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The Effect of Complementary and Alternative Medicine Claims on Risk Adjustment

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Abstract

Objective—To assess how the inclusion of diagnoses from complementary and alternative medicine (CAM) providers affects measures of morbidity burden and expectations of health care resource use for insured patients.

Methods—Claims data from Washington State were used to create two versions of a case-mix index. One version included claims from all provider types; the second version omitted claims from CAM providers who are covered under commercial insurance. Expected resource use was also calculated. The distribution of expected and actual resource use was then compared for the two indices.

Results—Inclusion of CAM providers shifts many patients into higher morbidity categories; 54% of 61,914 CAM users had higher risk scores in the index which included CAM providers. When expected resource use categories were defined based on all providers, CAM users in the highest morbidity category had average (± s.d.) annual expenditures of $6661 (± $13,863). This was less than those in the highest morbidity category when CAM providers were not included in the index ($8562 ± $16,354), and was also lower than the highest morbidity patients who did not use any CAM services ($8419 ± $18,885).

Conclusions—Inclusion of services from CAM providers under third party payment increases risk scores for their patients but expectations of costs for this group are lower than expected had costs been estimated based only on services from traditional providers. Additional work is needed to validate risk adjustment indices when adding services from provider groups not included in the development of the index.

Introduction

Risk adjustment indices are widely used in modeling health care costs. They adjust for patient factors which are associated with health care utilization, and as such, they are useful for setting capitation payments, identifying patients expected to have high utilization, comparing provider practice patterns, utilization review, and quality assurance. [1–8] Another important use is in

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adjusting for selection bias in observational research, for example, when performing secondary analyses on administrative databases.[9] Because patients are not randomly assigned to providers, case-mix can vary widely between providers. Without risk adjustment, this can lead to biased results in analyses that compare provider utilization patterns or costs.[10]

A number of risk-adjustment indices have been developed to adjust for case-mix differences. Several recent reports have reviewed and compared various indices and their predictive ability for mortality and health care costs.[1, 2, 4, 8, 11–13] One commonly used risk-adjustment index is the Johns Hopkins Adjusted Clinical Groups (ACG) index. *[Note: The Johns Hopkins University has copyrighted software based on the ACG case-mix system applied in this study. Royalties are paid to the university when this software is used by insurance plans and commercial organizations*.]

This index was developed specifically to predict outpatient health care expenditures[5, 14] and later expanded to include inpatient expenditures. It categorizes patients primarily on their overall illness burden and the expected persistence of their diagnoses,[14, 15] and has been shown to explain a significant proportion of the variability in health care resource use. [6, 16]

When using a risk adjustment index constructed from ICD-9 codes on insurance claims, two implicit assumptions must be recognized. The first is that the codes included on claims accurately reflect actual conditions, and the second is that a given set of symptoms will elicit reasonably consistent coding patterns among all providers. Evidence exists that the first assumption is not entirely true. Previous reports have shown that ICD-9 codes are subject to various types of errors,[17] and codes included on insurance claims may represent only the most acute diagnoses or those most likely to be reimbursed.[18–20] Concerns regarding the second assumption focus on possible bias due to systematic undercoding or overcoding by provider type,[21] and the variability in coding practice that may arise because specific ICD-9 codes are open to interpretation.[18]

If specific providers affect the ICD-9 codes included on claims, then adding new provider types may lead to changes in the mix of recorded ICD-9 codes. For example, complementary and alternative medicine (CAM) providers are increasingly being included under insurance coverage,[22–24] and thus ICD-9 codes from their diagnoses are being added to patients' claims. To our knowledge, no one has studied how coding patterns among these providers compare to coding by conventional providers, nor how their inclusion may influence the performance of risk adjustment indices.

We have been studying the use of CAM providers under insurance coverage, using claims data. Our purpose has been to look at the impact of the use of CAM on overall health care utilization and expenditures.[25–28] Previous research has reported that patients who choose CAM providers tend to differ from other patients in the distribution of age,[29–31] race,[29, 30, 32, 33] gender,[29–31] income and education,[29–31, 34] and overall health status,[34, 35] so risk adjustment is critical in order to assess differences in health care utilization and costs between CAM users and non-users. That is, if patients who use CAM have higher health care costs than non-users, we need to assess whether the higher cost is due directly to their use of CAM or is explained by poorer health status and demographic factors associated with high medical care use (e.g., higher income, female gender). However, we had several concerns about using a risk adjustment index in this setting. First, to our knowledge none of the available indices used data from CAM providers in its development, and the validity of the indices when CAM providers are included has not been studied. Second, many CAM providers are newly included under insurance coverage and thus do not have a historical pattern of coding diagnoses for insurance claims. We do not know the extent to which different types of providers may have different

coding patterns for similar symptoms. Third, there is the potential for reverse causation; that is, the more different types of providers a patient sees, the more opportunity the patient has to get claims with a variety of diagnosis codes, which could lead to that person being classified at a higher disease level.[5, 12]

All of the indices attempt to measure overall disease burden in some way, but since this factor cannot be measured directly, the indices are subject to measurement error. As with other imperfectly measured patient characteristics, measurement error can cause two types of problems. First, if the measurement error is random (i.e., equally likely to result in a value that is too high or too low), it increases the variance in the data, leading to a loss of power and greater difficulty in detecting real differences. More serious, however, is the problem that results when the measurement error is not random. Biased errors can lead to a false conclusion that a relationship exists when in fact there is none.

This analysis looks at how the inclusion of CAM providers in the ACG risk adjustment index alters the results of analyses using the adjusted values. Specifically, we consider whether: 1) the use of CAM directly affects the ACG category assigned to patients, and 2) how this affects the relationship between expected and actual expenditures.

Methods

Study Population

We created a retrospective, cross-sectional cohort of adults using claims data from two large insurers in Washington State for 2002. The analysis was limited to enrollees in health insurance plans directly regulated by the Washington State law requiring that private commercial insurance companies cover all providers licensed to provider care (including CAM providers). This excluded Medicare, Medicaid, state-supplemental programs, and self-insured plans that are exempt from state regulation. The analyses presented here were limited to adults aged 18–64 who lived in Western Washington and had both continuous enrollment in a single plan and complete claims information for the year 2002. Included patients also had at least one allowed outpatient visit to a non-CAM provider during 2002.

Expenditures were measured using the amount allowed by the insurance company for each visit. Total expenditures included inpatient, outpatient, and pharmaceutical payments. Visits, defined as an encounter with a provider having a unique date of service, included inpatient and outpatient visits which were allowed by the insurance company. Disallowed visits (4.6% of all claims) were excluded from the analysis of utilization and expenditures; however, all claims were included in the calculation of the risk adjustment indices. Pharmacy claims were not counted as visits, rather the annual dollar amount allowed for all pharmacy claims during the year was added to the total expenditure for each person.

Provider groups

Providers were divided into three groups. CAM providers were defined as chiropractors, licensed massage therapists, acupuncturists, and naturopathic physicians. Conventional providers were defined as physicians (including all specialties), physical therapists, advanced registered nurse practitioners, and physician assistants. All providers who did not fit into either of these categories were put into a third category called “Other” which included providers such as occupational therapists and psychologists. Chiropractic care has been covered by insurance for many years, while coverage for the other CAM provider types is much more recent. Therefore for some analyses the non-chiropractic provider types were grouped as NAM providers (Naturopathic physicians, Acupuncturists, and Massage therapists).

Risk assessment indices

Using the John Hopkins ACG software, Version 6,[14] we constructed risk assessment indices of the types of diseases or disorders present and the expected resource utilization for each patient. The Adjusted Clinical Groups (ACG) System assigns each person to a single risk category based on age, sex, and the number, severity, and acute or chronic nature of the person's total disease burden. Because ACGs include 82 categories, it is sometimes helpful to collapse them into a smaller number of groups. Using cut points from the Hopkins national sample, all individuals were arrayed into five morbidity or risk groups ranging from very low to very high based on their expected need for health services resource use. For some analyses the five categories were further collapsed to represent simply "low" (risk groups 1 and 2), "moderate" (risk group 3) and "high" (risk groups 4 and 5) morbidity groupings. The indices were cross-sectional in that claims data from 2002 were used both to calculate the indices (expected resource use) and to measure actual resource use.

Two sets of indices were calculated. The first included diagnostic information from all provider types (CAM, conventional, and other providers). For patients who saw CAM providers, a second index was created that included only conventional and other providers. We then looked at how many CAM users changed ACG or morbidity categories in the two indices, and at how average annual expenditures within each morbidity group changed based on which index was used. Of note, the visits used to determine whether a patient was a CAM user, the total number of visits, and total expenditures were the same for all analyses.

Using the same software, Extended Diagnostic Categories (EDCs) were computed. EDCs are a set of 26 indicator variables for the presence or absence of broad disease categories (e.g., cancer, renal disease) or procedures (e.g., General Surgery). EDCs were used to compare CAM users and non-users for the presence of serious medical conditions.

Statistical Analyses

Expenditures were modeled using linear regression. Although expenditure data are skewed, our data set is large enough that ordinary least squares regression will provide accurate estimates of coefficients and standard errors.[36] Independent variables were age, gender, county population indicators (> 400,000 and 100,000–399,999 compared to < 100,000), insurance product line (Preferred Provider Organization [PPO], and Point of Service [POS] compared to Health Maintenance Organization [HMO]), CAM use, indicators for level of expected resource use (measured by morbidity group—five levels from low to high), and interactions between the morbidity indicators and use of CAM. Two models were fit, one using morbidity groups based on all provider visits, and the other using groups that excluded CAM provider diagnoses. Two additional models were fit that were the same as those described above except that they looked at use of Naturopathic physician, Acupuncturist, or Massage therapist (NAM provider) rather than CAM use. Stata statistical software version 8.0 was used for all analyses.[16]

Results

The study population included 337,147 patients who had at least one allowed outpatient visit to a non-CAM provider during 2002. Median age was 43, and 58% were female. Eighteen percent had one or more visits to CAM providers, mostly to chiropractors; 79% of CAM users had at least one visit to a chiropractor, and for 62% of CAM users chiropractors were the only CAM provider seen. Among CAM users, 38% had at least one visit to a Naturopathic physician, Acupuncturist, or Massage therapist (NAM provider). CAM users were more likely to be female and to belong to a PPO. (Table 1)

Figure 1 shows the distribution of CAM users and non-users among aggregated morbidity groups, illustrating the difference in distribution based on the inclusion or exclusion of diagnoses from CAM providers. The difference is largest in the Low morbidity group; when claims from all providers are used to define the morbidity groups 10% of CAM users fall in this group, while if claims from CAM providers are omitted from the calculation, 25% of CAM users fall in the low morbidity group. Conversely, a higher proportion of CAM users fall into the High morbidity group when diagnoses from CAM providers are included (29%) than when these diagnoses are excluded (19%). However, using either definition, the proportion of patients in the Low morbidity group is higher for patients with no CAM use than for patients with CAM use, and the proportion of patients in the High morbidity group is lower for patients with no CAM use than for patients with CAM use. This information is shown in more detail for all five morbidity groups in Table 2. In summary, when all providers are used to assign risk assessment variables, CAM users are more likely to be assigned higher risk groups, and less likely to be assigned lower risk groups, than when claims from CAM providers are excluded. Overall, 19,650 (32%) of CAM users change morbidity group categories depending on which claims are used, and 54% change ACG scores (data not shown).

Figure 2 illustrates how the morbidity group definition affects the average annual expenditures for patients in each risk category among CAM users and non-users. In the Low and Mid morbidity groups, expenditures are slightly higher for CAM users than non-users regardless of which definition is used to define the groups, and the difference is more pronounced when claims from CAM providers are omitted. However, in the High morbidity group, if claims from all providers are used to define the morbidity categories, CAM users are nearly $2000 less expensive on average than non-users of CAM services (mean ± s.d.), ($6661 ± 13863 vs. $8419 ± 18885) while if CAM providers are omitted from the calculation, CAM users and non-users have similar average expenditures, with CAM users slightly higher ($8562 ±16354 vs. $8419 ± 18885).

We fit multi-variable models of annual expenditures adjusted for age, gender, county of residence, insurance product type, CAM use, morbidity groups, and an interaction between CAM use and morbidity group. One model used morbidity groups defined using claims from all providers, and the other model used morbidity groups defined omitting claims from CAM providers. Both models had statistically significant interactions between morbidity groups and CAM use. In the model using morbidity groups based on claims from all providers, the beta coefficient for annual expenditures for CAM users was higher than non-CAM-users in morbidity groups 2 and 3, but the converse was true in morbidity groups 4 and 5. That is, CAM use was associated with higher expenses for individuals with low and moderate morbidity but with lower expenditures for individuals with high and very high morbidity. Beta coefficients in Table 3 show the average difference in expenditures between a non-CAM user in the lowest morbidity category and each listed category. For example, in morbidity group 5, the very high morbidity or multiple morbidity category, CAM users had average expenditures that were $12,926 higher than the reference group compared to $20,695 higher than the reference group for non-CAM-users. (Table 3) In the model using morbidity groups which omitted claims from CAM providers, CAM users were more expensive than non-users in all morbidity groups except for the highest morbidity category, although the difference between CAM users and non-users was smaller than in the previous model ($18,508 versus $20,695 respectively). We fit another set of models looking at NAM users. NAM users have higher average annual expenditures than CAM users as a whole, but the patterns described above were consistent for NAM users as well.

In earlier work, we found that among insured adults with back pain, 45% saw only CAM providers to treat their back pain.[27] This indicated a likely source for individuals to change

ACG and morbidity categories; that is, if diagnosis codes from CAM providers are excluded, then back pain diagnoses will be omitted from the calculation of ACGs and morbidity groups for a high percentage of those with back pain. If CAM providers add a diagnosis of back pain, it is reasonable that as a result the patient would move to higher ACG and morbidity categories. In the current analysis, 71,056 (21%) individuals had back pain; 11,927 of these moved to a lower morbidity group when CAM providers were excluded, accounting for 60% of the 19,650 patients who changed categories.

Finally, we looked at some indicators of overall health and found that CAM users were more likely to have been hospitalized (9.1% vs. 7.4% of non-CAM users), and more likely to have the Extended Diagnostic Category (EDC) for General Surgery (29.1% vs. 24.6%). Rates of other serious conditions, based on EDC categories assigned by conventional providers, were similar between CAM users and non-users but always slightly higher in CAM users: cancer (3.5% vs. 3.1%), cardiovascular disease (25.1% vs. 24.8%), endocrine disorders (including diabetes) (12.5% vs. 10.8%), and renal disease (1.3% vs. 1.2%).

Discussion

Our analysis found that the inclusion of diagnoses from CAM providers in the calculation of ACG indices substantially affected the distribution of patients in each index. Inclusion of claims from CAM providers caused many of their patients to appear in higher ACG and morbidity groups than they would based on their conventional visits.

There are several possible explanations why including diagnoses from CAM providers puts patients into higher morbidity categories. First, adding a new category of providers to the index likely resulted in more diagnoses, and a consequence of this was higher scores. For example, some patients only see CAM providers for certain symptoms, such as chiropractors for back pain. These conditions may be missed when the risk adjustment process excludes CAM providers. Another possible explanation is differences in coding practices. In contrast to conventional providers, who have a long history of coding symptoms using ICD-9 codes, CAM providers come from an entirely different model of diagnosis coding. For example, traditional acupuncture diagnoses deal with imbalances in qi (energy) along body meridians,[37] so the way they translate symptoms into ICD-9 codes may differ from other providers. We found some evidence of coding differences among back pain patients; only one ICD-9 code appeared among the top 5 most common ICD-9 back pain codes for both chiropractors and conventional providers (724.2, Lumbago: ranked first among conventional providers and fourth among chiropractors). Further, CAM providers are noted for their empathy and listening skills.[38] It is possible that they would be more likely to code a patient's symptoms as a valid physical condition when a conventional provider might consider the same complaint as psychosomatic.

In summary, the additional diagnoses patients have after seeing a CAM provider may occur because CAM providers code the same set of symptoms differently from a conventional provider, or because patients see the CAM provider for different conditions than those for which they see conventional providers. We cannot distinguish the effects of these two factors.

Our finding is particularly important in the contexts of using risk adjustment to set capitation rates, to predict utilization, or to identify potentially high-cost enrollees. Algorithms used for these purposes may need to be re-calibrated if CAM providers are added to the mix; historical cost data for specific risk categories may not give an accurate prediction of future costs for patients placed in those risk categories based on both conventional and CAM diagnoses.

For research uses of risk adjustment, these analyses raise several questions. In research, risk adjustment is often used to compare health care expenditures between groups with similar

disease burdens. We found that the two indices led to different answers to our primary question about relative health care expenditures between CAM users and non-users. When disease burden groups are determined without CAM providers, CAM users appear more expensive overall than non-users. However, when CAM providers are included in the determination of disease burden groups, the opposite is true; CAM users appear less expensive, especially in the highest disease burden groups. The validity and reliability of diagnoses assigned by CAM providers has not been established, so caution must be used when interpreting the meaning of "disease burden" based partially on CAM diagnoses.

It is important to note that all allowed visits, including CAM visits, were included in the calculation of total annual expenditures for each patient. When the risk scores were recalculated excluding CAM visits, individual expenditures did not change; however, some individuals moved from one risk group to another, and this affected the average annual expenditures for each risk group.

Why the CAM users in the high disease burden groups cost less than non-users is a key question. One potential explanation is that we know CAM providers are reimbursed at much lower rates per visit than conventional providers. In our dataset, the average allowed amount was $53 ± x for CAM visits and $117 ± x for conventional outpatient visits. To the degree that CAM providers thus are managing sick patients efficiently at lower costs, this is a benefit to the health care system. Another potential explanation, however, is that the patients who end up in high morbidity groups as a result of CAM provider diagnoses are not as "sick" as those put into high groups based on conventional diagnoses. In this case, the patients would likely have lower costs whether treated by CAM *or* conventional providers. However, we did not find evidence that this is the case, as CAM users were more likely to be hospitalized, more likely to have had a surgical procedure, and slightly more likely to have other serious conditions. Further, a higher proportion of CAM users than non-CAM users ended up in the highest morbidity categories even when diagnoses from CAM providers were excluded.

A third possibility is that the morbidity groups established by the Hopkins' national sample should be considered only as "expected resource use under conventional care." That is, the algorithm used to create the morbidity groups, which looks at average expenditures for each ACG category and then groups those with the most similar expenditures, was based solely on conventional providers. It is possible that when care from CAM providers is included, these standard groupings no longer represent individuals with similar expected resource use. If so, the indices need to be recalibrated for the inclusion of CAM providers. The same would be true of other risk adjustment indices calibrated using only conventional providers. When such indices are used to predict expenditures, recalibration may be the best approach. However, until more information is available regarding the coding practices of CAM providers, researchers may wish to consider excluding diagnoses from CAM providers in measures of disease burden based on ICD-9 codes.

When considering how CAM care affects insurance expenditures, it is important to note that we do not know how patients would have behaved had coverage for CAM care not been provided. That is, if CAM care was not covered and patients sought conventional care instead, this may have raised expenditures. On the other hand, CAM coverage may have added to expenses if this coverage led patients to use care that they otherwise would not have used or would have paid for out of pocket.

Due to the limitations of claims data, we have several other unanswered questions as well. One such question is the extent to which reverse causality may exist in these data: to what extent do CAM patients get additional diagnoses (and thus get bumped into higher risk categories)

simply because they see more providers, increasing their opportunity to get additional codes? In the original article describing the development of the ACG System, Weiner argues that this is unlikely to be a problem because ACGs are "few in number, broad in definition, and analyses have shown them to be distinct from one another." [5] Another question arises from the limited number of codes included on insurance claims. We do not know the extent to which this may affect conventional and CAM provider coding differently.[17–20]

Awareness of these potential issues in risk adjustment is important for several reasons. First, organizations using standard risk indices for future cost projection activities need to be aware of whether chiropractors or other CAM providers are included in their data sets and recognize the possible need to recalibrate the index if so. Second, given the increasing pressure on insurance companies to include coverage for CAM providers, the question of whether insurance coverage of CAM providers leads to higher – or perhaps lower – health care expenditures is an important one. Another reason this issue is important is that many insurance products now cover chiropractic,[22, 23, 30, 39] so risk indices based on insurance claims routinely include diagnoses from chiropractors. Chiropractic diagnoses must be included in the risk adjustment index in order to get a complete picture of health care use for these individuals; thus we must determine whether the algorithms used in the risk indices are valid when chiropractors are included. As other CAM provider types are increasingly covered under insurance in the future, this issue will become even more important to resolve.

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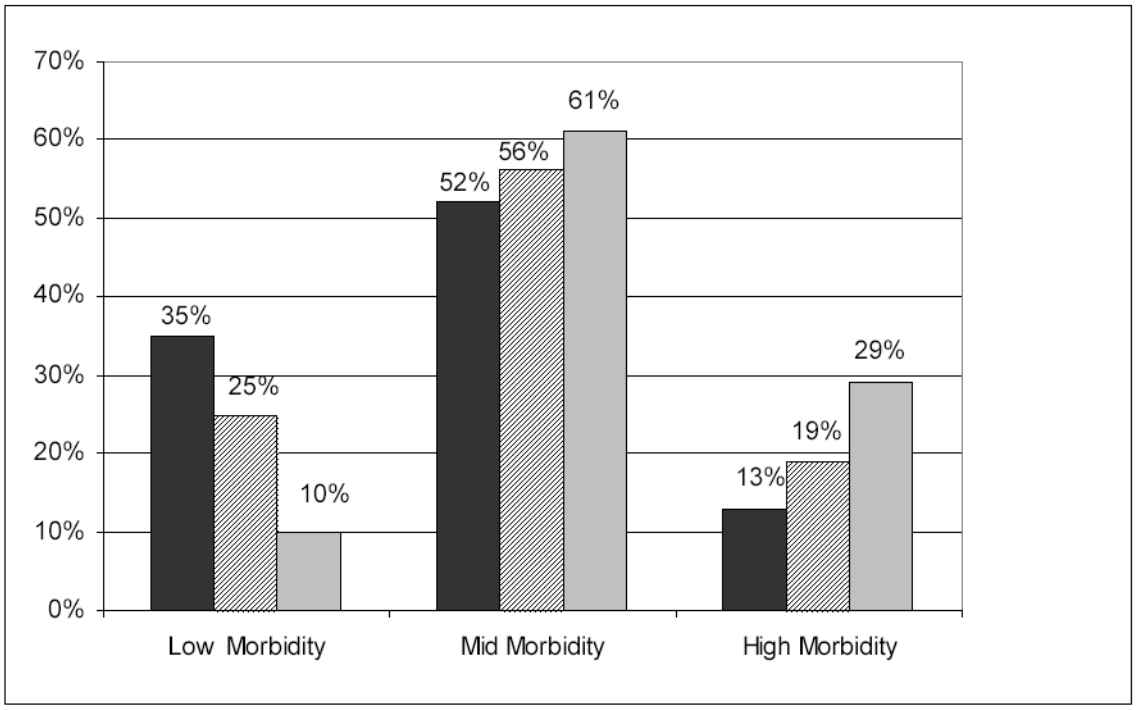

Figure 1.
Distribution of Morbidity groups by CAM use and the Inclusion or Exclusion of CAM Claims
Legend: Black bar: No CAM use.
Striped bar: CAM Users, CAM dx not included.
Solid gray bar: CAM Users, CAM dx included

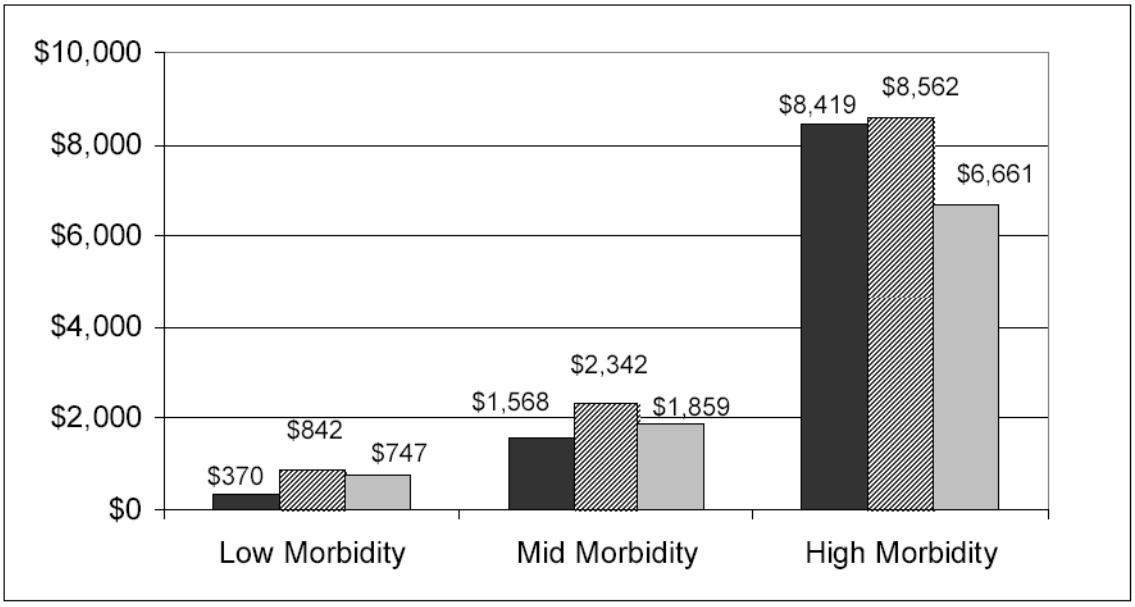

Figure 2.
Distribution of Annual Expenditures by CAM use and Inclusion or Exclusion of CAM Claims
Legend:Black bar: No CAM use.
Striped bar: CAM Users, CAM dx not included.
Solid gray bar: CAM Users, CAM dx included

Table 1

Characteristics of the Study Population: Adults (ages 18–64) with Private Commercial Insurance Coverage in Western Washington State

	Enrollees with allowed claims (n = 337,147)		Non-CAM Users (n = 275,233)	CAM Users (n = 61,914)	Any NAM Visits[1] (n = 23,322)
	n	%	%	%	%
Percent of total	337,147	100	82	18	7
Female	195,299	58	56	65	77
Median Age, (yrs)		(43)	(43)	(44)	(44)
County Population of Residence:					
400k +	256,575	76	77	71	75
100k – 399k	51,213	15	14	19	17
< 100k	29,359	9	8	10	7
Product Line[2]					
HMO	50,810	15	16	13	13
PPO	190,595	57	55	63	63
POS	95,742	28	29	24	24

[1] Subset of CAM users who saw a Naturopathic physician, Acupuncturist, or Massage therapist.

[2] Product Line: HMO = Health Maintenance Organization, PPO = Preferred Provider Organization, POS = Point of Service.

Table 2

Morbidity Groups

Morbidity groups* using claims from all providers	Enrollees with allowed claims (n = 337,147) n	%	Non-CAM Users (n = 275,233) %	CAM Users (n = 61,914) %	Any NAM Visits (n = 23,322) %
Low 1	31,305	9	11	0.4	0.7
2	71,209	21	24	9	6
3	181,190	54	52	61	60
4	43,036	13	11	23	27
High 5	10,400	3	2	6	7
Morbidity groups* excluding claims from CAM providers					
Low 1	35,583	11	11	7	5
2	76,372	23	24	18	14
3	178,169	53	52	56	57
4	38,449	11	11	15	19
High 5	8,566	3	2	3	4

* Morbidity groups are based on Adjusted Clinical Groups (ACG) scores as described in the text

Table 3

Linear Regression[1] Results of the Effect of CAM Use on Average Annual Expenditures per Patient by Morbidity Group, [2] Compared to Those in the Lowest Category*

	Morbidity Groups based on all providers				Morbidity Groups with CAM provider diagnoses excluded			
	CAM users		Non-CAM users		CAM users		Non-CAM users	
Morbidity group	beta[3]	s.e.	beta	s.e.	beta[3]	s.e.	beta	s.e.
Low 2	$511	15	$245	6	$687	11	$244	6
3	1,565	17	1,300	11	2,036	22	1,302	11
4	4,493	64	5,318	53	5,959	98	5,334	53
High 5	12,926	399	20,695	466	18,508	666	20,747	467

* $p < .001$ for all comparisons

[1] Independent variables were age, sex, county population, insurance product indicators, CAM use indicator, morbidity category indicators, and interactions between CAM use and morbidity category indicators.

[2] Morbidity groups are based on Adjusted Clinical Groups (ACG) scores as described in the text

[3] For CAM users, the beta coefficient shown for each morbidity category is the sum of the beta coefficients for CAM use, morbidity category, and the interaction of CAM use x morbidity category.