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Out-of-Pocket Expenditures on Complementary Health Approaches Associated with Painful Health Conditions in a Nationally Representative Adult Sample

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Abstract

National surveys suggest that millions of adults in the United States use complementary health approaches such as acupuncture, chiropractic manipulation, and herbal medicines to manage painful conditions such as arthritis, back pain and fibromyalgia. Yet, national and per person out-of-pocket (OOP) costs attributable to this condition-specific use are unknown. In the 2007 National Health Interview Survey, use of complementary health approaches, reasons for this use, and associated OOP costs were captured in a nationally representative sample of 5,467 adults. Ordinary least square regression models that controlled for co-morbid conditions were used to estimate aggregate and per person OOP costs associated with 14 painful health conditions. Individuals using complementary approaches spent a total of \$14.9 billion (S.E. \$0.9 billion) OOP on these approaches to manage these painful conditions. Total OOP expenditures seen in those using complementary approaches for their back pain (\$8.7 billion, S.E. \$0.8 billion) far outstripped that of any other condition, with the majority of these costs (\$4.7 billion, S.E. \$0.4 billion) resulting from visits to complementary providers. Annual condition-specific per-person OOP costs varied from a low of \$568 (SE \$144) for regular headaches, to a high of \$895 (SE \$163) for fibromyalgia.

Keywords

Complementary and Alternative Medicine; out-of-pocket costs; expenditures; back pain; chronic pain

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Disclosures

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INTRODUCTION

The continuing high use of complementary health approaches (e.g., acupuncture, chiropractic manipulation, massage therapy and herbal medicines) by adults (33.2%)¹⁶ and children (11.6%)⁹ in the United States has led to interest in identifying the costs associated with these approaches^{17, 19, 20, 21, 27, 29, 30, 33, 40}. Although earlier estimates of total out-of-pocket (OOP) expenditures have been made^{20, 21, 33}, to the best of our knowledge, none of these studies have provided nationally representative estimates on average per person or total OOP expenditures made by individuals using these approaches to treat or manage health conditions associated with pain, despite the fact that these painful conditions are a primary driver of use^{5, 6, 13, 20, 21}. Commenting on this lack of cost data, the Institute of Medicine (IOM)²⁶ page 93) noted that while “people with chronic pain are frequent users” of these complementary approaches, “the costs of these services – which often must be paid, at least in part, out of pocket – are difficult to measure.” The 2007 National Health Interview Survey (NHIS), a nationally representative dataset on complementary health approaches in the United States, provides a unique opportunity to help fill this void by providing the first nationally representative data on OOP expenditures for a variety of complementary health approaches used to treat or manage specific health conditions. Although the 2012 NHIS survey included questions on expenditures for complementary health approaches, the design of that questionnaire only allowed for a non-random assessment of cost data associated with the use of complementary approaches to treat specific health conditions. Therefore, unbiased assessments of national expenditures are not possible using 2012 data.

Using data from the 2007 NHIS, we examine the financial impact of complementary health approaches in individuals with painful health conditions such as arthritis, back pain and fibromyalgia to provide national estimates of all OOP expenditures on complementary health approaches to treat or manage these specific diseases or conditions after accounting for other co-morbid conditions. Such cost-of-treatment studies are necessary to describe the resources expended on these complementary approaches on a disease-by-disease basis. The literature suggests that most individuals do not have health insurance coverage for these approaches^{15, 21}. Even when health insurance coverage is available it is generally limited such that individuals will still have substantial amounts OOP²¹. Thus the current data will help inform accurate cost-of-illness studies, educate practitioners and policy makers regarding the extent of this use (and the implied value placed on that use), and may help more accurately portray the economic impact of these conditions and practices on both individuals and the nation.

METHODS

The NHIS is an annual survey of the health of the U.S. civilian, non-institutionalized population conducted by the National Center for Health Statistics, Centers for Disease Control and Prevention (CDC). The survey contains four main modules: Household, Family, Sample Child, and Sample Adult. The first two modules collect health and sociodemographic information on each member of all families residing within a sampled household. Within each family, additional information is collected from one randomly selected adult (the “sample adult”) aged 18 years or over and from an adult knowledgeable

about one randomly selected child (the “sample child”) under age 18. The survey uses a multi-stage clustered sample design, and oversamples black, Asian and Hispanic populations.

For the 2007 interviewed sample, there were 29,266 households consisting of 75,764 persons in 29,915 families. The total household response rate was 87.1%. From the households interviewed, 23,393 adults completed core interviews, resulting in overall sample adult response rate of 67.8%.

In 2007, a 15-minute supplement on complementary health approaches was added to the NHIS. The developmental processes for this supplement have been previously described⁴⁵. The supplement contained questions on 36 types of complementary health approaches used in the United States, including practitioner-based approaches (see Appendix A; e.g., acupuncture, chiropractic and osteopathic manipulation; naturopathy, etc.), and complementary health approaches for which the services of a practitioner are not necessary (see Appendix A; e.g., meditation; nonvitamin nonmineral, dietary supplements or NVNMDS; yoga; special diets).

Follow-up questions about out-of-pocket expenditures were only asked when a complementary health approach was used within the past 12 months except for NVNMDS where a 30 day time period was used. Cost questions in the NHIS supplement consisted of the number of visits to a complementary health provider, the number of purchases of complementary health products, and the amount spent on these visits and/or purchases.

Figure 1 describes the identification of participants with valid out-of-pocket expenditures on complementary health approaches in the 2007 National Health Interview. Of the 23,393 sample adults in the 2007 NHIS, 556 (2.4%) withdrew from the survey before answering any questions on complementary health approaches. Of the remaining sample (n=22,837), 8,462 (37.1%) used at least one complementary health approach within the past 12 months (30 days for NVNMDS). Those individuals who were not asked about expenditures for visits to complementary providers or purchases of complementary products (n=2,642; e.g., those who used meditation or yoga, but only on their own) were excluded from the analysis. Also excluded were 332 individuals with missing data pertinent to cost calculations (e.g., number of visits) (see Figure 1 for detail). Finally, during development and cognitive testing of the NHIS supplement on complementary health approaches⁴⁵, no respondent reported more than daily purchases of NVNMDS. Therefore, in the current analysis, responses indicating purchases of more than 365 times per year were excluded from the analysis as presumed keystroke errors (n = 21). Thus our final sample for analysis constituted 5,467 individuals who used complementary health approaches in the past 12 months (30 days for NVNMDS) and had out-of-pocket costs for complementary providers or purchases. Table 1 presents the demographic characteristics of the final sample for analysis.

The 2007 NHIS was approved by the National Center for Health Statistics Research Ethics Review Board on October 18, 2006. Verbal consent was obtained from all survey respondents.

Independent Variables

Based on ICD-9 condition grouping and sample size considerations, we created a broad category of 14 pain conditions as follows: arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, and severe headache or migraine. The complementary health approach supplement collected the specific condition(s) being treated by the approach from individuals who reported they were using complementary health approaches for treatment purposes. This was a mark-all-that-apply question, meaning the respondent could report as many conditions per approach as applicable. The question about using a complementary health approach for a specific health problem or condition was only asked when the respondent reported using these approaches during the past 12 months. As such, the reference period for condition-specific prevalence rates is 12-months. Individual cost data were calculated on the presence of any pain as described above and on the eight and four most prevalent pain conditions. Based on the 2007 NHIS³⁷, the 8 most prevalent conditions were back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia. The four most prevalent conditions³⁷ were back pain, neck pain, joint pain, and arthritis.

Dependent Variables

The primary dependent variables for this study were annual per person out-of-pocket expenditures on all use of complementary health approaches queried in the 2007 NHIS (as described above) for those who had expenditures. Annual per person out-of-pocket expenditures on complementary health approaches were calculated based on the equation:

$$\text{Out-of-pocket Cost/Person/yr} = [(\text{Out-of-pocket Cost/visit} \times \text{number of visits/yr}) + (\text{Out-of-pocket Cost/purchase} \times \text{number of purchases/yr})].$$

This calculation was applied to the 5,467 individuals who had the necessary data to calculate annual expenditures on visits to a complementary health provider and/or purchases of a complementary health product as described above.

To estimate the OOP costs per visit to a complementary provider, the costs per purchase for homeopathic medicine, costs per class for yoga, tai chi, and qi gong, and costs for materials (e.g., books and videos) related to relaxation techniques, the individual response amounts of \$0 to \$499 and the category of "\$500 or more," which was top coded as \$500, were used. Less than 0.5% of responses were top coded (see Appendix A for actual questionnaire wording). The response categories for the question about the amount spent on herbal supplements and other NVNMDS were: "under \$15, \$15–\$29, \$30–\$59, \$60–\$89, \$90–\$119, and \$120 or more" (see Appendix A for actual questionnaire wording). Following standard analytic procedures, the mid-points of the first five intervals were used in this analysis, and, responses of \$120 or more were top-coded as \$120^{18, 2324, 47}. Less than 6.0% of responses were top coded.

Participants were offered several response options to report the number of visits they made to a given complementary practitioner in the last 12 months: one time, 2–5 times, 6–10

times, 11–15 times, 16–20 times, and “more than 20 times” (see Appendix A for actual questionnaire wording). The mid-points of the first five intervals were used in this analysis, and, for the response category “more than 20 times,” the value 21 was used. Less than 9.0% of responses were top coded.

To estimate how often NVNMDS and homeopathic medicine were purchased, the respondent’s original answer of times per day, week, or month was converted into times per year.

Similar to the analysis of visits to practitioners, the number of times a person took a yoga, tai chi, or qi gong class was calculated by using the mid-points of the response category intervals. These intervals were 2–11 times per year, 2–3 times per month, 2–3 times per week, 4–6 times per week or “daily” (see Appendix A for actual questionnaire wording). Responses reported as daily, per week, or per month were converted into times per year. Individuals attending only one class per year were not considered users of complementary health approaches as defined in the 2007 survey and thus did not receive any questions about cost of the class.

Two non-exclusive groups of complementary health approaches were created: 1) users who saw a practitioner for any complementary approach; and 2) users of NVNMDS.

Statistical Analyses—On initial inspection, we found that the data distribution for the out-of-pocket expenditures on complementary health approaches was positively skewed (see Appendix B histogram). This skewness is common to most types of cost data^{8, 11, 31, 32}. While data transformation, such as using a log scale, can be used to account for this skewness, for several reasons we chose to use untransformed data: 1) it has been suggested that untransformed data often performs better in regression models than transformed data^{4,48}; 2) retransforming cost data back to its original scale requires the use of smearing coefficients or other perturbations that may not be easily interpreted and can result in under- or over-estimation of predicted costs^{11, 12}; and 3) it has been found that in large datasets (n ’s > 1000), such as the NHIS, ordinary least square (OLS) regression of untransformed data will provide unbiased estimates of the regression parameters based on the central limit theorem^{31, 48}.

Cost Analyses

The SUDAAN DESCRIPT and RATIO procedures were used to calculate: 1) mean number of visits, mean OOP cost per visit, and OOP cost per person for all visits to complementary health approach providers; 2) mean number of purchases, mean OOP cost per purchase, and OOP cost per person for all NVNMDS purchases; 3) overall national estimates of expenditures for visits to complementary health approach practitioners, complementary health approach purchases, NVNMDS purchases, and overall expenditures for complementary health approaches. The expenditure variables used in this procedure were created by summing the OOP amount each person paid over the past 12 months for: (1) visits to selected complementary practitioner(s), (2) purchases of NVNMDS, (3) purchases of complementary products other than NVNMDS, and (4) visits to selected complementary practitioner(s) plus purchases of complementary products (total expenditures on

complementary health approaches). These categories were also used when calculating national estimates incurred by individuals who reported having one or more of the 14 painful health conditions described above, as well as combined costs for the eight and four most prevalent individual painful conditions.

Since the NHIS questionnaire did not specifically ask about costs associated with the use of a given complementary approach for a specific health condition, we estimated condition-specific expenditures for individuals who reported using one or more complementary therapies to treat or manage a given condition. For this estimate, we used ordinary least squares (OLS) regression to calculate the adjusted mean OOP costs³⁸. This approach allowed the estimation of the incremental OOP costs associated with a given health condition, after adjusting for other conditions and non-condition reasons for using complementary therapies. For the OLS analyses, the dependent variable in each model was total OOP expenditures on complementary health approaches treated as a continuous variable. These models include an indicator variable for those individuals using complementary therapies to treat or manage pain (any pain, eight and four most prevalent painful conditions and 14 individual painful conditions), with the reference set as the absence of the condition. The models controlled for all other health conditions being treated or managed with complementary health approaches by combining these other individual health conditions into five groupings based on ICD 9 codes and sample size considerations: 1) circulatory/respiratory; 2) mental health; 3) digestive/endocrine/genitourinary; 4) cancer; and 5) all other conditions. The lists of specific conditions in each grouping are listed in Appendix C. Because complementary practices may be used for reasons other than a specific disease or condition, we also controlled for these other uses: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function. Note that the purpose of the OLS regression in the present work was to determine the typical actual (marginal) difference in expenditures for those with and without each health condition (i.e., for those who did and did not report a particular health condition as a reason for using complementary health approaches) in the study's population. For this reason, we did not adjust for variables such as age, sex, education, income, etc.

Costs can be driven by a number of factors including the number of visits to providers of complementary health approaches, number of purchases of products, and the cost of a given visit or purchase. Therefore, these factors were analyzed for both provider-based services and purchases of NVNMDS; data for purchases other than for NVNMDS were too sparse for analysis. Since not every person who used a NVNMDS also made a visit, and not everyone who made a visit also purchased a NVNMDS, the condition-specific values estimated from regression models for visits and NVNMDS are not additive to get total OOP costs per person. Using standard diagnostic approaches, all models were assessed for, and found free of, substantial collinearity or heteroscedasticity.

Data on expenditures are reported as mean (Standard Error [SE]). Prevalence data are reported as percentages (SE). Data for which the SE is greater than 50% of the estimate were considered unreliable and are not presented. For prevalence data, z-tests were performed on the proportions to compare the demographic characteristics of the sample of analysis (Figure

1) to both all individuals who used complementary health approaches and to the general population (Table 1).

Using SUDAAN software (Research Triangle Institute, Inc., 2008) to account for the complex sample design of the NHIS, Least Square Means and associated standard errors and confidence intervals were generated using PROC REGRESS. To represent the U.S., civilian, non-institutionalized population aged 18 years and over, all estimates were weighted using the NHIS sample adult record weight.

Sensitivity Analyses

In order to test whether the findings are sensitive to the coding of the intervals (minimum, mid-points, maximum) described above, we recalculated all statistics shown in the results section using the high and low ends of each interval category used in our cost calculation (cost of NVNMDS, number of visits to complementary health approach providers, and number of yoga, tai chi, and qi gong classes). Furthermore, in order to assess the impact of top coding the highest categories of each variable, we recalculated the cost of NVNMDS and number of provider visits using 25% above the top of the range for responses that fell in the highest categories (e.g. for NVNMDS we coded the highest expenditure response as 150, and coded the highest category for provider visits to 25). See appendix D for a complete description of category coding used in the sensitivity analyses. The Welch U-test was used to compare the original cost estimates to estimates calculated in the sensitivity analysis.

RESULTS

Table 1 presents selected demographic and health status characteristics of the general adult population (Table 1, column 1), as well as the characteristics of individuals who used any complementary health approach (Table 1, column 4) and of individuals who reported at least one expenditure on any complementary health approach (the sample of analysis, Table 1, column 7). Compared to all individuals who used complementary health approaches, those who reported making an expenditure were slightly more likely to be white (89.6% vs. 86.7%, $p < 0.001$), to have private health insurance (76.6% vs. 73.8%, $p = 0.004$), to have any pain in the previous 12 months (71.3% vs. 69.1%, $p = 0.029$), as well as back pain (36.8% vs. 34.2%, $p = 0.009$) and neck pain (22.6% vs 20.1%, $p = 0.004$). Both groups of complementary health approach users differed significantly ($p < 0.001$) from the general adult population including having a higher proportion of women, non-Hispanics, whites, individuals aged 45–64, individuals who graduated college, individuals with private insurance, individuals with any pain, as well as individuals having each painful condition examined and individuals falling into each of the five broad other condition groups.

Figure 2 presents the unadjusted and adjusted (after adjusting for other conditions and non-condition reasons for using complementary therapies) total annual population out-of-pocket expenditures for complementary health approaches by those who reported using these approaches to treat or manage any of the painful health conditions we studied. Similarly, Figure 3 presents the unadjusted and adjusted total annual population out-of-pocket expenditures for complementary health approaches for each of the individual painful health conditions.

Since little difference was seen between the unadjusted and adjusted estimates, only adjusted estimates will be presented in the text. The total expenditures for those reporting any pain was \$14.9 billion (S.E. \$0.9 billion), with the top four painful conditions (back pain, neck pain, joint pain and arthritis) accounting for \$13.7 billion (S.E., \$0.9 billion). Total expenditures seen in those using complementary health approaches for their back pain (\$8.7 billion, S.E. \$0.8 billion) far outstripped that of any other condition, with the majority of these costs (\$4.7 billion, S.E. \$0.4 billion) resulting from visits to complementary healthcare providers (Figure 4) versus purchases of NVNMDS (Figure 5: \$1.9 billion, SE \$0.46 billion).

Of note, the rank order of these expenditures closely mirrors the frequency with which complementary health approaches are used to treat or manage the 14 painful health conditions (Figure 6), as well as the total number of visits or purchases made (Table 2). These data suggest that the costs in Figure 3 are mostly driven by frequency of use by individuals using complementary approaches for a given condition rather than higher per visit or purchase OOP expenditure costs for one condition over another.

Figure 7 shows the annual adjusted per person per conditions OOP expenditures estimated from our regression analyses – i.e., after adjusting for co-morbidities. In those who had visited a complementary provider or purchased a complementary product, the estimated annual adjusted OOP expenditures per person per condition are fairly similar across most conditions, from a low of \$568 (SE \$144) for regular headaches (SE), to a high of \$895 (SE \$163) for fibromyalgia, with the average per person OOP costs for any type of pain being \$687 (SE \$44). Based on our regression models Figures 8 and 9 show, respectively, the estimated adjusted per person OOP costs associated with provider visits and purchases of NVNMDS to treat or manage a given painful health condition after adjusting for co-morbid conditions. Rarely was a given painful condition associated with both high per person costs for visits and purchases. For instance, fibromyalgia and regular headaches were associated with the two highest estimated per person per condition OOP cost for visits to complementary providers (\$629 [SE \$ 115] and \$461 [SE \$74], respectively), but had among the lowest costs for NVNMDS (\$616 [SE \$193] and \$293 [SE \$97], respectively). Conversely, sprains and strains were associated with the highest per person OOP cost for NVNMDS (\$1157, SE \$522) but the lowest cost for visits (\$284, SE \$53).

Table 2 shows the annual number of visits per person and number of NVNMDS purchases per person for individuals using complementary providers to treat or manage the 14 painful health conditions studied. Consistent with the annual per person OOP costs associated with visits to complementary health providers (Figure 6), individuals with fibromyalgia (14.28 visits per person, SE 1.66) and regular headaches (14.18 visits per person, SE 1.62) made the most visits, while those with arthritis (10.23 visits per person, SE 0.75), and sprains and strains (11.03 visits per person, SE 2.07) made the fewest. The tight relationship seen between the number of visits and per person OOP costs for visits is not as apparent when examining purchases of NVNMDS. For instance, while individuals using NVNMDS to treat or manage sprains and strains had the highest per person OOP costs for NVNMDS (see above), these individuals made the 3rd fewest number of NVNMDS purchases (13.72 per person, SE 3.98). Conversely, individuals with fibromyalgia made the most NVNMDS

purchases per person (28.89 purchases, SE 17.31) but had the 4th lowest per person OOP costs (Figure 7; \$616, SE \$193).

Examples of our sensitivity analysis are presented in Figure 10. The top panels present data on adjusted total annual OOP expenditures for all painful conditions combined and for back pain alone, while the bottom two panels present the corresponding data for annual per person OOP expenditures. In all cases the original estimates fall between the low and high ranges. No statistical difference was seen between the original estimate and any of the estimates calculated using different assumptions on how to treat interval data or top-coded data.

DISCUSSION

In this analysis we examined OOP spending associated with the use of complementary health approaches for specific painful health conditions to determine those conditions that accounted for the highest national and personal out-of-pocket resource use. Using data from the 2007 NHIS, we estimate that U.S. adults spent about \$14.9 billion out-of-pocket on visits to complementary practitioners and on purchases of complementary products, classes, and materials to treat or manage their pain. Using data from the 2008 MEPS Gaskin and Richard²² estimated that the incremental out-of-pocket costs of conventional care for U.S. adults with pain (defined as persons who reported that they experience pain that limited their ability to work and/or persons who were diagnosed with joint pain or arthritis and/or person who had a disability that limited their ability to work) fell between \$44–51 billion annually. Thus our estimate of \$14.9 billion for complementary health approaches could be as much as 20–25% of all OOP health-care expenditures (conventional and complementary combined) made by U.S. adults to treat or manage their pain.

As noted in this analysis, estimates of national expenditures were highest in those who report using any complementary therapy to treat or manage back pain (\$8.7 billion), neck pain (\$3.8 billion), joint pain (\$3.0 billion) and arthritis (\$2.2 billion). Our estimated national expenditures by those using complementary approaches to treat or manage back pain are particularly striking when one considers that the total conventional medical expenditure for back pain, derived from actual billing costs assessed in the Medical Expenditure Panel Survey (MEPS, which includes expenditures for hospital inpatient stays and outpatient visits, office based provider visits, emergency room visits, prescription medicine and home health visits), was \$30.5 billion in 2007¹. Out-of-pocket expenditure for this care estimated through MEPS was \$5.2 billion, which is 40% less than the \$8.7 billion spent out-of-pocket on complementary health approaches (Figure 2). On the other hand, MEPS estimates for OOP conventional care costs for arthritis (\$5.3 billion) and headache (\$1.6 billion) were greater than respective out-of-pocket costs for complementary health approaches (arthritis: \$2.2 billion; Headache [regular and severe combined]: \$1.1 billion). Our data and MEPS data become more comparable when examining per person costs. For instance, we found that adults with expenditures on complementary health approaches for their pain spent an average of \$687 (S.E. \$44) per person OOP on these approaches. This is close to the average out-of-pocket expenditures in 2007 (from MEPS) for conventional care by those actually using such care, \$792 (SE. \$15)². This comparability at the level of the

individual also applies to disease-specific data. For instance, individuals with arthritis were estimated to spend from \$694 (men) to \$1379 (women) per year out-of-pocket for conventional care²⁵ versus \$816 spent OOP by those using complementary health approaches (Figure 5). In another example, adults (<65 years of age) receiving treatment for migraine were estimated to spend \$1067 annually out-of-pocket for this care, with \$469 spent out-of-pocket on prescription drugs and \$598 on provider visits⁴⁴. In the present study, we estimated that \$635 was spent on average OOP for complementary health approaches by individuals using these approaches for severe headaches/migraines, with \$312 being spent on provider visits and \$380 for purchases of NVNMDS. Thus, although a small fraction of national expenditures on healthcare spending in the United States, expenditures for complementary health approaches constitute a substantial part of out-of-pocket health-care costs for those who experience these costs, and are comparable to such costs for conventional physician services and prescription drug use.

Given that approximately 93–96% of individuals using complementary health approaches also use conventional care^{3, 21, 35} it is likely individuals with painful health conditions will also use, and incur OOP costs, for both types of care. Unfortunately, the NHIS does not collect costs associated with conventional care. While the Medical Expenditure Panel Survey does collect costs for conventional care, it only collects cost data for visits to a few types of complementary providers – acupuncturist, chiropractor, massage therapist, naturopath/homeopath; MEPS does not collect ANY cost data on the many other types of complementary approaches - e.g., NVNMDS, yoga, meditation, homeopathy, etc. Therefore, to the best of our knowledge, it is not possible to estimate nationally representative data on the total combined OOP costs of conventional and complementary care for a given painful health condition.

The distribution of total OOP costs seen in Figure 2 for painful conditions are perhaps not surprising given the relative prevalence of these pain conditions in the general population) –, 27.6% for joint pain, 25.6% for back pain, 16.8% for arthritis and 13.0% for neck pain (Figure 3) - and the fact that individuals with painful conditions have some of the highest prevalence rates for the use of complementary health approaches^{5, 6, 28, 39, 40, 46}.

Our findings for complementary health providers are comparable to the small number of studies that have investigated the number of visits to complementary providers by those with back pain or fibromyalgia. While Lind et al.^{29,30} found an average of 13 visits per year to complementary providers for fibromyalgia and 7–13 visits per year for back pain (depending on whether the participants used only complementary providers or both complementary and conventional providers), we found 14 and 11 visits per year, respectively.

While we could not identify any other epidemiological research that tracked the number of per person purchases made for NVNMDS, these types of data are collected as part of marketing research by the nutrition industry³⁶. For instance in 2007, heavy consumers of NVNMDS (herbal medicine combined with specialty supplements such as glucosamine and omega 3 fatty acids) made, on average, 60 purchases per year, while occasional users made 9 purchases per year. Our data on use of NVNMDS for specific health conditions show a similar range from a low average of 8 purchases a year by those using these products to treat

severe headaches or migraines, to a high of 37 purchases a year by those treating their hypertension with these products.

There are several limitations in this analysis that warrant comment. First, the NHIS assigned conditions based on respondent self-reports, which are subject to various biases and reporting errors; inability to recall a condition, unwillingness to reveal a condition, or errors in coding conditions could all introduce errors. Also, potential underreporting increases with time since the expenditure, and with the number of ambulatory visits^{41, 42}. This underreporting could translate to underestimating expenditures in the current study. Second, the 2007 NHIS questionnaire did not specifically ask about costs associated with the use of a given complementary approach for a specific health condition. Thus we had to estimate these costs using OLS regression to account for comorbidities and other reasons an individual used these approaches. However, our results did not change much after adjustment, and our data are in line with the limited literature already published on the topic (see above) increasing our confidence in our estimates. Third, although the NHIS sampling design allows for unbiased estimates of national trends, the data are limited to the non-institutionalized population. Future research should consider out-of-pocket spending by persons in nursing home, hospice and other residential healthcare facilities, since these persons have been shown to use complementary health approaches⁷ and are likely to be disproportionately affected by chronic conditions. Fifth, the available data lack detailed clinical information such as a specific clinical diagnosis, disease severity and disease duration. These factors may both impact the use of complementary health approaches and the costs associated with this use^{10, 14, 29, 30, 34, 43}. Sixth, some expenditures are not in our estimate because they are not captured by NHIS (e.g., complementary health approaches other than those queried, or medical condition not listed in the NHIS). This would undoubtedly lead to an underestimate of total national expenditures. However, since the 2007 NHIS was designed⁴⁵ to capture the most prevalent forms of complementary health approaches used in the U.S., it is likely that any underestimate would be small compared to the current estimated expenditures. Finally, the data used for this analysis are now 8 years old. During this time the out-of-pocket costs associated with a specific complementary approach may have changed for a number of unmeasured reasons including changes in health insurance coverage and changes in the actual price of a visit to a provider (e.g., acupuncturist, chiropractor) or cost of a dietary supplement. However, to the best of our knowledge, data from the 2007 NHIS are the most recent data that allow unbiased out-of-pocket cost estimates to be made on a wide range of complementary health approaches.

CONCLUSION

Our paper extends the existing literature by providing both national- and individual-level estimates of out-of-pocket spending on complementary health approaches in those using these approaches to treat or manage selected painful health conditions. Although the overall impact of these approaches on total national health expenditures may be small, our data show that, at a societal level (i.e., including out-of-pocket costs), expenditures by those with back pain add substantially to that of conventional care, while at the level of the individual, estimated costs associated with the use of these approaches by individuals with pain-related health conditions are comparable in magnitude to those seen for out-of-pocket expenditures

on conventional care. While the quality of these data on expenditures was the best available to answer our research questions, our analyses are susceptible to a number of limitations as noted above and likely underestimate expenditures. These best-available estimates have the following practice, research and policy implications: first, these estimates inform practitioners about the extent of use (and the implied value placed on that use) for their patients who report using complementary health approaches. The information generated by this study is also essential to inform accurate societal cost-of-illness studies. Finally, this information can help drive complementary health approach research toward the conditions where consumers have indicated these approaches offer their highest out-of-pocket monetary value. It is true that expenditures are not a direct measure of whether the use of complementary health approaches improves individual or societal health. However, these out-of-pocket expenditures are an indication that consumers believe enough in the therapy's value to pay for it.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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APPENDIX A: Questions in the 2007 NHIS that were used to estimate expenditures on complementary health approaches for a specific health condition

I. PREVALENCE QUESTIONS

A: Use of complementary health included in estimating the cost of visits to complementary providers or practitioners

1. DURING THE PAST 12 MONTHS did you seen a provider or practitioner for any of the following therapies for yourself? Please say yes or no to each.

Acupuncture

Ayurveda

Biofeedback

Chelation Therapy

Chiropractic or Osteopathic manipulation

Energy Healing Therapy

Hypnosis

Massage Therapy

Naturopathy

2. . DURING THE PAST 12 MONTHS did you seen any of the following practitioners for health reasons? Please say yes or no to each.

Curandero

Espiritista

Hierbero or Yerbera

Shaman

Botanica

Native American ealer/Medicine man

Sobador

3. DURING THE PAST 12 MONTHS, did you see a practitioner or teacher for:

Feldenkreis

Alexander Technique

Pilates

Trager Psychophysical Integration

4. DURING THE PAST 12 MONTHS did you see a practitioner for:

Homeopathic treatment

Herbs or other non-vitamin, non-mineral dietary supplements

Vegetarian diet

Macrobiotic diet

Atkins diet

Pritikin diet

Ornish diet

Zone diet

South Beach diet

5. DURING THE PAST 12 MONTHS, did you see a practitioner or take a class for:

Meditation Guided imagery

Progressive relaxation

Deep breathing exercises

B: Use of complementary health approaches included in estimating the cost of purchases of nonvitamin, nonmineral dietary supplements, homeopathic medicine, or yoga, tai chi, or qi gong classes

1. DURING THE PAST 12 MONTHS, have you taken any herbal supplements listed on this card for yourself:

Androstenedione

Black cohosh

Carnitine

Chasteberry

Chondroitin

Coenzyme Q-10

Comfrey

Conjugated Linolenic Acid (CLA)

Cranberry (pills, gelcaps)

Creatine

DHEA

Echinacea

Ephedra
Evening primrose
Feverfew
Fiber or Psyllium (pills or powder)
Fish oil or omega 3 or DHA fatty acid supplements
Flaxseed Oil or Pills
Garlic supplements (pills, gelcaps)
Ginger pills or gelcaps
Ginkgo biloba
Ginseng
Glucosamine
Goldenseal
Guarana
Grape Seed Extract
Green tea pills (not brewed tea)
EGCG (pills)
Hawthorn
Horny Goat Weed
Kava kava
Lecithin
Lutein
Lycopene
Melatonin
MSM (Methylsulfonylmethane)
Milk thistle
Prebiotics or Probiotics
SAM-e
Saw palmetto
Senna
Soy supplements or soy isoflavones
St. John's wort
Valerian

2. DURING THE PAST 12 MONTHS, did you use homeopathic treatment for yourself?
3. DURING THE PAST 12 MONTHS, did you take a class or in some way receive formal training for [yoga, tai chi, qi gong]? Attending only one session does not count.
4. DURING THE PAST 12 MONTHS, on average, how often did you take a class or in some way receive formal training for [fill: practice used most]?
 - 2–11 times a year
 - Monthly
 - 2–3 times per month
 - Weekly
 - 2–3 times per week
 - 4–6 times per week
 - Daily

II. COST QUESTIONS

A: Costs for visits to complementary practitioners

1. DURING THE PAST 12 MONTHS, how many times did you see a practitioner or take a class or seen an instructor for [complementary approach]?
 - Only one time
 - 2–5 times
 - 6–10 times
 - 11–15 times
 - 16–20 times
 - More than 20 times
 - Refused
 - Don't know
2. On average, how much did you pay out-of-pocket for each visit to a practitioner or class (or other formal training) for [complementary approach]?
 - *Coded as actual numeric value up to \$500
 - *Responses of \$500 or more were coded by the interviewer as \$500

B: Costs for herbal medicine and other non-vitamin, non-mineral dietary supplements, and homeopathic medicine

1. About how often do you buy [herbal supplements, homeopathic medicine]?

* If necessary prompt with: how many times

per day

per week per month

per year

*Enter '0' if respondent does not buy [herbal supplements, homeopathic medicine].

*Enter time period for how often [herbal supplements, homeopathic medicine] are bought.

2. About how much did you spend the last time you bought herbal supplements:

Under \$15

\$15–\$29

\$30–\$59

\$60–\$89

\$90–\$119

\$120 or more

Refused

Don't know

About how much did you spend the last time you bought homeopathic medicine?

*Enter '500' for \$500 or more

C: Costs for yoga, tai chi, and qi gong classes

On average, how much did you pay out-of-pocket for each class or other formal training for [yoga, tai chi, qi gong]?

*Enter '500' for \$500 or more

III. USE OF EACH COMPLEMENTARY APPROACH FOR SPECIFIC HEALTH CONDITIONS

1. Did you use [complementary approach] for a specific health problem or condition?

2. For what health problems or conditions did you use [the complementary approach]?

*Enter all that apply, separate with commas.

01 Acid reflux or heartburn

02 Angina

03 Anxiety

04 Asthma

- 05 Arthritis
- 06 Attention Deficit Disorder/Hyperactivity
- 07 Autism
- 08 Benign tumors, cysts
- 09 Bipolar Disorder
- 10 Birth defect
- 11 Cancer
- 12 Cholesterol
- 13 Chronic Bronchitis
- 14 Circulation problems (other than in the legs)
- 15 Constipation severe enough to require medication
- 16 Coronary heart disease
- 17 Dementia, including Alzheimer's Disease
- 18 Dental pain
- 19 Depression
- 20 Diabetes
- 21 Emphysema
- 22 Excessive sleepiness during the day
- 23 Excessive use of alcohol or tobacco
- 24 Fibromyalgia
- 25 Fracture, bone/joint injury
- 26 Gout
- 27 Gum disease
- 28 Gynecologic problem
- 29 Hay fever
- 30 Hearing problem
- 31 Heart attack
- 32 Other heart condition or disease
- 33 Hernia
- 34 Hypertension
- 35 Inflammatory bowel disease
- 36 Influenza or pneumonia

- 37 Insomnia or trouble sleeping
- 38 Irritable bowel
- 39 Jaw pain
- 40 Joint pain or stiffness/other joint condition
- 41 Knee problems (not arthritis, not joint injury)
- 42 Liver problem
- 43 Lung/breathing problem (not already listed)
- 44 Lupus
- 45 Mania or psychosis
- 46 Memory loss or loss of other cognitive function
- 47 Menopause
- 48 Menstrual problems
- 49 Mental retardation
- 50 Missing limbs (fingers, toes or digits), amputee
- 51 Osteoporosis, tendinitis
- 52 Other developmental problem
- 53 Other injury
- 54 Other nerve damage, including carpal tunnel syndrome
- 55 Phobia or fears
- 56 Polio (myelitis), paralysis, para/quadruplegia
- 57 Poor circulation in legs
- 58 Prostate trouble or impotence
- 59 Regular headaches
- 60 Rheumatoid arthritis
- 61 Schizophrenia
- 62 Seizures
- 63 Senility
- 64 Sinusitis
- 65 Skin problems
- 66 Sprain or strain
- 67 Stroke
- 68 Substance abuse, other than alcohol or tobacco

- 69 Filled problem
- 72 Urinary problem
- 73 Varicose veins, hemorrhoids
- 74 Vision problem
- 75 Weak or failing kidneys
- 76 Weight problem
- 77 Back pain or problem
- 78 Head or chest cold
- 79 Neck pain or problem
- 80 Severe headache or migraine
- 81 Stomach or intestinal illness
- 82 Other - specify

Appendix B

Appendix B. Frequency distribution of total per person out-of-pocket expenditures on complementary health approaches^a

^aCreated by summing the amount each person paid out-of-pocket over the past 12 months for visits to selected complementary practitioner(s) and/or purchases of complementary products.

APPENDIX C: Individual conditions in each broad disease grouping

Circulatory/respiratory: asthma, emphysema, hay fever, angina, high cholesterol, chronic bronchitis, coronary heart disease, heart attack, other heart condition, hypertension, poor circulation in legs, and stroke

Mental health: anxiety, attention deficit disorder/hyperactivity, bipolar disorder, dementia including Alzheimer's disease, depression, excessive sleepiness during the day, excessive use of alcohol or tobacco, insomnia or trouble sleeping, mania or psychosis, memory loss or loss of other cognitive function, phobia or fears, schizophrenia, substance abuse, other than alcohol or tobacco

Digestive/endocrine/genitourinary: acid reflux or heartburn, constipation severe enough to require medication, gum disease, irritable bowel, liver problem, ulcer, stomach or intestinal illness, gynecologic problem, menopause, menstrual problems, prostate trouble or impotence, urinary problem, weak or failing kidneys, diabetes;

Cancer

Other conditions: influenza or pneumonia, sinusitis, head or chest cold, seizures, skin problems, vision problem.

Appendix D: Documentation of how variable values are altered in original estimate and sensitivity analyses

	Questionnaire categories	Original Estimate	Low Estimate	High Estimate	High Estimate including 25% added to value of top-code
Number of provider/practitioner visits ^a	1 time	1	1	1	1
	2–5 times	3.5	2	5	5
	6–10 times	8	6	10	10
	11–15 times	13	11	15	15
	16–20 times	18	16	20	20
	More than 20 times	21	20	21	25
OOP ^b cost for each visit to a provider/practitioner ^a	Responses recorded as integers of \$0 to \$499 and '500' for integers of 500 or more	Responses recorded as integers of \$0 to \$499 and '500' for integers of 500 or more	No alterations from original estimate	No alterations from original estimate	Responses of '500' or more recoded to \$625
OOP per purchase costs for purchases of NVNMDS ^c	\$0–15	\$8	\$0	\$15	\$15
	\$15–\$29	\$22	\$15	\$29	\$29
	\$30–\$59	\$44.5	\$30	\$59	\$59
	\$60–\$89	\$74.5	\$60	\$89	\$89

	Questionnaire categories	Original Estimate	Low Estimate	High Estimate	High Estimate including 25% added to value of top-code
	\$90–\$119	\$104.5	\$90	\$119	\$119
	\$120 or more	\$120	\$120	\$120	\$150
Number of classes for Yoga, Tai Chi, Qi Gong	2–11 time/yr	6.5/yr	2/yr	11/yr	11/yr
	Monthly	1/mo	1/mo	1/mo	1/mo
	2–3 times/month	2.5/mo	2/mo	3/mo	3/mo
	Weekly	1/wk	1/wk	1/wk	1/wk
	2–3 times/wk	2.5/wk	2/wk	3/wk	3/wk
	4–6 times/wk	5/wk	4/wk	6/wk	6/wk
	Daily	7/wk	7/wk	7/wk	7/wk
OOP Cost per class for Yoga, Tai Chi, Qi Gong	Responses recorded as integers of \$0 to \$499 and '500' for integers of 500 or more	Responses coded as integers of \$0 to \$499 and '500' for integers of 500 or more	No alterations from original estimate	No alterations from original estimate	Responses of '500' or more recoded to \$625
OOP per purchase cost of Homeopathic medicines	Responses recorded as integers of \$0 to \$499 and '500' for integers of 500 or more	Responses coded as integers of \$0 to \$499 and '500' for integers of 500 or more	No alterations from original estimate	No alterations from original estimate	Responses of '500' or more recoded to \$625

^a Complementary providers: Includes providers of acupuncture, Ayurveda, biofeedback, chelation therapy, chiropractic or osteopathic manipulation, energy healing therapy, herbal medicine, hypnosis, massage therapy, naturopathy: specific traditional healers, curandero, espiritista, hierbero or yerbera, shaman, botanica, native american healer/medicine man, sobador; practitioners or teachers of Feldenkreis, Alexander Technique, Pilates, Trager Psychophysical Integration, Guided Imagery, Mantra Meditation, Mindfulness Meditation, Spiritual Meditation, and Progressive Relaxation.

^b Out-of-Pocket

^c Nonvitamin, nonmineral dietary supplements include: Androstenedione, Black cohosh, Carnitine, Chasteberry, Condroitin, Coenzyme Q-10, Comfrey, Conjugated Linolenic Acid (CLA), Cranberry (pills, gelcaps), Creatine, DHEA, Echinacea, Ephedra, Evening primrose, Feverfew, Fiber or Psyllium (pills or powder), Fish oil or omega 3 or DHA fatty acid supplements, Flaxseed Oil or Pills, Garlic supplements (pills, gelcaps), Ginger pills or gelcaps, Ginkgo biloba, Ginseng, Glucosamine, Goldenseal, Guarana, Grape Seed Extract, Green tea pills (not brewed tea), EGCG (pills), Hawthorn, Horny Goat Weed, Kava kava, Lecithin, Lutein, Lycopene, Melatonin, MSM (Methylsulfonylmethane), Milk thistle, Probiotics or Probiotics, SAM-e, Saw palmetto, Senna, Soy supplements or soy isoflavones, St. John's wort, and Valerian

PERSPECTIVE

Adults in the United States spent \$14.9 billion OOP on complementary health approaches (e.g., acupuncture, chiropractic, herbal medicines) to manage painful conditions including back pain (\$8.7 billion). This back pain estimate is almost 1/3rd of total conventional healthcare expenditures for back pain (\$30.4 billion) and 2/3rds higher than conventional OOP expenditures (\$5.1 billion).

Highlights

- Many adults in the United States use complementary approaches to manage their pain
- In 2007, U.S. adults spent \$14.9 billion out-of-pocket (OOP) for this reason
- \$7.5 billion OOP was spent on visits to providers, e.g., chiropractors, acupuncturists
- \$5.2 billion OOP was spent for nonvitamin, nonmineral dietary supplements
- Costs are comparable to those seen for OOP expenditures on conventional care.

Figure 1.
Sample selection of participants with out-of-pocket expenditures on complementary health approaches in the 2007 National Health Interview Survey

Figure 2. Annual population out-of-pocket expenditures by those using complementary health approaches to treat or manage one or more painful health conditions^a: unadjusted^b and adjusted^c

^aOne or more of the following: arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, and severe headache or migraine

^bCreated by summing the amount each person paid out-of-pocket over the past 12 months for visits to selected complementary practitioner(s) and/or purchases of complementary products. Actual and weighted sample sizes for each group can be found in Table 2.

^cAdjusting for co-morbid health conditions and non-condition reasons for using complementary therapies: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function.

^dIncludes providers of acupuncture, Ayurveda, biofeedback, chelation therapy, chiropractic or osteopathic manipulation, energy healing therapy, herbal medicine, hypnosis, massage therapy, naturopathy; traditional healers including curandero, espiritista, hierbero or yerbera, shaman, botanica, native american healer/medicine man, sobador; practitioners or teachers of Feldenkreis, Alexander Technique, Pilates, Trager Psychophysical Integration, Guided Imagery, Meditation, and Progressive Relaxation

^eNonvitamin, nonmineral dietary supplements include: Androstenedione, Black cohosh, Carnitine, Chasteberry, Chondroitin, Coenzyme Q-10, Comfrey, Conjugated Linolenic Acid (CLA), Cranberry (pills, gelcaps), Creatine, DHEA, Echinacea, Ephedra, Evening primrose, Feverfew, Fiber or Psyllium (pills or powder), Fish oil or omega 3 or DHA fatty acid supplements, Flaxseed Oil or Pills, Garlic supplements (pills, gelcaps), Ginger pills or gelcaps, Ginkgo biloba, Ginseng, Glucosamine, Goldenseal, Guarana, Grape Seed Extract, Green tea pills (not brewed tea), EGCG (pills), Hawthorn, Horny Goat Weed, Kava kava, Lecithin, Lutein, Lycopene, Melatonin, MSM (Methylsulfonylmethane), Milk thistle, Prebiotics or Probiotics, SAM-e, Saw palmetto, Senna, Soy supplements or soy isoflavones, St. John's wort, and Valerian

^fOther costs include costs of homeopathic products, classes/instruction for yoga, tai chi and qi gong, and books and other materials to learn about relaxation techniques.

Figure 3. Total annual population out-of-pocket expenditures by those using complementary health approaches to treat or manage the indicated painful health condition: unadjusted^a and adjusted^b cost

^aCreated by summing the amount each person paid out-of-pocket over the past 12 months for visits to selected complementary practitioner(s) and/or purchases of complementary products. Actual and weighted sample sizes for each group can be found in Table 2.

^bAdjusting for co-morbid health conditions and non-condition reasons for using complementary therapies: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function.

^c8 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

^d4 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis

Figure 4. Annual population out-of-pocket expenditures by those visiting complementary health providers^a to treat or manage the indicated painful health condition: unadjusted^b and adjusted^c

^aIncludes providers of acupuncture, Ayurveda, biofeedback, chelation therapy, chiropractic or osteopathic manipulation, energy healing therapy, herbal medicine, hypnosis, massage therapy, naturopathy: specific traditional healers, curandero, espiritista, hierbero or yerbero, shaman, botanica, native american healer/medicine man, sobador; practitioners or teachers of Feldenkrais, Alexander Technique, Pilates, Trager Psychophysical Integration, Guided Imagery, Meditation, and Progressive Relaxation

^bCreated by summing the amount each person paid out-of-pocket over the past 12 months for visits to selected complementary practitioner(s). Actual and weighted sample sizes for each group can be found in Table 2.

^cAdjusting for co-morbid health conditions and non-condition reasons for using complementary therapies: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function.

^d8 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

^e4 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis

Figure 5. Annual population out-of-pocket expenditures by those purchasing nonvitamin, nonmineral dietary supplements^a to treat or manage the indicated painful health condition: unadjusted^b and adjusted^c

^aNonvitamin, nonmineral dietary supplements include: Androstenedione, Black cohosh, Carnitine, Chasteberry, Chondroitin, Coenzyme Q-10, Comfrey, Conjugated Linolenic Acid (CLA), Cranberry (pills, gelcaps), Creatine, DHEA, Echinacea, Ephedra, Evening primrose, Feverfew, Fiber or Psyllium (pills or powder), Fish oil or omega 3 or DHA fatty acid supplements, Flaxseed Oil or Pills, Garlic supplements (pills, gelcaps), Ginger pills or gelcaps, Ginkgo biloba, Ginseng, Glucosamine, Goldenseal, Guarana, Grape Seed Extract, Green tea pills (not brewed tea), EGCG (pills), Hawthorn, Horny Goat Weed, Kava kava, Lecithin, Lutein, Lycopene, Melatonin, MSM (Methylsulfonylmethane), Milk thistle, Prebiotics or Probiotics, SAM-e, Saw palmetto, Senna, Soy supplements or soy isoflavones, St. John's wort, and Valerian

^bCreated by summing the amount each person paid out-of-pocket over the past 12 months for purchases of NVNMDs. Actual and weighted sample sizes for each group can be found in Table 2.

^cAdjusting for co-morbid health conditions and non-condition reasons for using complementary therapies: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function.

^d8 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

^e4 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis

Figure 6. Population Frequency of Adults Using Complementary Health Approaches to Treat or Manage Specific Painful Health Conditions by Type of Complementary Approach – visits to complementary providers^a and purchases of nonvitamin, nonmineral dietary supplements (NVNMDS)^b

^aComplementary providers: Includes providers of acupuncture, Ayurveda, biofeedback, chelation therapy, chiropractic or osteopathic manipulation, energy healing therapy, herbal medicine, hypnosis, massage therapy, naturopathy: specific traditional healers, curandero, espiritista, hierbero or yerbero, shaman, botanica, native american healer/medicine man, sobador; practitioners or teachers of Feldenkreis, Alexander Technique, Pilates, Trager Psychophysical Integration, Guided Imagery, Meditation, and Progressive Relaxation.

^bNonvitamin, nonmineral dietary supplements include: Androstenedione, Black cohosh, Carnitine, Chasteberry, Chondroitin, Coenzyme Q-10, Comfrey, Conjugated Linolenic Acid (CLA), Cranberry (pills, gelcaps), Creatine, DHEA, Echinacea, Ephedra, Evening primrose, Feverfew, Fiber or Psyllium (pills or powder), Fish oil or omega 3 or DHA fatty acid supplements, Flaxseed Oil or Pills, Garlic supplements (pills, gelcaps), Ginger pills or gelcaps, Ginkgo biloba, Ginseng, Glucosamine, Goldenseal, Guarana, Grape Seed Extract, Green tea pills (not brewed tea), EGCG (pills), Hawthorn, Horny Goat Weed, Kava kava, Lecithin, Lutein, Lycopene, Melatonin, MSM (Methylsulfonylmethane), Milk thistle, Prebiotics or Probiotics, SAM-e, Saw palmetto, Senna, Soy supplements or soy isoflavones, St. John's wort, and Valerian

^cIncludes: arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, and severe headache or migraine

^d8 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

^e4 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis

Figure 7. Unadjusted^a and Adjusted^b annual per person expenditures for any use of complementary health approach for the reported painful health condition

^aCreated by summing the amount each person paid out-of-pocket over the past 12 months for visits to selected complementary practitioner(s) and/or purchases of complementary products. Actual and weighted sample sizes for each group can be found in Table 2.

^b Adjusting for co-morbid health conditions and non-condition reasons for using complementary therapies: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function.

^c4 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis

^dIncludes: arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, and severe headache or migraine

^e8 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

Figure 8. Unadjusted^a and Adjusted^b annual per person expenditures for visits to complementary health providers^c for the reported health condition

^aCreated by summing the amount each person paid out-of-pocket over the past 12 months for visits to selected complementary practitioners. Actual and weighted sample sizes for each group can be found in Table 2.

^b Adjusting for co-morbid health conditions and non-condition reasons for using complementary therapies: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function.

^c.Complementary providers: Includes providers of acupuncture, Ayurveda, biofeedback, chelation therapy, chiropractic or osteopathic manipulation, energy healing therapy, herbal medicine, hypnosis, massage therapy, naturopathy: specific traditional healers, curandero, espiritista, hierbero or yerbero, shaman, botanica, native american healer/medicine man, sobador; practitioners or teachers of Feldenkreis, Alexander Technique, Pilates, Trager Psychophysical Integration, Guided Imagery, Meditation, and Progressive Relaxation

^dIncludes: arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, and severe headache or migraine

^e4 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis

^f8 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

Figure 9. Unadjusted^a and Adjusted^b annual per person expenditures for purchases of NVNMDS^c for the reported painful health conditions

^aCreated by summing the amount each person paid out-of-pocket over the past 12 months for purchases of nonvitamin, nonmineral dietary supplements. Actual and weighted sample sizes for each group can be found in Table 2.

^bAdjusting for co-morbid health conditions and non-condition reasons for using complementary therapies: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function.

^cNon-vitamin, non-mineral dietary supplements include: Androstenedione, Black cohosh, Carnitine, Chasteberry, Chondroitin, Coenzyme Q-10, Comfrey, Conjugated Linolenic Acid (CLA), Cranberry (pills, gelcaps), Creatine, DHEA, Echinacea, Ephedra, Evening primrose, Feverfew, Fiber or Psyllium (pills or powder), Fish oil or omega 3 or DHA fatty acid supplements, Flaxseed Oil or Pills, Garlic supplements (pills, gelcaps), Ginger pills or gelcaps, Ginkgo biloba, Ginseng, Glucosamine, Goldenseal, Guarana, Grape Seed Extract, Green tea pills (not brewed tea), EGCG (pills), Hawthorn, Horny Goat Weed, Kava kava, Lecithin, Lutein, Lycopene, Melatonin, MSM (Methylsulfonylmethane), Milk thistle, Prebiotics or Probiotics, SAM-e, Saw palmetto, Senna, Soy supplements or soy isoflavones, St. John's wort, and Valerian

^d4 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis

^e8 most prevalent painful conditions: back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

^fIncludes: arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, and severe headache or migraine

Figure 10. Sensitivity analysis examining the impact of different ways to treat survey range categories for number of visit to complementary providers^a and amount per purchase of NVNMDs^b: adjusted^c total annual expenditures and per person expenditures for any pain^d and back pain

^aComplementary providers: Includes providers of acupuncture, Ayurveda, biofeedback, chelation therapy, chiropractic or osteopathic manipulation, energy healing therapy, herbal medicine, hypnosis, massage therapy, naturopathy: specific traditional healers, curandero, espiritista, hierbero or yerbera, shaman, botanica, native american healer/medicine man, sobador; practitioners or teachers of Feldenkreis, Alexander Technique, Pilates, Trager Psychophysical Integration, Guided Imagery, Meditation, and Progressive Relaxation.

^bNonvitamin, nonmineral dietary supplements include: Androstenedione, Black cohosh, Carnitine, Chasteberry, Chondroitin, Coenzyme Q-10, Comfrey, Conjugated Linolenic Acid (CLA), Cranberry (pills, gelcaps), Creatine, DHEA, Echinacea, Ephedra, Evening primrose, Feverfew, Fiber or Psyllium (pills or powder), Fish oil or omega 3 or DHA fatty acid

supplements, Flaxseed Oil or Pills, Garlic supplements (pills, gelcaps), Ginger pills or gelcaps, Ginkgo biloba, Ginseng, Glucosamine, Goldenseal, Guarana, Grape Seed Extract, Green tea pills (not brewed tea), EGCG (pills), Hawthorn, Horny Goat Weed, Kava kava, Lecithin, Lutein, Lycopene, Melatonin, MSM (Methylsulfonylmethane), Milk thistle, Prebiotics or Probiotics, SAM-e, Saw palmetto, Senna, Soy supplements or soy isoflavones, St. John's wort, and Valerian

^cAdjusting for co-morbid health conditions and non-condition reasons for using complementary therapies: 1) to improve or enhance energy; 2) for general wellness or general disease prevention; and 3) to improve or enhance immune function.

^dAny pain includes one or more of the following: arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, and severe headache or migraine

^eLow: recalculated cost estimates using the low end of each interval category used in our cost calculation (cost of NVNMDS, number of visits to complementary health approach providers, and number of yoga, tai chi, and qi gong classes).

^fOriginal: Cost estimates using the mid-range of each interval category used in our cost calculation (cost of NVNMDS, number of visits to complementary health approach providers, and number of yoga, tai chi, and qi gong classes).

^gHigh: recalculated cost estimates using the high end of each interval category used in our cost calculation (cost of NVNMDS, number of visits to complementary health approach providers, and number of yoga, tai chi, and qi gong classes).

^hHigh plus top code: recalculated cost estimates using the high end of each interval category used in our cost calculation (cost of NVNMDS, number of visits to complementary health approach providers, and number of yoga, tai chi, and qi gong classes) and 25% above the top of the range for responses that fell in the highest categories (e.g. for Non-vitamin, non-mineral dietary supplements, we recoded the highest response for the cost per purchase from \$120 to \$150, and recoded the highest response for number of provider visits to from 20 to 25).

Table 1

Demographics and Health Status

	All Adults			Adults who used any complementary health approach			Sample of Analysis		
	weighted frequency (1000's)	weighted %	S.E.	weighted frequency (1000's)	weighted %	S.E.	weighted frequency (1000's)	weighted %	S.E.
Total	223,181	100		83,014	100		54,013	100	
DEMOGRAPHICS									
Sex									
Male	107,750	48.3	0.43	35,020	42.2	0.63	22,734	42.1	0.77
Female	115,431	51.7 <i>h</i>	0.43	47,993	57.8	0.63	31,279	57.9	0.77
Age									
18–44	110,890	49.7	0.46	39,560	47.7	7	24,942	46.2	0.87
45–64	76,136	34.1	0.41	31,692	38.2	0.67	21,319	39.5	0.87
65+	36,155	16.2	0.35	11,761	14.2	0.49	7,752	14.4	0.6
Educational Attainment									
High School or less	98,386	44.6	0.52	25,424	30.7	0.64	15,559	28.9	0.82
Some college	62,894	28.5	0.44	27,289	33	0.65	17,674	32.8	0.8
BA, BS or higher	59,527	27 <i>h</i>	0.5	30,089	36.3	0.72	20,674	38.4	0.92
Ethnicity									
Hispanics	29,857	13.4	0.39	6,761	8.1	0.36	4,036	7.5	0.46
Non-Hispanics	193,324	86.6 <i>h</i>	0.39	76,253	91.9	0.36	49,977	92.5	0.46
Race									
White	182,513	82.9 <i>h</i>	0.4	70,872	86.7 <i>i</i>	0.51	47,741	89.6	0.5
Black	26,927	12.2	0.36	6,861	8.4	0.42	3,251	6.1	0.38
Asian	10,696	4.9	0.18	4,004	4.9	0.29	2,266	4.3	0.33
Insurance Status									
Private	148,742	66.9 <i>h</i>	0.43	61,004	73.8 <i>j</i>	0.62	41,247	76.6	0.75
Public	36,390	16.4	0.34	10,542	12.8	0.46	6,055	11.2	0.51

	All Adults	Adults who used any complementary health approach			Adults with an expenditure on any complementary health approach		
		weighted frequency (1000's)	weighted %	S.E.	weighted frequency (1000's)	weighted %	S.E.
Not Insured	37,197		16.7	0.34	11,096	13.4	0.45
HEALTH STATUS							
Any painful condition within last 12 months ^a	125,341		56.3 ^h	0.49	57,361	69.1 ^k	0.68
Any of the 8 most prevalent painful conditions within the last 12 months ^b	117,539		52.7 ^h	0.49	54,414	65.6 ⁱ	0.72
Any of the 4 most prevalent painful conditions within the last 12 months ^c	101,423		45.5 ^h	0.47	48,453	58.4 ⁱ	0.7
Had joint pain, aching or stiffness in the last 30 days	61,567		27.6 ^h	0.41	30,411	36.6	0.65
Had back pain in last 3 months	56,070		25.6 ^h	0.38	28,360	34.2 ^j	0.67
Ever been told you have Arthritis	37,481		16.8 ^h	0.32	17,296	20.9	0.51
Had a regular headache 1 the last 3 months	33,853		15.2 ^h	0.33	15,696	18.9	0.52
Had neck pain in the last 3 months	29,019		13 ^h	0.28	16,654	20.1 ^j	0.56
Had a severe headache or migraine in the last 3 months	27,364		12.3 ^h	0.26	14,025	16.9	0.47
Had a sprain or strain in the last 3 months	15,209		6.8 ^h	0.22	8,675	10.5	0.39
Ever been told you had Fibromyalgia	2,756		1.2 ^h	0.1	2,014	2.4	0.24
Ever had cancer	16,370		7.3 ^h	0.21	7,078	8.5	0.32
Ever been told you had a chronic circulatory or respiratory condition ^d	85,845		43.2 ^h	0.45	39,242	47.5	0.68

	All Adults	Adults who used any complementary health approach			Adults with an expenditure on any complementary health approach		
		weighted frequency (1000's)	weighted %	S.E.	weighted frequency (1000's)	weighted %	S.E.
Ever been told you had a mental health condition ^e	73,838		33.2 <i>h</i>	0.43	34,879	42.1	0.71
Ever been told you had a digestive, endocrine or genitourinary condition ^f	92,833		41.8 <i>h</i>	0.44	42,562	51.5	0.64
Had other conditions ^g	78,923		35.5 <i>h</i>	0.42	36,214	43.7	0.63
					22,108	41	0.87
					28,034	52.1	0.83
					23,890	44.2	0.79

^a arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, severe headache or migraine

^b back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

^c back pain, neck pain, joint pain, arthritis,

^d asthma, emphysema, hay fever, angina, high cholesterol, chronic bronchitis, coronary heart disease, heart attack, other heart condition, hypertension, poor circulation in legs, and stroke

^e anxiety, attention deficit disorder/hyperactivity, bipolar disorder, dementia including Alzheimer's disease, depression, excessive sleepiness during the day, excessive use of alcohol or tobacco, insomnia or trouble sleeping, mania or psychosis, memory loss or loss of other cognitive function, phobia or fears, schizophrenia, substance abuse, other than alcohol or tobacco

^f acid reflux or heartburn, constipation severe enough to require medication, gum disease, irritable bowel, liver problem, ulcer, stomach or intestinal illness, gynecologic problem, menopause, menstrual problems, prostate trouble or impotence, urinary problem, weak or failing kidneys, diabetes

^g Other conditions (influenza or pneumonia, sinusitis, head or chest cold, seizures, skin problems, vision problem

^h $p < 0.001$ compared to both groups of individuals using complementary health approaches - computed using the Z-test

ⁱ $p < 0.001$ compared to individuals with an expenditure for complementary health approaches - computed using the Z-test

^j $p < 0.01$ compared to individuals with an expenditure for complementary health approaches - computed using the Z-test

^k $p < 0.05$ compared to individuals with an expenditure for complementary health approaches - computed using the Z-test

Number of visits to complementary providers^a and number of purchases of non-vitamin, non-mineral dietary supplements^b for the given painful health condition

TABLE 2

Condition	Visits to complementary providers ^a				Purchases of NVNMDS ^b			
	Sample size	Population size (thousands)	Weighted number of visits (thousands)	Visits per person (SE)	Sample size	Population size (thousands)	Weighted number of purchases (thousands)	Purchases per person (SE)
Any painful condition ^c	1924	19,073	210,858	10.95 (.31)	802	7,889	137,226	17.2 (1.75)
Any of the 8 most prevalent painful conditions ^d	1909	18,913	208,975	10.94 (.31)	790	7,692	134,857	17.33 (1.79)
Any of the 4 most prevalent painful conditions ^e	1775	17,655	195,617	10.96 (.32)	735	7,149	122,973	17.2 (1.75)
Back pain	1298	12,994	146,916	11.31 (.39)	374	3,704	56,514	15.26 (2.09)
Neck pain	475	4,666	65,710	14.08 (.74)	159	1,658	30,884	18.62 (3.9)
Joint Pain	304	2,938	37,951	12.91 (.8)	253	2,401	37,589	15.65 (2.44)
Arthritis	162	1,561	15,985	10.23 (.75)	191	1,848	31,803	17.21 (3.62)
Severe headache or migraine	104	945	12,815	13.55 (.97)	37	367	2,828	7.7 (.99)
Regular headache	56	509	7,220	14.18 (1.62)	26	259	2,286	8.83 (2.64)
Fibromyalgia	57	599	8,567	14.28 (1.66)	32	326	9,752	29.89 (17.31)
Sprain/strain	54	533	5,888	11.03 (2.07)	20	223	3,063	13.72 (3.98)

^a Any of the following: Acupuncture Alexander Technique Ayurveda Biofeedback Botanical Chelation Therapy Chiropractic or Osteopathic manipulation Curanderismo Energy Healing Therapy Espiritista Feldenkrais Herbal Medicine Hypnosis Massage Therapy Native American Healer/Medicine Naturopathy Pilates Shaman Sobador Trager Psychophysical Integration Yerbera

^b Any one of the following: Androstenedione Black cohosh Carnitine Chasteberry Condroitin Coenzyme Q-10 Comfrey Conjugated Linolenic Acid (CLA) Cranberry (pills, gelscaps) C reatine DHEA Echinacea Ephedra Evening primrose Feverfew Fiber or Psyllium (pills or powder) Fish oil or omega 3 or DHA fatty acid supplements Flaxseed Oil or Pills Garlic supplements (pills, gelscaps) Ginger pills or gelscaps Ginkgo biloba Ginseng Glucosamine Goldenseal Guarana Grape Seed Extract Green tea pills (not brewed tea) EGCG (pills) Hawthorn Horny Goat Weed Kava kava Lecithin Lutein Lycopene Melatonin MSM (Methylsulfonylmethane) Milk thistlePrebiotics or Probiotics SAME Saw palmetto Senna Soy supplements or soy isoflavones St. John's wort Valerian

^c arthritis, dental pain, fibromyalgia, gout, inflammatory bowel disease, jaw pain, joint pain or stiffness/other joint condition, lupus, regular headaches, rheumatoid arthritis, sprain or strain, back pain or problem, neck pain or problem, severe headache or migraine

^d back pain, neck pain, joint pain, arthritis, regular headaches, severe headaches, sprain and strains, and fibromyalgia

back pain, neck pain, joint pain, arthritis,

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