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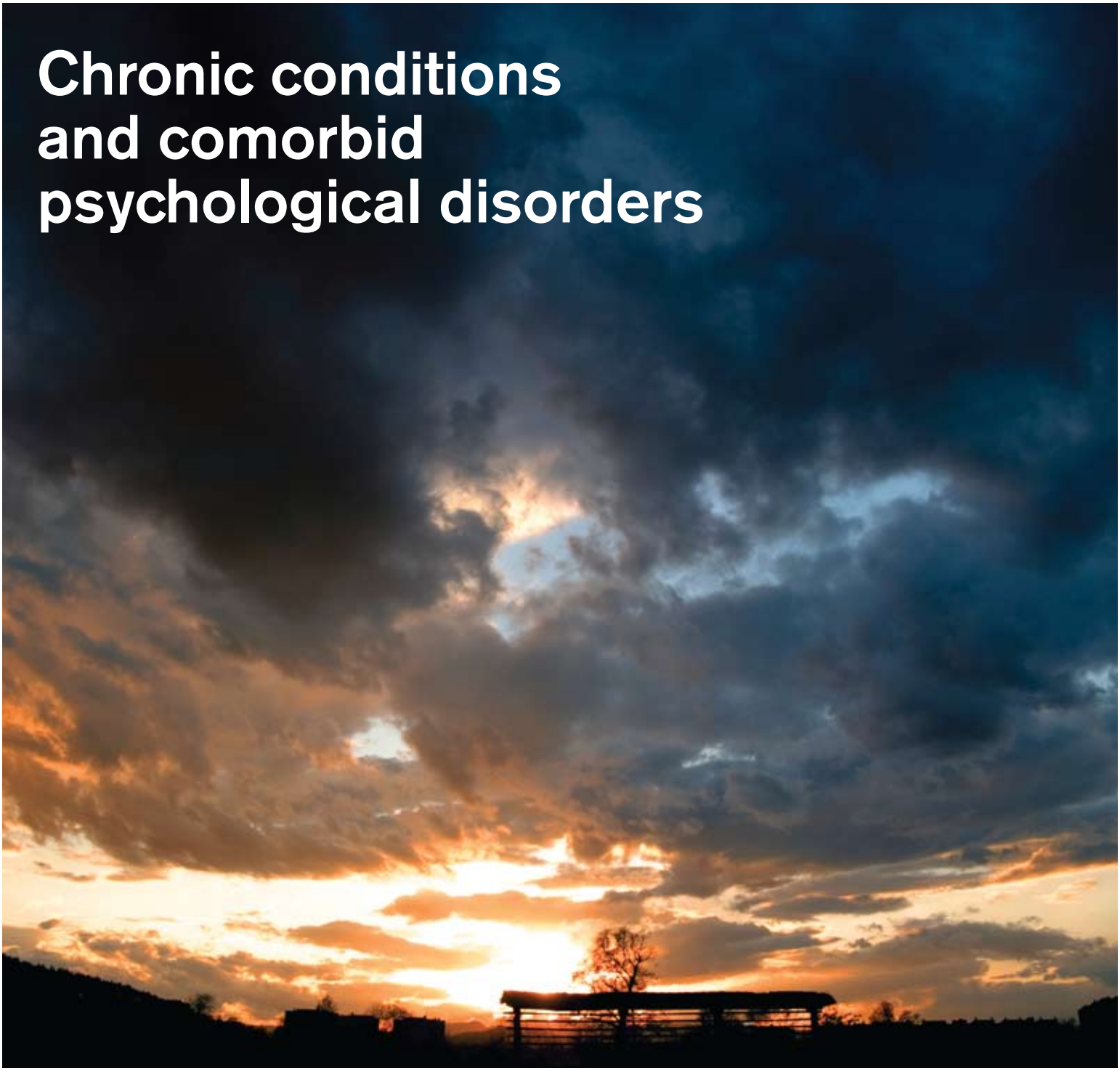
Chronic conditions and comorbid psychological disorders



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INTRODUCTION

In the current environment of continually escalating healthcare costs, payers are desperately looking for opportunities to improve the health of their insured members and keep their healthcare costs under control. There has been an increased focus on effective diagnosis of behavioral illnesses along with effective delivery of behavioral healthcare in recent years:

- *Surgeon General's Report on Mental Health* (U.S. Department of Health and Human Services, 1999). The first-ever Surgeon General's report on behavioral health presented the evidence to support a wide range of effective treatment modalities.
- *President's New Freedom Commission Report on Mental Health: Achieving the Promise–Transforming Mental Health Care in America* (U.S. Department of Health and Human Services, July 2003). This task force, established by the president, examined the failings and successes of the public mental healthcare system and established six goals for improving behavioral healthcare in the United States.
- *Improving the Quality of Healthcare for Mental and Substance Abuse Conditions* (Quality Chasm Series, The Institute of Medicine, November 2005). This report describes a multifaceted and comprehensive strategy for ensuring access, improving quality, and expanding mental-health and substance-abuse treatment services.

Quality of care has been a major concern among both employers and beneficiaries. Unfortunately, the quality of behavioral healthcare delivered in the United States is highly uneven, with many receiving inadequate treatment, if any treatment at all:

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- In 2004, the National Survey on Drug Use and Health found that 5.1% of all adults in the United States (10.8 million people) reported they had an unmet need for mental healthcare resulting from insufficient, interrupted, and/or delayed treatment.
- The Center for Mental Health Services estimates that two-thirds of children and adolescents who need mental-health services do not receive them.
- The National Comorbidity Survey Replication (NCS-R) found that only 32.7% of patients treated for a behavioral disorder receive adequate treatment. In fact, only 12.7% treated in the general medical sector received minimally adequate treatment, and even in the specialty mental-health sector, only 43.9% treated received minimally effective treatment.

Studies continue to emerge that suggest that patients with depression have a higher burden of medical illness than people without depression. Some report 40% or more of high utilizers of healthcare have depression, anxiety, or dysthymia. Yet most care-management programs continue to separate medical and behavioral healthcare.

Is there a significant opportunity for payers in the area of medical-behavioral integration? In this report, we analyze the cost impact of comorbid depression and anxiety on commercially insured patients with certain chronic medical conditions. We identify potential opportunities for reductions in healthcare and other employer costs, and improved clinical outcomes, if the U.S. healthcare delivery system could improve upon some of the poor results described above.

COMORBID DEPRESSION PREVALENCE

Ten chronic medical conditions were chosen for analysis in this study:

- Arthritis
- Hypertension
- Chronic pain
- Diabetes mellitus
- Asthma
- Ischemic heart disease (IHD)
- Chronic obstructive pulmonary disorder (COPD)
- (Malignant) cancer
- Congestive heart failure (CHF)
- Stroke

The identification criteria we used for these chronic conditions (diagnosis codes and prescriptions filled) are listed in Appendix C. The claims data analyzed was from our Medstat claims database during 2005–2006. We developed comorbid depression-treatment prevalence rates for each of the chronic medical conditions and compared them to expected depression prevalence rates from the scientific literature in Figure 1.

FIGURE 1: COMORBID PREVALENCE RATES

CHRONIC MEDICAL CONDITION	COMORBID DEPRESSION PREVALENCE	
	TREATED	EXPECTED
ARTHRITIS	21.90%	25.00%
HYPERTENSION	20.20%	22.50%
CHRONIC PAIN	46.70%	50.00%
DIABETES MELLITUS	21.30%	25.00%
ASTHMA	16.40%	45.00%
IHD	22.40%	35.00%
COPD	24.80%	30.00%
CANCER	20.30%	30.00%
CHF	28.40%	35.00%
STROKE	29.70%	40.00%

Many individuals with chronic medical conditions and co-occurring depression or anxiety are never diagnosed or treated for their psychiatric conditions.

Unfortunately, many individuals with chronic medical conditions and co-occurring depression or anxiety are never diagnosed or treated for their psychiatric conditions. While the treatment prevalence of comorbid depression for members with chronic pain is reasonably close to the expected comorbidity rate (46.7% vs. 50.0%), the treatment prevalence rates of comorbid depression for other chronic medical conditions is significantly lower than the expected comorbidity rates (e.g., asthma, 16.4% vs. 45.0%).

COST IMPACT OF COMORBID DEPRESSION/ANXIETY BY CHRONIC MEDICAL CONDITION

We accumulated total healthcare costs, separated between medical and behavioral (BHV) service categories, for all patients with each chronic medical condition that we analyzed, and also separated these costs for the cohorts of patients with and without comorbid depression, comorbid anxiety, or either comorbid psychiatric disorder. Figure 2 presents the results for comorbid depression and Figure 3, for comorbid anxiety. Appendix A provides a sample of the more detailed service-category results (inpatient facility, outpatient facility, professional, and prescription) for one of the chronic medical conditions studied, diabetes.

FIGURE 2: COMPARISON OF HEALTHCARE COSTS FOR COMORBID DEPRESSION

MEDICAL CONDITION	COHORT SIZE	NUMBER DEPRESSED	HEALTHCARE COSTS PER MEMBER PER MONTH NO TREATED DEPRESSION			WITH TREATED DEPRESSION		
			MEDICAL	BHV	TOTAL	MEDICAL	BHV	TOTAL
ARTHRITIS	715,977	157,091	$508.90	$12.17	$521.07	$926.13	$121.86	$1,047.99
HYPERTENSION	818,000	165,708	$541.48	$8.64	$550.21	$862.62	$98.32	$960.94
CHRONIC PAIN	114,724	53,647	$898.39	$78.45	$976.84	$1,209.17	$254.29	$1,463.46
DIABETES MELLITUS	469,355	99,985	$691.65	$9.76	$701.41	$1,074.25	$107.55	$1,181.80
ASTHMA	215,789	35,488	$390.26	$9.23	$399.49	$939.80	$125.31	$1,065.10
IHD	165,196	37,088	$900.34	$11.17	$911.50	$1,350.79	$107.14	$1,457.93
COPD	129,923	32,447	$699.29	$14.02	$713.31	$1,244.38	$132.69	$1,377.07
CANCER	305,727	62,215	$839.98	$10.76	$850.74	$1,274.07	$102.82	$1,376.89
CHF	29,029	8,302	$1,828.57	$17.14	$1,845.71	$2,427.11	$139.84	$2,566.95
STROKE	24,333	7,215	$1,128.28	$20.98	$1,149.26	$1,580.20	$129.64	$1,709.84

Comorbid depression clearly results in elevated total healthcare costs. In our analysis, these increased healthcare costs range from $411 to $721 per comorbid member per month. They average $505 per comorbid member per month across all chronic medical conditions we analyzed, of which nearly $400 is higher medical costs.

Comorbid depression clearly results in elevated total healthcare costs averaging $505 per comorbid member per month across all chronic medical conditions we analyzed.

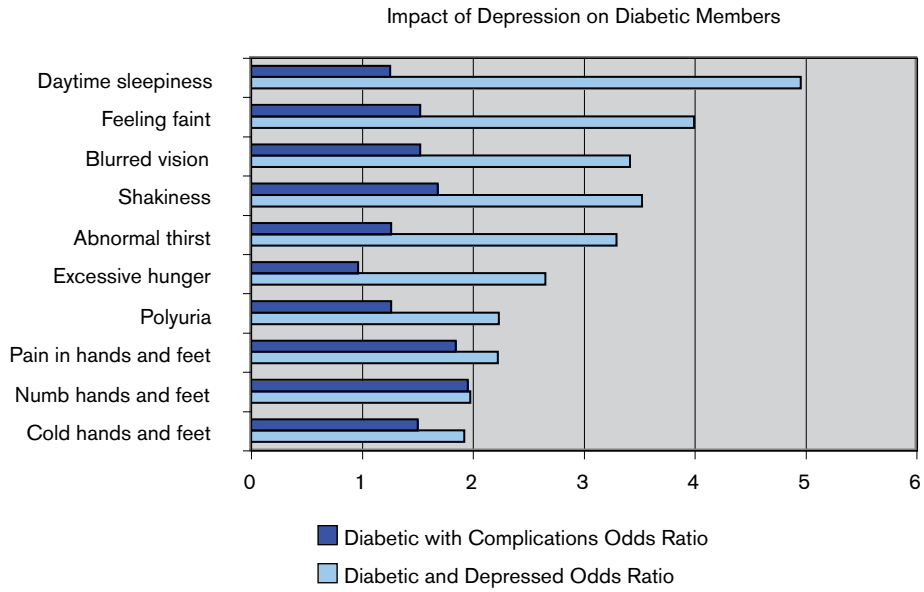
FIGURE 3: COMPARISON OF HEALTHCARE COSTS FOR COMORBID ANXIETY

MEDICAL CONDITION	COHORT SIZE	NUMBER WITH ANXIETY	HEALTHCARE COSTS PER MEMBER PER MONTH NO TREATED ANXIETY			WITH TREATED ANXIETY		
			MEDICAL	BHV	TOTAL	MEDICAL	BHV	TOTAL
ARTHRITIS	715,977	79,227	$543.45	$23.02	$566.47	$1,061.73	$143.14	$1,204.87
HYPERTENSION	818,000	86,482	$561.95	$17.47	$579.41	$986.60	$106.25	$1,092.85
CHRONIC PAIN	114,724	35,600	$950.03	$104.40	$1,054.43	$1,254.79	$287.51	$1,542.31
DIABETES MELLITUS	469,355	43,281	$724.88	$20.66	$745.54	$1,252.61	$129.14	$1,381.75
ASTHMA	215,789	18,615	$419.79	$17.67	$437.46	$1,129.25	$141.69	$1,270.95
IHD	165,196	22,649	$934.32	$20.64	$954.96	$1,426.52	$109.08	$1,535.60
COPD	129,923	20,122	$720.81	$24.29	$745.09	$1,467.36	$150.21	$1,617.57
CANCER	305,727	34,073	$827.20	$19.42	$846.62	$1,750.30	$111.03	$1,861.33
CHF	29,029	5,201	$1,870.89	$29.68	$1,900.57	$2,595.53	$156.27	$2,751.81
STROKE	24,333	4,260	$1,182.30	$33.87	$1,216.17	$1,641.56	$144.88	$1,786.45

Comorbid anxiety also clearly results in elevated total healthcare costs. In our analysis, these increased healthcare costs range from $513 to $1,015 per comorbid member per month. They average $651 per comorbid member per month across all chronic medical conditions we analyzed, of which nearly $538 is due to higher medical costs.

Why do these comorbid psychological disorders drive up healthcare costs, with about 80% of the increased costs being for medical (not behavioral) service costs? The graph compares odds ratios of various physical effects that depression has on diabetic members.[1]

FIGURE 4: ODDS RATIOS OF PHYSICAL EFFECTS OF DEPRESSION ON DIABETES



Depression also significantly affects the self-care of members that have chronic medical conditions (Katon, 2004), as seen in Figure 5.

FIGURE 5: IMPACT OF DEPRESSION ON SELF-CARE OF MEMBERS WITH CHRONIC MEDICAL CONDITIONS

SELF-CARE ACTIVITIES (PAST 7 DAYS)	NO MAJOR DEPRESSION	MAJOR DEPRESSION	ODDS RATIO
HEALTHY EATING <1 TIME/WEEK	8.80%	17.20%	2.1
5 SERVINGS OF FRUIT/VEGETABLES <1 TIME/WEEK	21.10%	32.40%	1.8
HIGH FAT FOODS >6 TIMES/WEEK	11.90%	15.50%	1.3
PHYSICAL ACTIVITY (>30MIN) <1 TIME/WEEK	27.3	44.1	1.9
SPECIFIC EXERCISE SESSION <1 TIME/WEEK	45.8	62.1	1.7
SMOKING: YES	7.7	16.1	1.9

Poor self-care among members with chronic medical conditions such as diabetes results in more acute episodes of needed healthcare.

Poor self-care among members with chronic medical conditions such as diabetes results in more acute episodes of needed healthcare, with patients ending up in emergency rooms and hospital beds, or at the least, more frequent trips to physicians.

1 Ludman et al., Gen Hosp Psychiatry 26:430–436, 2004.

Additional employer costs of psychological disorders

Academic studies have also exhibited the nondirect employer costs of comorbid psychological disorders. These costs include absenteeism (time missed due to sick days), disability, and presenteeism (lost productivity at work).

- Average annual sick days for depression (9.9) exceed those lost from hypertension (5.4), back problems (7.2), diabetes (7.2), and heart disease (7.5)[2].
- The average lost productive time per depressed worker per week includes 1.0 hour due to absenteeism and 4.6 hours due to presenteeism[3], compared to 0.4 hours of absenteeism and 1.1 hours of presenteeism for nondepressed workers.
- Based on average impairment and prevalence estimates, depression and other mental illness ranked third for the overall economic burden of illness among the top 10 health conditions, at an average annual cost per employee of $348, behind hypertension ($392) and heart disease ($368)[4].
- Depressed workers were found to have between 1.5 and 3.2 more short-term disability days in a 30-day period than other workers[5].

Depression and other mental illness ranked third for the overall economic burden of illness among the top 10 health conditions.

2 Druss et al., Am J Psychiatry, August 2000
3 Stewart et al. JAMA, 6/18/03
4 Goetzel et al., JOEM, April 2004
5 Kessler et al., Health Affairs, 1999

PUTTING THINGS IN PERSPECTIVE

Consider a commercial health insurance plan with 100,000 covered lives and an average monthly healthcare cost of $270. Using Medstat data as a proxy for this health plan, we would expect to find the numbers of chronically ill individuals seen in Figure 6.

FIGURE 6: EXPECTED PREVALENCE OF COMORBID CONDITIONS

CHRONIC MEDICAL CONDITION	MEMBERS WITH CONDITION	MEMBERS WITH COMORBID DEPRESSION		MEMBERS WITH COMORBID ANXIETY	
		DIAGNOSED AND TREATED	UNTREATED	DIAGNOSED AND TREATED	UNTREATED
ARTHRITIS	7,880	1,725	245	863	123
HYPERTENSION	9,034	1,822	211	942	109
CHRONIC PAIN	1,262	589	42	387	27
DIABETES MELLITUS	5,165	1,098	193	471	83
ASTHMA	2,372	388	679	202	353
IHD	1,801	403	228	244	138
COPD	1,405	349	73	214	45
CANCER	3,348	679	326	365	175
CHF	308	87	20	54	13
STROKE	260	77	27	45	16

Assumptions about the numbers of untreated individuals are based on the expected prevalence rates presented in Figure 1 above. Note that, in the absence of scientific literature on the expected treatment rates for comorbid anxiety for chronic medical conditions, we made the assumption here that the percentage of chronic-medical-condition patients with an undiagnosed or untreated anxiety disorder was identical to the percentages for depression by chronic medical condition.

Over the course of one year, these 8,785 patients with chronic medical conditions and treated comorbid depression and/or anxiety (some patients experience both depression and anxiety) will incur an *additional* $54 million in annual healthcare costs ($512.25 per diseased member per month [PDMPM], or $45 per member per month [PMPM]) associated with the impact of the comorbid psychological disorders. This represents 16.6% of the total healthcare costs of the insured group. Note that $44.1 million is for increased medical costs ($418.33 PDMPM, $36.75 PMPM), while less than 20% of these costs is for additional behavioral service costs. If improved behavioral healthcare services for this population can reduce these elevated medical costs, very substantial savings could be achieved.

In total, there are 11,278 patients with these chronic medical conditions that are *expected* to have a comorbid depressive and/or anxiety disorder. We estimate that there are an additional 2,493 patients who have either not been diagnosed or not received treatment for their comorbid psychological disorders. If we assume that these chronically ill patients with undiagnosed psychological disorders have similar exacerbated healthcare costs as their treated counterparts by chronic medical condition ($512.25 PDMPM), then all of our expected 11,278 patients with comorbid depression and/or anxiety will incur an *additional* $68.4 million in annual healthcare costs, of which $56.2 million is medical costs, and $12.2 million is behavioral costs. These additional costs represent 21.1% of the total healthcare costs of the insured group.

LIMITATIONS

The results of our analysis clearly demonstrate that, among patients with chronic medical conditions, those also suffering from comorbid depression or anxiety incurred considerably higher healthcare costs than those without the treated comorbid psychological disorder. This can be explained in part as a result of the patients with comorbid psychological disorders having poor self-care, including lack of exercise, poor nutrition and diet, lower treatment-adherence rates for their medical conditions, and greater tendency for smoking. One specific study showed that diabetics who were also depressed more frequently ate high-fat foods and fewer fruits and vegetables, were less physically active and more frequently smokers.[6]

Among patients with chronic medical conditions, those suffering from comorbid depression or anxiety incurred considerably higher healthcare costs.

However, the cost differences can also be attributed, in part, to higher severity of disease for patients with comorbid medical and psychological disorders. It is likely that some patients with more severe chronic medical conditions will become depressed or anxious. It is also possible that both the chronic medical conditions and comorbid psychological disorders are associated with common underlying risk factors that make them appear to be related.

People with more severe diseases may certainly be more expensive to treat and also may be more often subject to social isolation, economic worries, and a variety of other problems that could lead to depression or anxiety. It can be difficult to determine the direction from which the causality arises—does the psychological disorder cause a more severe medical condition, or does the more severe medical condition cause the psychological disorder? Whatever the link, there are clearly elevated healthcare costs present that result in an opportunity for improved clinical-care programs.

6 Katon, 2004.

CONCLUSIONS–WHERE DO WE GO FROM HERE?

Effective integrated programs of medical and behavioral healthcare are vital to the future success of managed healthcare. Insured members suffering from comorbid chronic medical and behavioral conditions would greatly value from such effective treatment programs. Even with the knowledge that the implementation of these types of programs will lead to both up-front and ongoing care-coordination costs, our research shows that these additional administrative costs may easily be offset by the ultimate savings from reduced healthcare and other employer costs.

In the above example, if a 10% reduction can be made in the excess healthcare costs of patients with comorbid psychiatric disorders via an effective integrated medical-behavioral healthcare program, $5.4 million of healthcare savings could be achieved for each group of 100,000 insured members. Those savings could grow to $6.8 million with the additional identification and treatment of patients with previously undiagnosed or untreated comorbid psychological disorders. Comparable and even greater savings could be achieved in reduced employer costs for sick days, reduced disability costs, and improved productivity.

What happens if we do nothing, but just continue the status quo? The size of the U.S. commercially insured population is about 218 million lives. The Medicare-insured population is about 39.2 million lives. Applying the treatment and expected comorbidity prevalence rates from Figure 1 above to these populations, and assuming an average additional healthcare cost of $500 per comorbid patient per month (a bit conservative, based on our findings), the total annual excess costs from the psychiatric comorbidities, seen in Figure 7, are hard to ignore.

The cost of doing nothing may exceed $300 billion per year in the United States.

FIGURE 7: PROJECTED ANNUAL COSTS OF STATUS QUO IN TREATMENT

POPULATION	ANNUAL ADDITIONAL COSTS
COMMERCIAL	$83.4–$241.2 BILLION
MEDICARE	$49.2–$109.8 BILLION
TOTAL	$132.6–$351.0 BILLION

The time may very well have come for these types of programs, as radical as they may seem to some. Employers and health plans are beginning to see the potential for such programs. Those that can achieve and document measurable savings through integrated medical-behavioral care management may gain a market advantage through lower healthcare costs, lower employer costs, and improved clinical outcomes.

APPENDIX A: PMPM SPLITS BY SERVICE CATEGORY

Results in Section III split total healthcare costs between behavioral and medical dollars; however, the results of our analysis are available at a finer level of service-category detail.

Figures 8 and 9 show our expanded service-category results for the 2006 diabetes population. Across the entire population studied, the average diabetes patient consumed $803.55 per month in medical services (health plan costs), including $30.55 in behavioral services.

FIGURE 8: PER MEMBER PER MONTH (PMPM) COSTS – DIABETIC PATIENTS

		DEPRESSION	
SERVICE CATEGORY	TOTAL	WITH	WITHOUT
IP FACILITY (BEHAVIORAL)	$1.32	$4.60	$0.43
IP FACILITY (MEDICAL)	$132.48	$195.83	$115.37
PH/IOP	$0.38	$1.25	$0.14
HOSP ER/LAB/RAD/OTHER	$207.75	$287.44	$186.23
PROFESSIONAL OP (BEHAVIORAL)	$2.73	$9.59	$0.88
PROFESSIONAL AND OTHER MEDICAL	$237.28	$327.96	$212.80
PRESCRIPTION DRUGS (BEHAVIORAL)	$26.13	$92.11	$8.31
PRESCRIPTION DRUGS (MEDICAL)	$195.49	$263.02	$177.25
TOTAL (BEHAVIORAL)	$30.55	$107.55	$9.76
TOTAL (MEDICAL)	$773.00	$1,074.25	$691.65
TOTAL	$803.55	$1,181.80	$701.41

FIGURE 9: PMPM COSTS – DIABETIC PATIENTS

		ANXIETY	
SERVICE CATEGORY	TOTAL	WITH	WITHOUT
IP FACILITY (BEHAVIORAL)	$1.32	$6.24	$0.82
IP FACILITY (MEDICAL)	$132.48	$248.12	$120.87
PH/IOP	$0.38	$1.79	$0.24
HOSP ER/LAB/RAD/OTHER	$207.75	$349.15	$193.57
PROFESSIONAL OP (BEHAVIORAL)	$2.73	$12.05	$1.80
PROFESSIONAL / OTHER MEDICAL	$237.28	$375.53	$223.41
PRESCRIPTION DRUGS (BEHAVIORAL)	$26.13	$109.07	$17.80
PRESCRIPTION DRUGS (MEDICAL)	$195.49	$279.82	$187.03
TOTAL (BEHAVIORAL)	$30.55	$129.14	$20.66
TOTAL (MEDICAL)	$773.00	$1,252.61	$724.88
TOTAL	$803.55	$1,381.75	$745.54

More detail concerning the apportionment of claim dollars into the above categories may be found in Appendix D.

APPENDIX B: SENSITIVITY OF RESULTS

The definition of a patient with depression (or an anxiety disorder) based on claims data is a flexible one, and there are multiple boundary cases where altering our criteria slightly would place patients in one category or the other.

For instance, some antidepressant medications are not always prescribed for the treatment of a mental condition (off-label use); therefore, some patients treated only by medication are not really afflicted with the related mental condition. It is likely these cases are less severe. In this section, we will look at how our results change with different selection criteria.

In this sensitivity testing, we have chosen the following eight criteria for identifying patients with depression and/or anxiety disorder in a calendar year:

1. One inpatient claim, one emergency room claim, two outpatient claims, two prescription claims, or one outpatient claim and one prescription
2. One inpatient claim, one emergency room claim, two outpatient claims, or one outpatient claim and one prescription
3. One inpatient claim, one emergency room claim, or two outpatient claims
4. One inpatient claim or one emergency room claim
5. Two outpatient claims
6. Two prescription claims
7. One emergency room claim
8. One inpatient claim

Note that the above criteria are minimum thresholds, and patients incurring more claims than those listed are considered to have the condition present. Criterion 1 is the definition used in the body of this research report. Criteria 2 and 3 might be considered preferable in a population where many patients are using behavioral medications for off-label purposes. Criteria 4, 7, and 8 are the strictest definitions, requiring a more severe (and frequently high-cost) episode.

Using each of our criteria definitions in turn, Figure 10 shows the identified prevalence of depression and anxiety disorders under each criteria set:

FIGURE 10: PREVALENCE SENSITIVITY

	PREVALENCE	
CRITERION	DEPRESSION	ANXIETY DISORDER
1	21.30%	9.10%
2	5.20%	1.80%
3	4.20%	1.40%
4	0.40%	0.30%
5	4.20%	1.30%
6	20.00%	8.20%
7	0.20%	0.20%
8	0.30%	0.10%

We learn several interesting things here—most notably, the relative dominance of prescription claims in the identification of these populations. Because criterion 6 is a subset of our main definition, it is easy to see that nearly all of our patients treated for depression or anxiety are using at least two psychotropic prescriptions in a calendar year.

Also notice that requiring at least one visit to a professional in a calendar year (removing the prescription-claims-only criteria) markedly reduces the prevalence of these conditions; the drop in prevalence from criterion 1 to criterion 2 is substantial.

From the final criteria, we can also note that in the 2005 Medstat diabetic population, 0.2% of the population visited an emergency room for a depression condition (0.2% for anxiety disorder), while 0.3% were admitted to the hospital for depression (0.1% for anxiety disorder).

We can also examine the differences in PMPM healthcare costs for the different criteria applied to our diabetic population, seen in Figures 11 and 12.

FIGURE 11: PMPM COSTS – DIABETICS

CRITERION	WITH DEPRESSION	W/O DEPRESSION	DIFFERENCE	
1	$1,181.80	$701.41	$480.39	(68.5%)
2	$1,295.70	$776.60	$519.10	(66.8%)
3	$1,326.58	$780.59	$545.99	(69.9%)
4	$1,807.87	$799.13	$1,008.74	(126.2%)
5	$1,323.21	$780.98	$542.23	(69.4%)
6	$1,189.01	$706.97	$482.04	(68.2%)
7	$1,822.74	$801.13	$1,021.61	(127.5%)
8	$1,878.09	$800.19	$1,077.90	(134.7%)

FIGURE 12: PMPM COSTS – DIABETICS

CRITERION	WITH ANXIETY	W/O ANXIETY	DIFFERENCE	
1	$1,381.75	$745.54	$636.22	(85.3%)
2	$1,214.90	$795.95	$418.95	(52.6%)
3	$1,194.58	$798.06	$396.52	(49.7%)
4	$1,611.25	$801.29	$809.96	(101.1%)
5	$1,184.27	$798.44	$385.83	(48.3%)
6	$1,433.46	$747.27	$686.19	(91.8%)
7	$1,587.62	$801.62	$786.00	(98.1%)
8	$2,059.17	$802.87	$1,256.30	(156.5%)

First, note that criteria 4, 7, and 8 (each of which requires inpatient and/or emergency room treatment for consideration) result in large differences between comorbid diabetics and non-comorbid diabetics. This is to be expected, as those using these higher-cost services are much more likely to have more severe conditions.

One interesting thing to note is that, although using a broader definition to classify patients with depression and/or anxiety results in less severe cases being included (other than the exceptions already noted), we see roughly the same difference between depressed and non depressed chronic patients on a PMPM basis under these criteria (between about $480 and $550).

APPENDIX C: CONDITION DIAGNOSIS CODES AND MEDICATIONS

For each of the ten chronic conditions used in the analyses, these were the ICD-9 diagnosis codes used to determine if an inpatient, outpatient, or emergency-room claim met the criteria for the condition.

- **Arthritis**. Claim lines were identified as pertaining to arthritis if either of the ICD-9 diagnosis codes were in the range 710–719 inclusive.
- **Hypertension**. Claim lines were identified as pertaining to hypertension if either of the ICD-9 diagnosis codes were in the range 401–405 inclusive, with the exception of diagnosis codes 402.01, 402.11, 402.91, 404.01, and 404.11.
- **Chronic pain**. Claim lines were not used to determine if an individual exhibited chronic-pain symptoms. Patients were determined to have chronic pain if they had been taking an NSAID for at least 75% of their eligible membership (see below for list of NSAIDs).
- **Diabetes mellitus**. Claim lines were identified as pertaining to diabetes mellitus if either of the ICD-9 diagnosis codes were equal to 250.
- **Asthma**. Claim lines were identified as pertaining to asthma if either of the ICD-9 diagnosis codes were equal to 493.
- **IHD**. Claim lines were identified as pertaining to coronary artery disease if either of the ICD-9 diagnosis codes were in the range 410–414 inclusive.
- **COPD**. Claim lines were identified as pertaining to COPD if either of the ICD-9 diagnosis codes were in one of the ranges 490–492 inclusive, 494–496 inclusive, or 500–508 inclusive.
- **Cancer**. Claim lines were identified as pertaining to malignant cancer if either of the ICD-9 diagnosis codes were in one of the ranges 140–208 inclusive or 230–239 inclusive.
- **CHF**. Claim lines were identified as pertaining to congestive heart failure if either of the ICD-9 diagnosis codes were equal to 402.01, 402.11, 402.91, 404.01, 404.11, or 428.
- **Stroke**. Claim lines were identified as pertaining to ischemic stroke if either of the ICD-9 diagnosis codes were in the range 430–434 inclusive.

Additionally, these were the diagnosis codes used to determine if an inpatient, outpatient, or emergency-room claim line met the criteria for depression or anxiety.

- **Depression**. Claim lines were identified as pertaining to depression if either of the ICD-9 diagnosis codes were equal to 296 or 311, or if the diagnosis code was equal to 300.4.
- **Anxiety**. Claim lines were identified as pertaining to anxiety if either of the ICD-9 diagnosis codes were equal to 293.84, 300.00, 300.01, 300.02, 300.3, 308.3 or 309.81.

The following Medstat therapeutic class definitions were used to determine if a prescription claim line was for a diabetes condition:

- Diabetes mellitus (diabetic supply NEC)
- Antidiabetic agents (sulfonylureas)
- Antidiabetic agents (insulins)
- Antidiabetic agents (miscellaneous)

The following NSAID medications were used to determine if a prescription claim line was for a chronic-pain condition:

- APAP/Butalbital/Caffeine/Codeine phosphate
- Acetaminophen/Butalbital
- Acetaminophen/Butalbital/Caffeine
- Acetaminophen/Caffeine/Dihydrocodeine bitartrate
- Acetaminophen/Codeine phosphate
- Acetaminophen/Hydrocodone bitartrate
- Acetaminophen/Oxycodone hydrochloride

- Acetaminophen/Propoxyphene hydrochloride
- Acetaminophen/Propoxyphene napsylate
- Acetaminophen/Salicylamide
- ASA/Al hydroxide/Calcium carbonate/Magnesium hydroxide
- ASA/Oxycodone HCl/Oxycodone terephthalate
- Aspirin
- Aspirin/Butalbital/Caffeine
- Aspirin/Butalbital/Caffeine/Codeine phosphate
- Aspirin/Caffeine/Dihydrocodeine bitartrate
- Aspirin/Caffeine/Propoxyphene hydrochloride
- Aspirin/Carisoprodol/Codeine phosphate
- Aspirin/Codeine phosphate
- Aspirin/Hydrocodone bitartrate
- Celecoxib
- Choline magnesium trisalicylate
- Codeine phosphate
- Codeine sulfate
- Diclofenac potassium
- Diclofenac sodium
- Diclofenac sodium/Misoprostol
- Diflunisal
- Etodolac
- Fenoprofen calcium
- Fentanyl
- Fentanyl citrate
- Flurbiprofen
- Hydrocodone bitartrate/Ibuprofen
- Hydrocodone bitartrate/Potassium guaiacolsulfonate
- Hydromorphone hydrochloride
- Ibuprofen
- Indomethacin
- Ketoprofen
- Ketorolac tromethamine
- Levorphanol tartrate
- Magnesium salicylate
- Magnesium salicylate/Phenyltoloxamine citrate
- Meclofenamate sodium
- Mefenamic acid
- Meloxicam
- Meperidine HCl/Promethazine HCl
- Meperidine hydrochloride
- Morphine sulfate
- Nabumetone
- Naproxen
- Naproxen sodium
- Opium
- Oxaprozin
- Oxycodone hydrochloride
- Oxymorphone hydrochloride
- Piroxicam
- Propoxyphene hydrochloride
- Propoxyphene napsylate
- Rofecoxib
- Salsalate
- Sulindac
- Tolmetin sodium
- Valdecoxib

The following Medstat therapeutic class definitions were used to determine if a prescription claim line was for a depression condition:

- Psychother, Antidepressants

The following Medstat therapeutic class definitions and generic equivalents were used to determine if a prescription claim line was for an anxiety condition:

- ASH, Benzodiazepines (therapeutic class)
- Clonazepam (generic equivalent)
- Buspirone hydrochloride (generic equivalent)

APPENDIX D: CLAIM CATEGORIES

The following rules were used to determine which category a claim belonged to:

For medical claims, revenue codes, CPT codes, and HCPC codes were used to classify claims as follows (all ranges are inclusive):

- **Inpatient Facility (behavioral)**: revenue codes 114, 116, 124, 126, 134, 136, 144, 146, 154, 156, and 204
- **Inpatient Facility (medical)**: revenue codes between 100 and 249 not specifically mentioned above Revenue codes between 720 and 729
- **PHP/IOP**: revenue codes between 900 and 919. Revenue codes 944 and 945
- **Hospital ER/Lab/Rad/Other**: any revenue code not specifically mentioned above
- **OP Professional (behavioral)**: HCPCS codes G0176, G0177, M0064, S9475, and S9480-S9485 CPT codes 90801–90911
- **Professional and Other Medical**: any CPT/HCPCS codes not specifically mentioned above

All prescription claims belonging to one of the following Medstat therapeutic classes are categorized as Prescription Behavioral:

- ASH (benzodiazepines)
- Analgesic/Antipyretic (opiate agonists)
- Anticonvulsant (benzodiazepine)
- Anticonvulsants (miscellaneous)
- Antimanic agents (NEC)
- Anxiolytic/Sedative/Hypnotic (NEC)
- CNS agents (miscellaneous)
- Psychother (antidepressants)
- Psychother (tranquilizer/antipsychotic)
- Stimulant (amphetamine type)

The remainder of prescription claims is categorized as Prescription Medical.

APPENDIX E: THE MEDSTAT MARKETSCAN DATABASE

For purposes of these analyses, the Medstat MarketScan claims database was used. The MarketScan database represents the inpatient and outpatient healthcare service use by individuals in the United States who are covered by the benefit plans of large employers, health plans, and government and public organizations.

The MarketScan database links paid claims and encounter data to detailed patient information across sites and types of providers, and over time. The annual medical database includes private-sector health data from approximately 100 payers. Historically, more than 500 million claim records are available in the MarketScan database.

These data represent the medical experience of insured employees and their dependents (for active employees), early retirees, COBRA continuees, and Medicare-eligible retirees with employer-provided Medicare Supplemental plans. No Medicaid or Workers' Compensation data are included.

These analyses used Medstat data for 2005 and 2006, covering a total of more than 200 million member-months. When restricting our study to members who were eligible in both 2005 and 2006, with full 2006 prescription history, we are left with approximately 9.2 million individuals for study.

Identification of patients

To identify patients diagnosed with the chosen chronic medical conditions, we analyzed a combination of inpatient, outpatient, and prescription-drug claims appearing in the 2005 Medstat data. Each claim line was categorized as outpatient, inpatient, or emergency room based on the revenue code field as follows: revenue codes between 100 and 249 (inclusive) were categorized as inpatient; revenue codes between 450 and 459 (inclusive), 760, 761, 762 or 769 were categorized as emergency room; and the remainder of claims (including those claims without a revenue code) were categorized as outpatient.

For CHF, IHD, malignant cancer, asthma, hypertension, stroke, arthritis, and COPD, a patient was considered as having the condition if the 2005 Medstat claims history included at least two outpatient claims, at least one inpatient claim, or at least one emergency-room claim with a corresponding diagnosis code.

For diabetes mellitus, a patient was considered as having the condition if the 2005 Medstat claims history included at least two outpatient claims with a corresponding diagnosis code, at least one inpatient claim, at least one emergency-room claim, at least two diabetes prescription-drug claims, or at least one outpatient claim and one diabetes prescription-drug claim. (Diabetes prescription-drug claims are defined in Appendix C.)

Chronic pain was handled separately from the other nine chronic medical conditions. In lieu of inpatient, outpatient, and emergency-room claims, each patient was tested to see how many 2005 calendar days were spent taking NSAID prescription medications (a detailed list of NSAID prescription medications considered appears in Appendix C). An individual was considered a chronic-pain patient if he or she had at least 91 days of 2005 Medstat eligibility with at least 75% of those days taking an NSAID prescription medication.

For all ten conditions, each patient was assigned a "flag date," defined to be the earliest existence of the chronic medical condition in the 2005 claims data involving a severe (inpatient or emergency room) claim. In total, the numbers of patients seen in Figure 13 were identified in the 2005 Medstat database.

FIGURE 13: PREVALENCE DATA BY CHRONIC MEDICAL CONDITION

CHRONIC CONDITION	2005 MEMBERS	PREVALENCE
ARTHRITIS	715,977	7.80%
HYPERTENSION	818,000	8.90%
CHRONIC PAIN	114,724	1.30%
DIABETES MELLITUS	469,355	5.10%
ASTHMA	215,789	2.40%
IHD	165,196	1.80%
COPD	129,923	1.40%
CANCER	305,727	3.30%
CHF	29,029	0.30%
STROKE	24,333	0.30%

Prevalence rates are based on our study population of nearly 9.2 million. In total, there were 3 million cases of our chosen chronic medical conditions identified in the 2005 Medstat database. Obviously these prevalence rates are not mutually exclusive, and there are numerous patients with more than one identified chronic medical condition. In fact, these conditions are the result of 2.2 million unique enrollees, and two individuals were categorized as having nine of our ten chosen chronic conditions (one was also treated for depression, and both for an anxiety disorder). Of the 44 patients identified with (exactly) eight of the ten chosen conditions, 31 were also exhibiting depression and 23, an anxiety disorder.

Each of these 3 million cases was further categorized as to whether there had been treatment received for depression, anxiety, or both. (Diagnosis codes and therapeutic class descriptions used to identify depression and anxiety treatment are listed in Appendix C.)

For depression and anxiety, a patient was considered as having the condition if the 2005 Medstat claims history included at least two outpatient claims, at least one inpatient claim, at least one emergency-room claim, at least two prescription claims, or at least one prescription claim and one outpatient claim with a corresponding diagnosis code.

A rudimentary analysis on how results change with different selection criteria may be found in Appendix B–Sensitivity of Results.

We then followed the claims experience for these patients during calendar year 2006, separating their claims experience into the following major service categories: Inpatient Facility (behavioral), Inpatient Facility (medical), Partial Hospital/Intensive Outpatient, Hospital ER/Laboratory/Radiology/Other, Outpatient Professional (behavioral), Professional/Other Medical, Prescription Drugs (behavioral), and Prescription Drugs (medical).

Details on classification of these claims are found in Appendix D. Our analysis ignored any claims occurring within 121 days of the patient's chronic-disease flag date in an effort to avoid issues involving regression to the mean.

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