

Trends in Medical Care Expenditures of US Adults with Arthritis and Other Rheumatic Conditions 1997 to 2005

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ABSTRACT. Objective. To examine trends in annual medical expenditures from 1997 to 2005 among adults with arthritis and other rheumatic conditions (denoted *Arthritis* group).

Methods. We analyzed annual medical expenditures (2005 US dollars) among adults with *Arthritis* using the Medical Expenditure Panel Survey (MEPS), a nationally representative survey of the US civilian, noninstitutionalized population. Expenditures were stratified by *Arthritis* and comorbidity status.

Results. The *Arthritis* population increased by 22% (36.8 to 44.9 million) during this period, attributable entirely to the subpopulation with at least one comorbid condition (31.8 to 40.3 million). The overall, inflation-adjusted annual mean medical expenditures for adults with *Arthritis* increased from \$6,848 in 1997 to \$7,854 in 2005. In 1997, inpatient care was the most expensive component of overall expenditures (mean \$2,702), but beginning in 2001, mean inpatient and ambulatory expenditures were almost identical. Mean prescription expenditures increased nearly every year, almost doubling from \$970 in 1997 to \$1,811 in 2005. Aggregate total expenditures for the *Arthritis* population increased markedly during this period, from \$252.0 to \$353.0 billion (+40%). Most of this increase was attributable to the population increase in the *Arthritis* and comorbid condition subgroup.

Conclusion. Mean annual ambulatory and prescription expenditures for adults with *Arthritis* increased far above the rate of medical inflation, offsetting a relative decline in inpatient expenditures. Increases in overall mean and aggregate total expenditures are attributable to the increasing number of adults with *Arthritis* and at least one comorbid chronic condition. Projected increases in this population suggest that these expenditures will continue to rise. (J Rheumatol First Release Oct 1 2009; doi:10.3899/jrheum.081068)

Key Indexing Terms:

ECONOMICS

COMORBIDITY

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Arthritis is among the most common chronic diseases¹, the most common cause of disability in the United States², and the second most common group of conditions affecting

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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health-related quality of life³. It has been projected that the prevalence of doctor-diagnosed arthritis in the US adult population will increase from 45.7 million, or 22% of the population, in 2003 to 67.0 million adults, 25% of the population, in 2030. Of those US adults with doctor-diagnosed arthritis, it is estimated that 16.8 million experienced arthritis-attributable limitation in 2003; that number is projected to increase by 49% to 25.0 million in 2030⁴.

Recognizing the current and growing economic impact of arthritis and other rheumatic conditions (here called *Arthritis*), we previously reported *Arthritis* prevalence, direct medical expenditures among those with *Arthritis*, and direct and indirect expenditures attributable to *Arthritis*, among US adults in 1997⁵ and 2003⁶. We observed large increases in prescription and ambulatory care expenses from 1997 to 2003⁶. Our current analysis was conducted to determine (1) whether rising expenditures for prescriptions and ambulatory care are responsible for the increases in the overall expenditures for individuals with *Arthritis*; and (2) whether increases in the size and overall medical expenses of the *Arthritis* population observed in our previous study

were biased by the choice of years examined in that study⁶. This report presents updated estimates of *Arthritis* prevalence and medical expenditures among people with *Arthritis* for 1997 through 2005, describing all expenditures among people with *Arthritis*, rather than those specifically attributable to *Arthritis*^{5,6}.

The focus of this report is trends in medical expenditures among people with *Arthritis* (as defined by the National Arthritis Data Workgroup⁷), thereby providing the rheumatology community with an essential tool for describing the ongoing public health and economic burden of *Arthritis* to healthcare policymakers. We also report expenditures among US adults with other and no chronic conditions to provide policymakers with a comprehensive overview of medical expenditures among all adults to demonstrate the proportional influence of *Arthritis* on total expenditures and guide decisions concerning resource allocation.

MATERIALS AND METHODS

Data source. We analyzed expenditures among adults using the Medical Expenditure Panel Survey (MEPS) household component, a nationally representative survey of the United States civilian, noninstitutionalized population. MEPS, a joint endeavor of the Agency for Healthcare Research and Quality and the National Center for Health Statistics, is designed to provide data on national healthcare use, medical care expenditures, and sources of payment.

MEPS collects data on healthcare use, medical care expenditures, demographic characteristics, and health status from 5 interviews over a 2-year period^{8,9}. The presence of medical conditions is ascertained primarily by prompting household component respondents for the causes of medical events and disability episodes (i.e., time lost from work or school and days spent in bed due to illness or injury). The condition can also be reported by the respondent as “bothering” the person during the reference period. Conditions identified by one or more of these methods are then coded using the *International Classifications of Diseases*, ninth revision (ICD-9) system at the 3-digit level¹⁰. Expenditure data in MEPS derive from a combination of the household component interviews and information obtained from providers¹⁰. Expenditures in MEPS are defined as the actual expenditures for the medical care services used, regardless of the source of payment. Payments for over-the-counter medications and indirect payments (e.g., Medicaid Disproportionate Share and Medicare Direct Medical Education subsidies) are not included¹¹.

The study uses 1997 to 2005 MEPS data, with each year’s sample comprising roughly 22,000 adults aged ≥ 18 years. MEPS is a continuous study with an overlapping panel design that can provide estimates that are exclusive to a calendar year. In this study, we conducted analysis using a cross-sectional approach (including application of annual cross-sectional sampling weights), which ensures that expenditures analyzed do not overlap with adjacent years.

Definition of the Arthritis Group and 2 subgroups. From our earlier work^{5,6}, adults in each year with *Arthritis* were defined using the National Arthritis Data Workgroup⁷ definition, modified to apply to the 3-digit ICD-9 level available in the MEPS public release files (ICD-9 codes 274, 354, 390, 391, 443, 446, 710–716, 719–721, and 725–729). The *Arthritis* group was further stratified into 2 subgroups based on the presence of other chronic conditions: (1) *Arthritis Only* (adults with *Arthritis* and no other chronic conditions); and (2) *Arthritis Plus* (adults with *Arthritis* and one or more comorbid chronic conditions). Chronic conditions in general are defined by the protocol devised by Hoffman, et al., which was designed to provide a conservative estimate of prevalence. All of these conditions have been previously defined by NHIS as impairments, or were defined by

Hoffman et al. as creating persistent health consequences lasting several years or more¹². We reserve the terms “comorbid conditions” and “comorbidities” to describe the presence of additional conditions for individuals with arthritis, whereas we use the term “multimorbidity” in the context of several conditions occurring together.

General approach. We estimated annual medical care expenditures (2005 US dollars) overall and subdivided by expenditure components for the *Arthritis* population and its 2 subgroups. First, we estimated the mean (i.e., per person) medical care expenditures for 6 expenditure components (inpatient, ambulatory, prescription medications, home health, emergency room, and other) and overall (all 6 expenditure components combined). Then, we estimated the aggregate expenditures for the *Arthritis* group and its 2 subgroups by multiplying the number of persons in the group or subgroup by their overall mean expenditures. Expenditures were tabulated without regard to the extent the condition(s) characterizing each group or subgroup accounted for those expenditures, i.e., they were not specifically attributed to *Arthritis* or any other specific condition.

Complex survey design. Population sampling weights were applied in all analyses so that estimates could be projected to the US population. We used SAS version 9.1.3 Survey procedures (Surveyfreq and Surveymeans) to adjust standard error estimates for MEPS’s clustered sampling design¹³.

Statistical significance of changes over time. All estimates were not statistically different at $\alpha = 0.05$ unless explicitly noted; 2 population or expenditure estimates were considered significantly different if their 95% confidence intervals did not overlap. The use of “significant” and “significantly” refer exclusively to statistical significance. In a few circumstances where confidence intervals were especially large, we evaluated the effect of removing the largest outliers as noted in the text. Average annual expenditure increases were calculated by regressing log expenditures on (year of estimate – 1997). We used the Fieller approach as described by Motulsky¹⁴ to calculate confidence intervals for ratios of 2005 estimates relative to their 1997 counterparts.

Converting annual expenditures to 2005 dollars. We used the medical care component of the Consumer Price Index¹⁵ to convert expenditures for 1997 through 2004 into 2005 dollars (selections: “Area”: US city average; “Item”: medical care; “Seasonal Adjustment” = not seasonally adjusted).

Comparative analyses. From our previous work^{5,6}, we stratified the remaining adults without *Arthritis* in each year into 2 other mutually exclusive groups: (1) *Other CC* (non-*Arthritis* chronic conditions); and (2) *None* (no chronic conditions). As with the *Arthritis* group, the *Other CC* group was further stratified into 2 subgroups (single morbidity and multimorbidity subgroups based on the presence of comorbid conditions): (1) *Other CC Only* (just one non-*Arthritis* chronic condition) and (2) *Other CC Plus* (2 or more non-*Arthritis* chronic conditions). We also estimated annual medical care expenditures subdivided by expenditure components for these populations just as we did for *Arthritis*. Therefore, aggregate expenditures for the 3 groups (*Arthritis*, *Other CC*, and *None*) sum to the aggregate expenditures for the entire country, and the sum of subgroup aggregate expenditures is equal to the aggregate expenditures for the corresponding group.

RESULTS

Population trends. While the entire US adult population increased steadily from 196.6 to 219.5 million (12%) from 1997 to 2005, population changes differed among the *Arthritis* group and subgroups (Figure 1). From 1997 to 2005, the *Arthritis* group increased significantly (22%); the largest increase was in the *Arthritis Plus* subgroup (27%), with the *Arthritis Only* subgroup remaining relatively stable.

Trends in mean overall medical expenditures. Between 1997 and 1998, the annual mean overall medical care expenditures for the *Arthritis* group decreased sharply from \$6,848

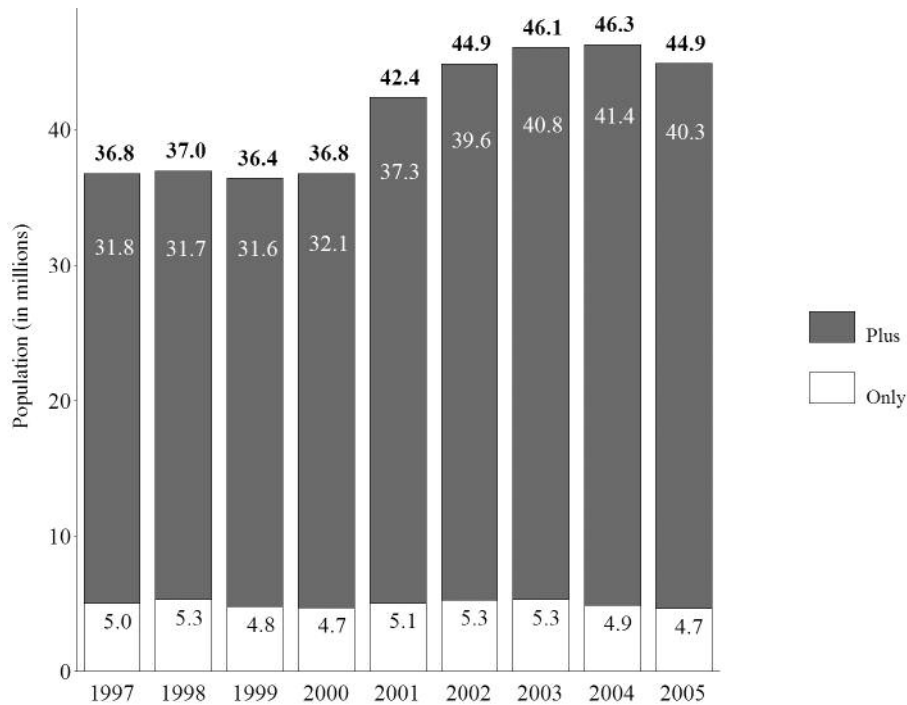


Figure 1. US adult population trends in Medical Expenditure Panel Survey (MEPS) for *Arthritis* by subgroups, 1997 to 2005. “Plus”: *Arthritis* and 1+ non-*Arthritis* chronic condition; “Only”: *Arthritis* and no other chronic condition. Population totals for *Arthritis* group may not equal sum of “Plus” + “Only” subgroups due to rounding. MEPS sample reflects the noninstitutionalized civilian population; analyses limited to individuals age 18 years and over.

to \$6,141, but then increased steadily to \$7,854 in 2005 (Figure 2), representing an average increase of \$196 (2.8%) per year above medical inflation. The baseline level of expenditures and trends over time for the *Arthritis* group conceals important differences between its two subgroups. Mean overall health expenditures for the much smaller *Arthritis Only* subgroup fluctuated from 1997 through 2005, with 2003 and 2005 “peaks” resulting from a single extreme outlier in each year; when removed, the values are \$1,807 (95% CI \$1,405 to \$2,210) in 2003 and \$1,770 (95% CI \$1,194 to \$2,346) in 2005 (data not shown).

Trends in component expenditures. Annual mean medical care component expenditures for the *Arthritis* group are plotted in Figure 3. In 1997, inpatient care was the most expensive component, averaging \$2,702 annually (95% CI \$2,294 to \$3,111), which was significantly higher than the next component, ambulatory care, at \$1,957 (95% CI \$1,774 to \$2,139). By 2001, means of the inpatient and ambulatory components were almost identical (\$2,193 and \$2,240), with this pattern persisting through 2005. The increase in ambulatory expenses was driven in part by a significant increase in mean ambulatory visits, from 11.1 in 1997 to 12.7 in 2005 (data not shown).

Another important trend was the consistent annual increase in mean prescription expenditures, which resulted in a significant increase over the entire period. In 1997, prescription expenditures averaged \$970 (95% CI \$914 to

\$1,025), or 14% of overall expenditures for the *Arthritis* group. By 2005, prescription expenditures almost doubled to a mean of \$1,811 (95% CI \$1,727 to \$1,896), accounting for 23% of overall expenditures.

A less marked but still significant trend was exhibited by home healthcare, which accounted for \$565 or 8% of the *Arthritis* group total expenditures in 1997 (95% CI \$444 to \$687). Home healthcare expenditures decreased significantly over the period under study. In 2005, home healthcare expenditures averaged \$354 (95% CI \$280 to \$428), or 5% of the overall healthcare expenditures that year.

Both the emergency room and “other” expenditure components exhibited year-to-year fluctuations throughout the period, resulting in nonsignificant changes from 1997 to 2005 overall. As was the case with overall expenditures, the patterns of the specific expenditure categories of the *Arthritis* group mirrored those of its *Arthritis Plus* multimorbidity subgroup (data not shown).

Drivers of prescription component expenditures. The marked increase in prescription expenditures for the *Arthritis* group described above resulted from increases in both the mean expenditures per prescription and the number of prescriptions filled by each individual in that group (Table 1). Mean expenditures per prescription increased from 1997 to 2005 for the *Arthritis* group and its subgroups. The 1997 to 2005 increases were significant for the *Arthritis* group and the *Arthritis Plus* subgroup, but not the *Arthritis*

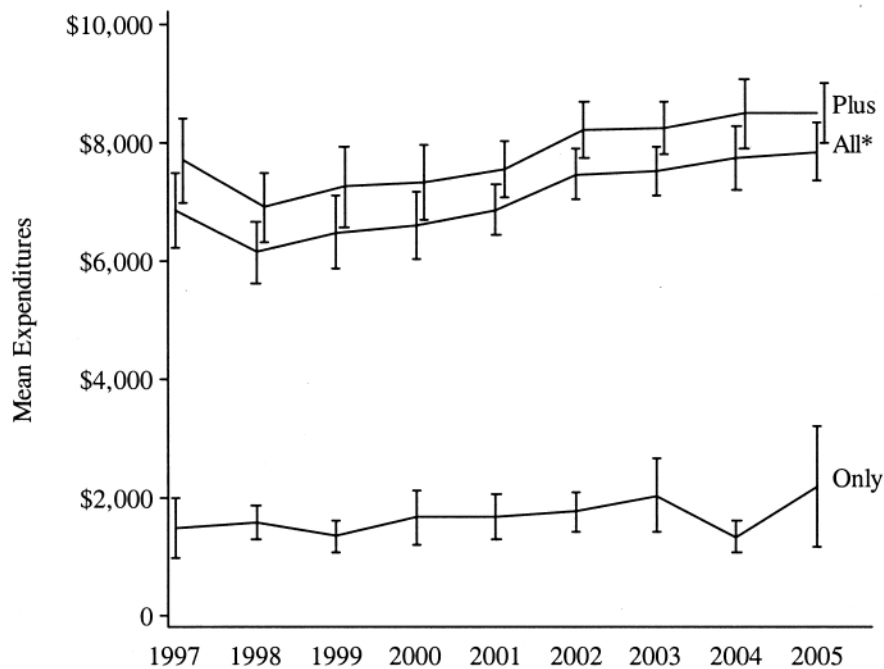


Figure 2. Annual mean overall healthcare expenditures in Medical Expenditure Panel Survey (MEPS) for the *Arthritis* group and subgroups, 1997 to 2005 (2005 US dollars). Overall expenditures for each individual are the sum of their component expenditures (i.e., inpatient, outpatient, office visit, home health, emergency, prescription medications, and other). “Plus”: *Arthritis* and 1+ non-*Arthritis* chronic condition; “Only”: *Arthritis* and no other chronic condition. MEPS sample reflects the noninstitutionalized civilian population; analyses limited to individuals age 18 years and over. *Average annual increase above medical inflation was 2.8% for “All”.

Only subgroup. The mean total number of prescriptions filled increased significantly and steadily from 1997 to 2005 for *Arthritis* and the *Arthritis Plus* subgroup. Among the *Arthritis Only* subgroup there were similar numbers of prescriptions in 1997 and 2005 (2.7 and 2.5 prescriptions per person, respectively).

To determine whether the increases in mean prescription expenditures per person were attributable to increases in mean expenditures per prescription or mean total number of prescriptions, we computed ratios of the 2005 estimates relative to their 1997 counterparts for each of these 3 quantities and by subgroups; 95% CI were calculated around these ratios. The *Arthritis Plus* subgroup exhibited a significant 81% (95% CI 68% to 94%) increase in mean prescription expenditures per person, and also showed significant increases for mean expenditures per prescription [31% (95% CI 26% to 36%)] and mean prescriptions per person [38% (95% CI 30% to 47%)] from 1997 to 2005, indicating that both factors contributed relatively equally to the increase in mean prescription expenditures per person. The *Arthritis Only* subgroup did not exhibit an increase in mean prescription expenditures per person, although there was a significant increase of 49% in mean expenditures per prescription filled (95% CI 1% to 97%).

Comparative analyses — trends in Other CC and None. (Detailed population and expenditure data for *Other CC* and *None* groups are available in the technical appendix located at www.mgcd.com/publications/trends_arthritis/appendix.pdf) The *Other CC* group mirrored the trends for *Arthritis*. Between 1997 and 2005, the size of the *Other CC* population increased significantly (15%), primarily as a result of an increase in the *Other CC Plus* subgroup (22%).

The *Other CC* group also exhibited a significant steady increase in annual mean overall medical care expenditures from \$3,848 (95% CI \$3,571 to \$4,126) in 1997 to \$4,629 (95% CI \$4,293 to \$4,965) in 2005, representing an average increase of \$109 (2.6%) per year. The expenditure patterns for the 2 *Other CC* subgroups were similar to those for the 2 *Arthritis* subgroups. As was the case for *Arthritis*, the increase in overall expenditures for the *Other CC* group follows the trends of its multimorbidity subgroup (*Other CC Plus*) closely. Expenditures for the *Other CC Only* subgroup remained essentially flat across the years, with overlapping confidence intervals throughout the period.

Mean expenditures per prescription for *Other CC* and its subgroups increased from 1997 to 2005. The 1997 to 2005 increases were significant for *Other CC* and the *Other CC Plus* subgroup. The average total number of prescriptions

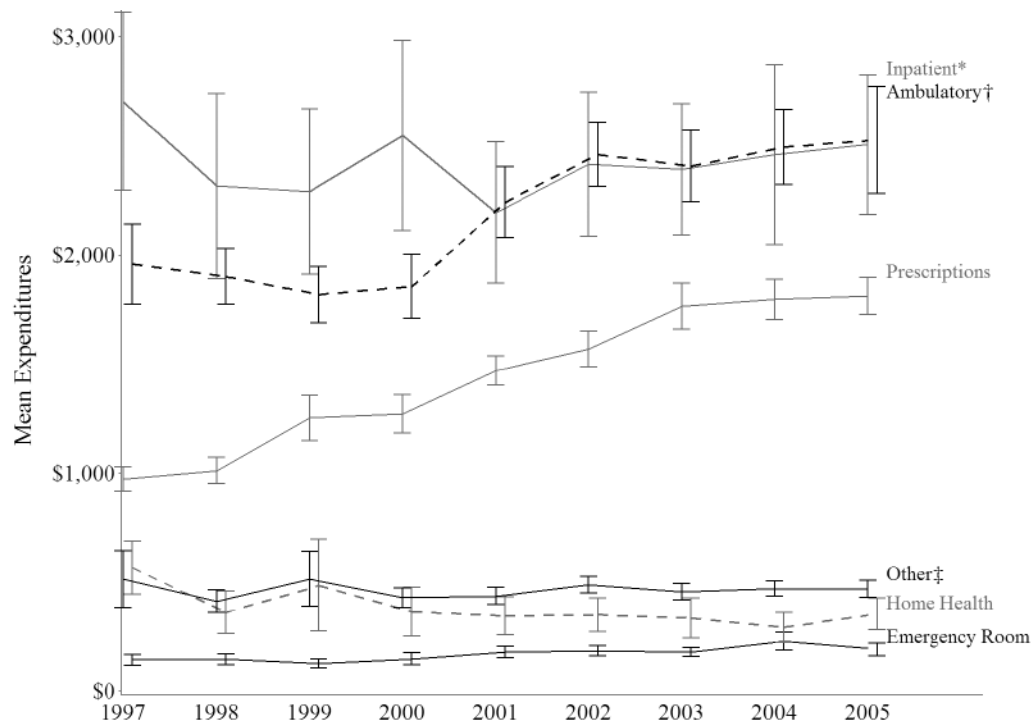


Figure 3. Annual mean component healthcare expenditures in Medical Expenditure Panel Survey (MEPS) for the *Arthritis* group, by expenditure category, 1997 to 2005 (2005 US dollars). MEPS sample reflects the noninstitutionalized civilian population; analyses limited to individuals age 18 years and over. *"Inpatient" includes facility and separately billed provider expense. †"Ambulatory" includes office and outpatient visits. ‡"Other" includes dental visits and other medical supplies and equipment.

Table 1. Mean (95% CI) annual prescription utilization and expenditures in MEPS for the *Arthritis* group and 2 subgroups, 1997 to 2005. The MEPS sample reflects the noninstitutionalized civilian population; analyses limited to individuals age 18 years and over.

Measure/Chronic Condition Status	1997	1998	1999	2000	2001	2002	2003	2004	2005
Expenditures per filled prescription (all 2005 US\$)									
<i>Arthritis</i>	52 (50, 53)	52 (50, 53)	59 (56, 62)	59 (56, 61)	63 (61, 64)	63 (62, 65)	70 (68, 72)	68 (66, 70)	68 (66, 70)
<i>Arthritis Only</i>	44 (37, 51)	42 (31, 53)	44 (38, 51)	49 (43, 54)	60 (52, 68)	51 (39, 63)	58 (47, 69)	53 (44, 62)	65 (47, 83)
<i>Arthritis Plus</i>	52 (51, 54)	52 (51, 54)	59 (57, 62)	59 (57, 61)	63 (61, 65)	64 (62, 65)	70 (68, 72)	68 (66, 70)	68 (66, 70)
Total number of prescriptions filled per individual									
<i>Arthritis</i>	18.7 (17.7, 19.7)	19.5 (18.4, 20.5)	21.1 (19.8, 22.4)	21.7 (20.4, 23.0)	23.4 (22.3, 24.4)	24.8 (23.6, 26.0)	25.2 (24.0, 26.4)	26.5 (25.3, 27.7)	26.6 (25.5, 27.6)
<i>Arthritis Only</i>	2.7 (1.9, 3.4)	2.9 (1.9, 3.8)	2.4 (2.0, 2.8)	2.8 (2.2, 3.4)	3.4 (2.8, 3.9)	4.0 (3.2, 4.7)	3.5 (3.0, 4.1)	2.6 (2.1, 3.2)	2.5 (1.9, 3.0)
<i>Arthritis Plus</i>	21.2 (20.2, 22.3)	22.3 (21.1, 23.4)	23.9 (22.5, 25.3)	24.5 (23.1, 25.8)	26.1 (24.9, 27.2)	27.6 (26.2, 28.9)	28.1 (26.8, 29.3)	29.3 (28.0, 30.6)	29.4 (28.3, 30.5)

filled increased significantly from 1997 to 2005 for *Other CC* and both its subgroups. The *Other CC* group and its *Other CC Plus* subgroup showed a consistent pattern of increasing prescription use throughout the period. Interestingly, persons in the *Arthritis Plus* group filled significantly more prescriptions than those in the *Other CC Plus* group [e.g., 29.4 (95% CI 28.3 to 30.5) for *Arthritis Plus* vs 19.0 (95% CI 18.2 to 19.8) for *Other CC Plus* in 2005], even as the number of prescriptions filled in both groups rose between 1997 and 2005.

The *None* group (individuals with no chronic conditions)

remained relatively stable in size from 1997 to 2005, and total expenditures remained the most stable of all the groups during the period, with a small and statistically nonsignificant \$40 decrease in mean overall expenditures (\$774 in 1997 to \$734 in 2005). With respect to prescriptions, the *None* group showed no real change in mean expenditures or numbers filled over the time period.

Trends in aggregate total expenditures. The estimated aggregated total expenditures, the product of mean overall medical care expenditures and total population, for the *Arthritis* group and its 2 subgroups, are displayed in Figure

4. Aggregate total expenditures increased markedly and steadily for the entire US population during this period, from \$676.9 billion to \$918.6 billion (36%). The *Arthritis* group experienced a marked decrease in aggregate expenditures from \$252.0 billion in 1997 to \$227.1 billion in 1998, followed by steady increases through 2004. Overall, the aggregate total expenditures for the *Arthritis* group rose by 40% during the period, resulting in \$353.0 billion in expenditures in 2005. Increases in aggregate expenditures for the *Arthritis* group are wholly attributable to the *Arthritis Plus* subgroup, whose aggregate expenditures increased by \$98.2 billion from 1997 to 2005 to yield aggregate expenditures of \$342.7 billion in 2005. Aggregate expenditures for the *Arthritis Only* subgroup experienced a slight net gain from \$7.5 billion in 1997 to \$10.3 billion in 2005. However, the year-to-year fluctuations in the mean expenditures of this subgroup, combined with the error around the mean expenditure and population estimates, do not provide strong evidence for an increasing trend.

(Detailed aggregate expenditure data for *Other CC* and *None* groups are available in the technical appendix located at www.mgcdata.com/publications/trends_arthritis/appendix.pdf) Like its *Arthritis* counterpart, the *Other CC* group also experienced steady increases in aggregate expenditures

throughout the period (from \$377.0 to \$520.0 billion, or 38%). Like *Arthritis*, the primary driver of this increase was the aggregate expenditures of the multimorbidity subgroup (*Other CC Plus*), which generally rose steadily, from \$308.6 billion in 1997 to \$433.9 billion in 2005, representing an increase of 41%. The increase in *Other CC Only* was less (from \$68.3 to \$86.0 billion, or 26%), and exhibited year-to-year fluctuations similar to its *Arthritis Only* counterpart. Aggregate total expenditures for the *None* group also fluctuated between individual years and actually decreased by 5% overall across the years covered by the present analysis (from \$47.9 to \$45.6 billion).

DISCUSSION

We found a constant annual increase above medical inflation in overall medical expenditures for individuals with *Arthritis* from 1997 through 2005, although the \$1,006 increase for the period was not statistically significant. As we hypothesized, increases in overall *Arthritis* group expenditures since 1997 are primarily attributable to significant escalations in ambulatory visit expenditures (29% above medical inflation, due to increases in both mean number of visits and expenditures per visit) and prescription expenditures (87% above). This finding confirms our earlier 1997 to

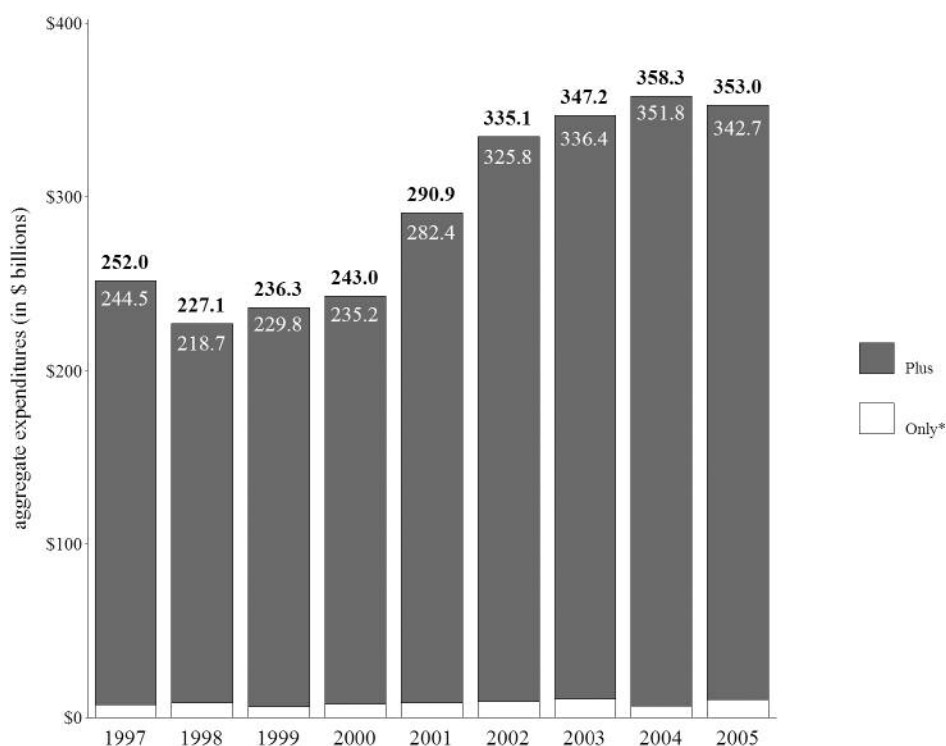


Figure 4. Aggregate total expenditures (\$ billion) of the *Arthritis* group, by subgroups, 1997 to 2005 (2005 US dollars). “Plus”: *Arthritis* and 1+ non-*Arthritis* chronic condition; “Only”: *Arthritis* and no other chronic condition. Aggregate totals for *Arthritis* group may not equal sum of “Plus” + “Only” subgroups due to rounding. Medical Expenditure Panel Survey (MEPS) sample reflects the noninstitutionalized civilian population; analyses limited to individuals age 18 years and over. **Arthritis Only* subgroup yearly expenditures as follows: \$7.5, \$8.4, \$6.5, \$7.9, \$8.5, \$9.4, \$10.9, \$6.5, and \$10.3 billion.

2003 study results⁶ and is consistent with a broader Agency for Healthcare Research and Quality analysis of the MEPS, which also found increases between 1997 and 2004 in the cost of prescription medications and the number of prescriptions filled for the US population¹⁶.

In 2005, the \$353 billion spent on aggregate overall direct medical expenditures for the 20% of adults represented by the *Arthritis* group accounted for 38% of the aggregate direct medical expenditures for all US adults. In other words, the proportion of aggregate costs incurred by the *Arthritis* group is almost twice its share of the population. These aggregate costs accounted for 2.8% of the US gross domestic product (GDP) in 2005, slightly higher than the 2.2% of the GDP these expenditures represented in 1997.

The 40% increase in aggregate expenditures from 1997 to 2005 for the *Arthritis* group is attributable to 2 distinct factors: (1) the 22% increase in population for this group during this period, and (2) the 15% increase in mean per-person expenditures for the adults comprising this group. Questions eliciting conditions have not changed during this period; thus the large increases in population for the *Arthritis* and *Other CC* groups and their multimorbidity subgroups observed here are not due to changes in survey design. In addition, our prevalence estimate for *Arthritis* in the US adult population in 2003 (46.1 million) is very similar to that estimated by Hootman and Helmick from the National Health Interview Survey (NHIS) in that year (45.7 million)⁴. This similarity is remarkable given that the case-finding question in the NHIS is a single question querying whether the respondent has ever been diagnosed with arthritis by a doctor or healthcare practitioner, whereas the MEPS solicits causes of medical events or reports of bothersome conditions to ascertain medical diagnoses.

What might explain the large increase in the adult *Arthritis* population in this period, especially the 15% increase between 2000 (36.8 million) and 2001 (42.4 million)? The introduction of cyclooxygenase-2 (COX-2) inhibitors in 1999 and subsequent aggressive national and local direct-to-patient advertising in the last quarter of 2000 through 2002 significantly increased the flow of patients with osteoarthritis into physician practices¹⁷. It is reasonable to assume that individuals with osteoarthritis who may not have been diagnosed or who otherwise would not have visited a doctor due to their arthritis pain, started to do so shortly following the increase in advertising that began in late 2000. The increase in patient contact with physicians due to direct-to-patient advertising for COX-2 inhibitors could also have affected individuals with other conditions included in the *Arthritis* definition, and we presume that the large increases seen in the *Arthritis* population between 2000 and 2001, and to a lesser extent between 2001 and 2002, reflect that trend.

In our earlier work, we compared overall expenditures attributable specifically to *Arthritis* between 1997 and 2003

and found virtually no change in average per-person medical expenditures⁶. The significant increase in the overall expenditures found in this study among people with *Arthritis* is therefore due to treatment of the concurrent nonarthritis conditions experienced by adults in the *Arthritis Plus* subgroup, not due to an increase in the cost of treating arthritis.

One study objective was to examine the stability in expenditures among people with *Arthritis* across time and determine the robustness of our 2003 *Arthritis*-attributable cost estimate. This study confirms that (1) inflation-adjusted healthcare expenditures among adults with *Arthritis Only* remained roughly constant between 1997 and 2003, and (2) increases in expenditures among adults with *Arthritis* were attributable to the increased number of adults with *Arthritis* and coexisting conditions. This verifies that the findings in our earlier study⁶, which were based on only 2 years (1997 and 2003), were not biased by our choice of years.

Using a longitudinal study of older adults, Schoenberg and colleagues¹⁸ documented a large increase in multimorbidity and associated out-of-pocket expenditures from 1998 to 2002. Specifically, the prevalence of multimorbidity for all chronic diseases increased from 58% to 70% during this period. The percentage of the older adult population represented by adults with arthritis and another condition (equivalent to our *Arthritis Plus* subgroup) increased slightly, from 20.2% in 1998 to 22.5% in 2002, while the percentage for those with arthritis only decreased from 12.9% to 10.2%¹⁸.

This work sheds light on the growth and expenditures trends of the *Arthritis* adult population, but has at least 2 limitations. First, the accuracy of self-reported diagnosis of specific arthritis and rheumatic conditions in population-based samples is typically only low to moderate^{19,20}; however, the agreement between self-reported and medical-provider diagnosis for the generic *Arthritis* category has been demonstrated to be sound in MEPS, with a sensitivity of 78% and specificity of 87%²¹. Second, other health-related expenditures such as those for modifications to an individual's environment are not addressed.

The increased medical expenditures among people with *Arthritis* observed in our study indicate that the societal and individual burden of *Arthritis* has indeed increased and that this increase is likely to grow if trends observed here continue. The parallel trends seen in the non-*Arthritis* multimorbidity group (*Other CC Plus*) suggests that mounting effective public health responses to risk factors shared across many chronic diseases may yield substantial health and economic benefits. Our results further illustrate the urgent need for clinical and public health strategies to reduce risk factors (e.g., obesity) associated with *Arthritis* and other chronic conditions, and for greater awareness and use of disease management approaches, such as self-management education and regular physical activity, that are proven to decrease the symptoms of arthritis (e.g., pain) and other chronic conditions.

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