to analyze the impact of treatment persistence on healthcare cost outcomes—in other words, to determine whether depressed patients who "stick with" a course of treatment incur relatively higher or lower costs after the end of treatment than patients who end treatment early (based on the definitions used in this study). This section will discuss the results of the study in more detail, followed by important caveats on the limitations of our research, and suggestions for future studies.

SELECTION OF TREATMENT PATH

Prior research has indicated that most depression patients do not receive recommended treatment; a 2005 study estimated that 38% of major depression patients and 41% of dysthymia patients receive minimally adequate treatment. Information from our study is consistent with this finding. Less than one-third of members in the psychotherapy-only cohort have persistent treatment, and more than half attend four or fewer psychotherapy visits. Approximately 37% of members in the pharmacotherapy-only cohort have persistent treatment. In the combination cohort (members with both some psychotherapy and some pharmacotherapy treatments), persistence rates are under 50% for each type of treatment.

Researchers have proposed definitions for "minimally adequate treatment" (as discussed above), which is due to the fact that it is difficult to adequately treat depression with very few psychotherapy visits or with very short-term antidepressant therapy. That so many people receive short-term care suggests that their depressions are unlikely to be treated adequately. Moreover, psychotherapy and antidepressants are costly, resulting in a significant amount of ineffectively used resources when patients do not improve. Money spent on treatment that is too short in duration to adequately address depression is money not well spent.

The tables in Figures 1-8 above provide a number of insights into who follows what treatment path. Antidepressant users are, on average, a bit older, more likely to be female, and more likely to live in a rural area than are psychotherapy users. The urban/rural differences can be partially explained by access to care. In many rural areas, there are few or no mental health specialists available. For example, a 2007 study reports that in Montana, Idaho, North Dakota, and South Dakota, there are no practicing psychiatrists in the vast majority of counties. Mental healthcare in rural areas is more likely to be provided by nonspecialists. Antidepressants, however, are available at any pharmacy and do not require access to specialty medical care (psychiatrists). However, as the National Comorbidity Survey demonstrated, treatment adequacy is far lower when provided in the general medical sector than in the behavioral specialty sector.

Within each treatment cohort, the prevalence rates of most of the comorbidities displayed in the tables in Figures 5-8 exhibit little variation across the different levels of treatment persistency. However, there is a sharp difference in the prevalence rate of behavioral conditions when examining the six-month period immediately before treatment begins compared to the year prior. This suggests that, in many cases, the decision to begin depression treatment comes soon after the onset (or at least the initial diagnosis) of a different behavioral condition. Moreover, for psychotherapy, attending more visits is associated with a higher prevalence of behavioral comorbidities during the six months immediately prior to treatment. The longer therapy duration for patients with comorbid behavioral conditions may be due to the higher level of clinical complexity of these patients compared to a patient with depression and no other behavioral condition.

COST OUTCOMES

The last rows of the tables in Figures 11-14 display the weighted average ratio of PMPM costs post-treatment to PMPM costs pretreatment. To illustrate the mechanics behind this calculation, consider the example shown in Figure 16 (taken from the psychotherapy-only cohort, 1-7 visits):

FIGURE 16: EXAMPLE OF CALCULATION OF WEIGHTED AVERAGE PMPM RATIO

	PRETREATMENT	POST-TREATMENT
Member months	**602,834**	**974,439**
Total costs	**$203,444,682**	**$352,533,280**
Weighted average PMPM	**$337.48**	**$361.78**
Ratio	**1.07 = $361.78/$337.48**	

Comparing this weighted average ratio for the portion of a treatment cohort with persistent treatment to the portion of the cohort with nonpersistent treatment is an estimate of the impact of persistence of treatment on post-treatment costs. For example, in the pharmacotherapy-only cohort, members with persistent treatment have a cost ratio of 1.15, while members with nonpersistent treatment have a cost ratio of 1.17. This indicates that, in this population, PMPM cost for persistently treated members grew at a slightly slower rate than it grew for nonpersistently treated members. Results for the complete cohorts were mixed. In some cases (pharmacotherapy-only, combination cohort stratified by antidepressant duration), persistent treatment was associated with lower cost growth. In other treatment cohorts (psychotherapy-only, combination cohort stratified by psychotherapy duration), persistent treatment was associated with a higher growth rate in cost. We suggest two hypotheses that may explain these results:

- As with most healthcare cost analyses, the means exceed the medians in the cost tables above. In other words, the relatively small number of members with high healthcare costs tends to pull the mean up without having much influence on the median. The results may differ if we exclude members from the analysis who are otherwise relatively healthy (because any percentage movement in their PMPM costs represents relatively few dollars). We address this issue by analyzing subsets of the population who have been diagnosed with various comorbidities. A summary of that analysis is presented above in Figures 13 and 14, and is discussed in more detail below.

- While we are able to measure *persistence* of treatment, it is not possible in a retrospective claims analysis to measure *quality* or *effectiveness* of psychotherapy or pharmacotherapy use. Some members may appear to be persistent but receive poor quality care and exhibit higher healthcare costs as a result. Others may utilize fewer psychotherapy visits, adequately manage their depression in fewer than eight visits, and exhibit lower growth in healthcare costs as a result. Similarly, antidepressants can be taken for an appropriate amount of time but be taken at suboptimal doses. Also, as is the case with most drug classes, some patients respond better to antidepressants than others; persistent treatment is not a guarantee of success. It may be the case that *effectiveness* of care (whether through psychotherapy or antidepressants or both) is a more important driver of cost trends than *quantity* of care. Choosing the right drug for each patient can take time—symptoms, side effects, interactions with other medications, and other health conditions will be different for each patient and can significantly influence the effectiveness of particular drugs.[34] In the end, however, treatment for depression shouldn't differ that much from other chronic conditions; the overall goal is to relieve symptoms, which requires regular monitoring of the patient's condition.[35]

Analysis of subsets of the cohorts (based on comorbidity profiles) yielded some interesting results that differed in many cases from the results on the entire cohorts. PMPM cost ratios from this analysis are shown above in the table in Figure 15. Of particular note are asthma, arthritis, hypertension, and diabetes. For most cohorts, persistent treatment is associated with lower PMPM cost growth for members with these costly, chronic medical conditions.

Caution should be used when drawing conclusions from these results. In particular, it is almost always the case that persistently treated members received treatment for a longer period of time than nonpersistently treated members (as discussed above). One possible explanation is that persistent treatment could better help patients cope with and manage their chronic medical conditions, resulting in lower rates of cost growth.

LIMITATIONS OF THIS RESEARCH

A retrospective claims data analysis allows for a study of a large population under real-world conditions. There are, however, several limitations of this type of study. First, it is impossible to randomly assign members to undergo a particular course of treatment (as is possible, for example, in a clinical trial). While we can observe what course of treatment was chosen and what the outcomes were, there may be unobserved characteristics that contributed both to the decision to undergo that course of treatment and to the outcomes. Second, our ability to describe members' clinical characteristics is limited to the variables typically used to process health insurance claims. ICD-9 diagnosis codes do not always fully describe the spectrum of disease severity that can be present in a patient; for example, two patients may have the same diagnosis code for arthritis, but it is possible that one patient's arthritis is much more severe than the other's. Certain health status information that could be valuable is unavailable in a claims database (e.g., height, weight, blood pressure, lab test results).

The methods used in this report are well suited to detect associations and correlations between variables (such as treatment persistence and cost outcomes). A retrospective claims analysis—which does not provide access to medical records and does not allow for random assignment of study members to a treatment cohort—cannot directly measure causation. For example, we cannot know why some members terminate treatment earlier than others. A study with access to this type of information (which is not available in claims records) would be valuable.

Relying on costs as an outcome makes much sense from the perspective of a health plan or employer. However, even though reduced healthcare costs can be a benefit of effective management of depression, the immediate goal of depression treatment is not cost reduction; it is the reduction in symptoms and better management of depression. A claims database cannot easily tell us the severity of a patient's depression, either before or after treatment.

WHERE TO GO FROM HERE

We believe this report suggests several important topics for future research:

- Measure the impact of treatment persistence on reduction in depression symptoms in a study with access to detailed patient records and the ability to prospectively direct members' courses of treatment,. Results of simple screening tools such as the PHQ-9 questionnaire could be used as the principal outcome variable.

- Quantify the impact of reduced depression symptoms on healthcare costs. In this study, the *input* would be more directly related to quality of care than to quantity (persistence). In effect, it would be a study of the impact of effective depression treatment on healthcare costs, which is not always synonymous with more depression treatment.

- The Mental Health Parity and Addiction Equity Act of 2008 (MHPAEA) imposed new restrictions on health plans' ability to impose limits on outpatient visits and inpatient stays, and it required lowering (or sometimes eliminating) member cost sharing for behavioral health services. This law, which became effective for most plans starting in 2010, may result in different levels of treatment persistence than those observed in our study (which relies upon data from prior to the effective date of the MHPAEA). In particular, there may be members in our study cohorts who ended treatment because of the exhaustion of insured benefits or who were deterred from continuing treatment because of high cost-sharing levels. Further research should examine the impact of MHPAEA on treatment persistence.

- This study does not attempt to identify differences in persistence rates or cost outcomes between members treated by different provider specialties (e.g., primary care physicians, psychologists, psychiatrists), to compare one antidepressant to another, or to investigate the impact on special populations such as children or pregnant women. Such research could be a useful follow-up to our analysis.

- Treatment with both pharmacotherapy and psychotherapy is supported by treatment guidelines, but our data show that it is the least common type of treatment for depression. Further research can attempt to

identify the obstacles that prevent more people from receiving a combination of pharmacotherapy and psychotherapy treatment.

- Similar analyses could be performed for other behavioral health conditions, such as anxiety.

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QUALIFICATIONS

Guidelines issued by the American Academy of Actuaries require actuaries to include their professional qualifications in all actuarial communications. The authors of this report, Steve Melek, FSA, Michael Halford, ASA, and Daniel Perlman, ASA, are members of the American Academy of Actuaries, and meet the qualification standards for performing the analyses in this report.

APPENDIX A: PSYCHOTHERAPY DEFINITION

LIST OF REVENUE AND CPT/HCPCS CODES

CODE	CODE TYPE	DESCRIPTION
0900	Revenue code	Behavior Health Treatments/Services - general classification
0902	Revenue code	Behavior Health Treatments/Services-milieu therapy
0903	Revenue code	Behavior Health Treatments/Services-play therapy
0904	Revenue code	Behavior Health Treatments/Services-activity therapy
0905	Revenue code	Behavior Health Treatments/Services-intensive outpatient services-psychiatric
0906	Revenue code	Behavior Health Treatments/Services-Intensive outpatient services-chemical dependency
0907	Revenue code	Behavior Health Treatments/Services-community behavioral health program (day treatment)
0909	Revenue code	Behavior Health Treatments/Services: Other
0910	Revenue code	Behavioral Health Treatment/Services - extension of general classification
0911	Revenue code	Behavioral Health Treatment/Services-rehabilitation
0912	Revenue code	Behavioral Health Treatment/Services - partial hospitalization - less intensive
0913	Revenue code	Behavioral Health Treatment/Services - partial hospitalization - intensive
0914	Revenue code	Behavioral Health Treatment/Services-individual therapy
0915	Revenue code	Behavioral Health Treatment/Services-group therapy
0916	Revenue code	Behavioral Health Treatment/Services-family therapy
0917	Revenue code	Behavioral Health Treatment/Services-bio feedback
0918	Revenue code	Behavioral Health Treatment/Services-testing
0919	Revenue code	Behavioral Health Treatment/Services-other
0944	Revenue code	Other therapeutic services-drug rehabilitation
0945	Revenue code	Other therapeutic services-alcohol rehabilitation
G0176	Procedure code	OPPS/PHP; activity therapy
G0177	Procedure code	OPPS/PHP; train & educational services
M0064	Procedure code	Visit for drug monitoring
S9475	Procedure code	Ambulatory setting substance
S9480	Procedure code	Intensive outpatient psychiatric
S9482	Procedure code	Family stabilization 15 min
S9484	Procedure code	Crisis intervention per hour
S9485	Procedure code	Crisis intervention mental health
H0001	Procedure code	Alcohol and/or drug assessment
H0002	Procedure code	Alcohol and/or drug screening
H0003	Procedure code	Alcohol and/or drug screening
H0004	Procedure code	Alcohol and/or drug services
H0005	Procedure code	Alcohol and/or drug services
H0006	Procedure code	Alcohol and/or drug services
H0007	Procedure code	Alcohol and/or drug services
H0012	Procedure code	Alcohol and/or drug services
H0013	Procedure code	Alcohol and/or drug services
H0014	Procedure code	Alcohol and/or drug services
H0015	Procedure code	Alcohol and/or drug services
H0016	Procedure code	Alcohol and/or drug services
H0022	Procedure code	Alcohol and/or drug intervention
H0023	Procedure code	Alcohol and/or drug outreach
H0026	Procedure code	Alcohol and/or drug prevention
H0028	Procedure code	Alcohol and/or drug prevention
H0029	Procedure code	Alcohol and/or drug prevention
H0030	Procedure code	Alcohol and/or drug hotline

APPENDIX A: PSYCHOTHERAPY DEFINITION (CONTINUED)

LIST OF REVENUE AND CPT/HCPCS CODES

CODE	CODE TYPE	DESCRIPTION
H0031	Procedure code	MH health assess by non-md
H0032	Procedure code	MH svc plan development by non-md
H0036	Procedure code	Community psychiatric face-face per 15 min
H0037	Procedure code	Community psychiatric support treatment program per diem
H0038	Procedure code	Self-help/peer service per 15 min
H0039	Procedure code	Asser com treatment face-face/15 min
H0046	Procedure code	Mental health service, not otherwise specified
H0047	Procedure code	Alcohol/drug abuse service, not otherwise specified
H0050	Procedure code	Alcohol/drug service 15 min
H1000	Procedure code	Prenatal care at risk assessment
H1001	Procedure code	Antepartum management
H1002	Procedure code	Care coordination prenatal
H1003	Procedure code	Prenatal at risk education
H1004	Procedure code	Follow up home visit/prenatal
H1005	Procedure code	Prenatal care enhanced service pack
H2015	Procedure code	Comp community support service, 15 min
H2016	Procedure code	Comp community support service, per diem
H2017	Procedure code	Psychosocial rehab service, per 15 min
H2018	Procedure code	Psychosocial rehab service, per diem
H2019	Procedure code	Therapeutic behavioral service, per 15 min
H2020	Procedure code	Therapeutic behavioral service, per diem
H2021	Procedure code	Com wrap-around service, 15 min
H2022	Procedure code	Com wrap-around service, per diem
H2027	Procedure code	Psycho educational service, per 15 min
H2033	Procedure code	Multisystem therapeutic/juvenile 15min
H2035	Procedure code	A/D treatment program, per hour
H2036	Procedure code	A/D treatment program, per diem
H2037	Procedure code	Developmental delay prevention activities dependent child, 15 min
90804-90911 (excl. 90862)	Procedure codes	Codes for: • Insight Oriented, Behavior Modifying and/or Supportive Psychotherapy • Interactive Psychotherapy • Other Psychotherapy • Other Psychiatric Services or Procedures (excl. pharmacologic management) • Biofeedback

APPENDIX B – DEPRESSION DEFINITION

DEFINITION OF DEPRESSION	
ICD-9 CODE	**DESCRIPTION**
296.2x	**Major Depressive Disorder, Single Episode**
296.3x	**Major Depressive Disorder, Recurrent Episode**
300.4	**Dysthymic Disorder**
311	**Depressive Disorder, Not Elsewhere Classified**

NOTES

1 Pezalla, Edmund J. (February 2007). Depression: A misunderstood companion to chronic illness. *Employee Benefit Plan Review*, pp. 26-27.

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7 Wang, Philip S., Lane, Michael, Olfson, Mark, et al. (June 2005). Twelve-month use of mental health services in the United States. *Archives of General Psychiatry*, vol. 62 p. 632.

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9 American Psychiatric Association (October 2010). *Practice Guideline for the Treatment of Patients With Major Depressive Disorder, Third Edition*. Retrieved May 31, 2012, from http://psychiatryonline.org/content.aspx?bookid=28&sectionid=1667485.

10 Wang, Lane & Olfson, ibid., p. 630.

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12 PPACA, section 1302.

13 U.S. Preventive Services Task Force (August 2010). USPSTF A and B Recommendations. Retrieved May 31, 2012, from http://www.uspreventiveservicestaskforce.org/uspstf/uspsabrecs.htm.

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15 Beck, Melinda (August 9, 2011). Confusing medical ailments with mental illness. *Wall Street Journal*. Retrieved May 31, 2012, from http://online.wsj.com/article/SB10001424053111904480904576496271983911668.html?mod=WSJ_hpp_MIDDLE_Video_second#articleTabs%3Darticle.

16 Lichtman, Judith H., Bigger, J. Thomas, Jr., Blumenthal, James A. et al. (2008). Depression and coronary heart disease. Circulation, Vol. 118, pp. 1768-75.

17 Katon, Wayne & Ciechanowski, Paul (2002). Impact of major depression on chronic medical illness. *Journal of Psychosomatic Research*, Vol. 53, pp. 859-963.

18 Dimsdale, Joel E. (February 19, 1997). Symptoms of anxiety and depression as precursors to hypertension. *JAMA*, 277:7: 574-75.

19 Chapman, Daniel P., Perry, Geraldine S., & Strine, Tara W. (December 15, 2004). The vital link between chronic disease and depressive disorders. *Preventing Chronic Disease* 2(1): A14. Retrieved May 31, 2012, from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1323317/.

20 Edge, Leonard E., Zheng, Deyi, & Simpson, Kit (March 2002). Comorbid depression is associated with increased health care use and expenditures in individuals with diabetes. Diabetes Care, 25:3, pp. 464-70.

21 Chapman et al., 2004, ibid.

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28 2008 Red Book [database]. Greenwood Village, Colo: Thomson Reuters (Healthcare) Inc.

29 Ani, Chizobam, Bazargan, Mohsen, Hindman, David et al. (2008). Depression symptomatology and diagnosis: Discordance between patients and physicians in primary care settings. *BMC Family Practice* 9:1.

30 Members with only one visit are excluded from the "Mean Treatment Interval" column, because an interval requires at least two visits. Members with only one visit have a treatment duration of one day. This is part of the reason that the 1-4 and 1-7 visit rows in Figure 9 are so much lower than the 5-7 and 8+ rows.

31 In this table, a "non-MHSA *condition*" is any of the non-MH/SA conditions listed in Figures 5-8.

32 Wang, Lane & Olfson, ibid., p. 635.

33 Cook, Ann Freeman & Hoas, Helena (November/December 2007). Hide and seek: The elusive rural psychiatrist. *Academic Psychiatry*, 31:6, pp. 419-422.

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36 ICD-9 diagnosis codes are available on claims data. We used several codes to define depression, as shown in Appendix B. One could argue that some of these codes represent greater degrees of severity than others (for example, 296.24, "Recurrent, severe, psychotic depression" could be considered more severe than 300.4, "Dysthymic disorder"). However, this is problematic for several reasons. First, a provider's ability to be reimbursed for a service is often not closely tied to the diagnosis code written on a claim; thus, there is often less precision with recording diagnoses than with recording procedure codes (which are closely tied to reimbursement). Additionally, the most common way to record depression in our data is with the relatively imprecise code 311, "Depressive disorder, not elsewhere classified."

37 The PHQ-9 is a screening tool developed by researchers at Columbia University and Indiana University, supported by a grant from Pfizer.
See http://www.phqscreeners.com/overview.aspx (accessed May 31, 2012).

1400 Wewatta Street
Suite 300
Denver, CO 80202-5549
USA
+1 303 299 9400 tel

milliman.com