

## Factors Associated with Healthcare Costs in Women with Fibromyalgia

Heather R. Walen, PhD; Terry A. Cronan, PhD;  
and Silvia M. Bigatti, PhD

**Objective:** To examine how women with high and low healthcare costs differ by using the Anderson Health Behavior Model of Utilization as a theoretical framework.

**Study Design:** One-year longitudinal design.

**Patients and Methods:** A total of 537 female health maintenance organization members with fibromyalgia participating in a study examining the effects of social support and education on health status and healthcare use were divided into 2 groups using a median split on health costs. Predisposing variables (demographic variables, self-efficacy, depression, and social support), enabling characteristics (income), and need variables (health status, perceived health status, disease severity, duration of symptoms, and comorbidity) were measured. Patients completed a battery of questionnaires at baseline assessment, and healthcare costs were assessed 1 year before and 1 year after baseline assessment. Healthcare data were collected from medical records. Healthcare costs were estimated by multiplying the number of each type of healthcare contact by the most recent national average cost figures.

**Results:** Multivariate analysis of covariance controlling for costs during the year before baseline assessment was performed. Low-cost patients had fewer comorbid conditions, better health status, higher self-perceived health status, less disease severity, greater self-efficacy for functioning, lower depression scores, and higher social support scores.  $\chi^2$  Analyses revealed no significant differences between groups on marital status but a significant difference in income: low-cost patients were more likely to report higher incomes.

**Conclusions:** There were several significant differences between people with higher and lower healthcare costs. Although effect sizes were small, many variables may be responsive to intervention.

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Understanding the factors associated with healthcare costs could be valuable in formulating healthcare policy. It is projected that in 2007, healthcare spending will amount to more than \$2 trillion (16.6% of the gross domestic product).<sup>1</sup> As healthcare costs soar, the ability to identify factors

associated with frequent or costly visits becomes increasingly important. Because people with chronic conditions are frequent users of the healthcare system,<sup>2</sup> and because women are more likely to use services than men,<sup>3-7</sup> understanding patterns of utilization in women with chronic conditions is vital.

The Anderson Health Behavior Model of Utilization<sup>8</sup> is often used for predicting healthcare utilization. This model of use includes social-psychological variables and measures of health and available resources. The model is patient centered and includes 3 components related to use: need (eg, number and type of health problems), enabling characteristics (ie, access to care), and predisposing factors (ie, demographic and psychosocial variables related to use).

The need for medical services, whether assessed using objective measures (eg, disability and physician ratings) or subjective measures (eg, perceived health status), is the strongest and most consistent predictor of healthcare utilization.<sup>4,8-10</sup> This may explain why individuals with disabling chronic conditions are frequent users of the healthcare system.<sup>9,10</sup> Studies<sup>11,12</sup> consistently report that a relatively small number of people use a large proportion of healthcare services. For example, McCall and Wai<sup>11</sup> reported that in an elderly Medicare group, 18% of the beneficiaries accounted for 88% of the cost of all services in 4 years.

Enabling characteristics in the Anderson model include individual, family, and community

From the Department of Psychology, San Diego State University, San Diego, CA (HRW, TAC); and the Department of Psychology, Indiana University-Purdue University, Indianapolis (SMB).

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Address correspondence to: Terry A. Cronan, PhD, Project USE, 6505 Alvarado Road, Suite 110, San Diego, CA 92120. E-mail: tcronan@sunstroke.sdsu.edu.

resources. These variables reflect access to care. Researchers<sup>8,10,13</sup> have found that having a higher income, medical insurance, accessible healthcare facilities, and a regular physician are related to increased use.

Predisposing characteristics comprise demographic factors (eg, age, sex, and marital status) and psychosocial characteristics (eg, health beliefs and attitudes). Because age is commonly associated with chronic illness or the presence of several health conditions,<sup>8</sup> it is sometimes used as a proxy for need. Research with other demographic characteristics has identified sex, race, and marital status as predictors of use, with women, whites, and married individuals being more likely to use services.<sup>7,10,13</sup> Psychosocial characteristics that might be related to use include concern about health status, self-efficacy, and depression<sup>4,14</sup>; however, such variables are often weakly or not at all significantly associated with use. In general, research<sup>3,8,10</sup> indicates that age and being female are the strongest and most consistent predisposing characteristics.

One reason that women have higher rates of use is that they report 40% more chronic problems than their male counterparts<sup>6</sup>; women also report more acute illnesses, health and somatic problems, and worries than men.<sup>3,15,16</sup> Although some of these differences may be attributed to gynecological operations and prenatal care,<sup>3</sup> these factors do not account for all of the differences, and neither does the fact that women live an average of 8 years longer than men, increasing their chances of developing health problems.<sup>3</sup> Socialization may make it more acceptable for women to identify and report pain than men.<sup>3,4</sup>

Several studies have examined predictors and patterns of use, although most have relied on survey data and cross-sectional designs. Some critics have suggested that these design limitations may explain why the variance in healthcare use accounted for by various models is typically small.<sup>10</sup> For example, self-reports of utilization may be unreliable because of poor recall; frequent users tend to underreport and low users typically overreport.<sup>17</sup> Although the accuracy of medical charts has not gone unquestioned, provider-based sources of information are considered the gold standard because they are less likely to have recall bias, interview shortcomings, or data processing errors.<sup>17</sup> Furthermore, designs that measure all variables at the same time do not adequately capture the dynamic nature of the decision to use the healthcare system.<sup>10</sup> For example, pain and disability may not predict use unless they persist.

In the present study, the Anderson model was used to examine whether women with higher and lower healthcare costs differed in need (health status, disease severity, perceived health status, duration of symptoms, and number of other medical conditions), enabling characteristics (income), and predisposing factors (age, marital status, self-efficacy, depression, and social support). Participants were female health maintenance organization (HMO) members with fibromyalgia syndrome (FMS). All participants took part in a larger intervention designed to reduce healthcare utilization while improving health status. Fibromyalgia is characterized by fatigue, widespread muscle pain, sleep disturbance, and depression<sup>18-20</sup> and can also lead to physical impairment and reduced functioning<sup>21</sup>; FMS affects mostly women (95%). It was hypothesized that women with FMS who had higher and lower healthcare costs would differ on factors included in the Anderson model, supporting previous research.

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... METHODS ...

### Participants

All participants were recruited from Kaiser Permanente Southern California, San Diego (>500,000 members) for a study examining the effects of social support and education on health status and healthcare use. Six hundred patients met participation requirements (see the "Participation Requirements" subsection) and were accepted into the study. Of these, only women without missing data were selected for the present study ( $n = 537$ ). Among participants (mean  $\pm$  SD age,  $53.9 \pm 11.3$  years), 65% were married, 48% were employed, 85% were white, and 81% had at least some college education; their median income was \$20,000 to \$50,000. The mean  $\pm$  SD duration of FMS symptoms was  $13.86 \pm 13.21$  years.

### Procedures

*Recruitment Methods.* Several different strategies were necessary to recruit HMO members with FMS. In addition to letters sent to randomly selected HMO members, newspaper ads were placed in the Sunday paper, flyers were posted in HMO waiting rooms, and e-mails were sent to HMO physicians telling them about the study and asking them to refer qualified patients. When asked how a participant heard about the study, most reported multiple modalities, making comparisons among patients with FMS recruited by the different methods impossible.

**Participation Requirements.** Participants had to have a diagnosis of FMS from their physician before being considered for the study. However, because of the variable criteria used within the HMO for diagnosing FMS, further evidence of FMS was required for participation. Specifically, during the initial assessment visit, a trained research assistant performed a manual tender point examination using the American College of Rheumatology diagnostic criteria<sup>22</sup> to confirm the diagnosis. These criteria are that the person must have widespread pain lasting at least 3 months in the left and right sides of the body, pain below and above the waist, axial skeletal pain, and pain in 11 of 18 tender points. Of HMO members who came to the initial assessment with a diagnosis from their physician, 86 did not qualify for the study because of the results of their tender point examination and were not included among the 600 participants. Written informed consent was obtained from all participants.

Participants completed a battery of questionnaires at baseline assessment and again 1 year later. After baseline assessment, individuals were randomly assigned to 1 of 2 interventions (social support or social support and education) or to a control group. The contents of the educational sessions and the social support tasks were standardized and were adapted specifically for FMS (see Oliver et al<sup>23</sup> for more details). There were no differential changes in overall healthcare costs among groups. There were also no differential changes in health status or psychosocial measures; however, there were several time effects, all indicating improvements in symptoms (eg, depression, pain, or sleep quality) and self-efficacy over time in all 3 groups.<sup>23</sup>

### Measures

All variables were measured at baseline. Costs were measured 1 year before and 1 year after baseline.

### Predisposing Factors

**Demographics.** Age and marital status were obtained through an interview completed at the initial assessment.

**Self-efficacy.** Perceived self-efficacy was measured using the Arthritis Self-Efficacy Scale.<sup>24</sup> The term “arthritis” was changed to “fibromyalgia.” The scale consists of 20 items that measure participants’ confidence in their ability to perform particular activities or tasks, eg, how certain they are that they can decrease their pain quite a bit, walk 100 ft on flat ground in 20 seconds, or button and unbutton 3 medium-sized buttons in a row in 12 seconds.

Participants were asked to rate their confidence in performing specific tasks on a scale from 0 (very uncertain) to 100 (very certain). The scale has 3 subscales, function, pain, and symptoms, which were examined separately in the present study. Test-retest reliability for this scale has ranged from 0.71 to 0.85, and it has demonstrated construct validity.<sup>24</sup>

**Depression.** Depression was assessed using the Center for Epidemiological Studies Depression Scale.<sup>25</sup> This 20-item self-administered questionnaire is used to measure depressive symptoms in general population surveys. A 4-point Likert scale is used to measure the rate at which a specific symptom was experienced during the past week, with 0 indicating rarely or none of the time and 3 indicating most or all of the time. High internal consistency, moderate test-retest reliability, and high concurrent and construct validity have been reported.<sup>25</sup> In chronically ill populations, a cutoff score of 19 (of a possible 60) signals depressed mood.<sup>26</sup>

**Social Support.** Social support was measured via the Norbeck Social Support Questionnaire,<sup>27</sup> administered by a research assistant. Participants are asked to list all the people who are important to them (12 maximum) and then to rate them in different areas of support on a Likert scale ranging from 1 (not at all) to 5 (a great deal). Three subscales are derived that assess affect, affirmation, and aid. A total functional score is obtained by taking the mean of these 3 subscales. Construct validity for this questionnaire has been demonstrated, and test-retest reliability ranges from 0.58 to 0.78.<sup>27</sup>

### Enabling Characteristics

Participants reported family income during the initial assessment interview.

### Need Variables

**Health Status.** The Quality of Well-Being (QWB) Scale<sup>28</sup> was used to assess health status. A trained research assistant administered this general measure of global functioning. The QWB Scale combines preference-weighted measures of symptoms and functioning to provide a numerical point-in-time expression of well-being, which ranges from 0 (death) to 1 (asymptomatic optimum functioning). Participants select from 27 symptom/problem complexes. Use of this measure does not require any assumptions about the intensity or duration of symptoms and problems or about the underlying pathologic mechanism. The measure simply indicates the presence or absence of a symptom or problem on a given day. The symptom/problem complexes are

weighted by perceived severity. Reliability for this scale has been demonstrated.<sup>29,30</sup> The QWB Scale's validity as an outcome measure has been shown for various conditions,<sup>31-34</sup> including FMS.<sup>35</sup>

**Perceived Health Status.** Participants were asked to rate their health on a 4-point scale ranging from "poor" to "excellent" as part of a paper-and-pencil questionnaire.

**Comorbidity.** Participants' comorbidities were measured using 9 "yes" or "no" questions included in a paper-and-pencil questionnaire that asked whether the participant's health was affected by high blood pressure, heart disease, diabetes mellitus, cancer, lung disease, kidney disease, liver disease, or another arthritis-related condition. There was also an opportunity for participants to list "other" medical conditions.

**Disease Severity.** The severity of FMS was measured using the Fibromyalgia Impact Questionnaire (FIQ),<sup>36</sup> a brief, self-administered, 10-item questionnaire that measures physical functioning, depression, work status, sleep, anxiety, pain, stiffness, fatigue, and well-being in people with FMS. The first item of the FIQ consists of 10 subitems that focus primarily on the patient's ability to perform large muscle tasks (eg, yard work or vacuuming), presented in a Likert-type scale ranging from 0 (always able to do) to 3 (never able to do). The sum of these 10 subitems is divided by the number of valid scores to provide one physical functioning score. The remainder of the items assess pain, fatigue, morning stiffness, anxiety, depression, and ability to perform at work. Each item is standardized on a scale from 0 to 10, with 10 indicating greater impairment. The items are then summed to create a total impact score.

**Duration of FMS Symptoms.** Participants were asked to record the month and year they first began experiencing FMS symptoms.

### Healthcare Costs

Healthcare costs were estimated by multiplying the number of each type of healthcare contact by recent national average cost figures (including medical test and prescription costs). Contacts were collected directly from patient medical records for 1 year before and 1 year after the initial interview. The following types of visits were recorded: physician visits (including primary care, urgent care, and specialist), nurse/physician assistant/nurse practitioner visits, inpatient stays (counted as the number of days in the hospital), emergency department visits, and mental health visits. Total contacts were calculated by summing every contact for each participant.

In addition, data for medical tests performed and for prescription costs were collected. Costs per contact for healthcare providers (physicians, nurse practitioners, physician assistants, etc) and mental health specialists were estimated by taking the contact category average from the *Physician's Fee Reference*<sup>37</sup> at the 50th percentile level. Costs of medical tests were also estimated using the 50th percentile level. Nurse practitioner, nurse, and physician assistant costs were estimated as 85% of physician fees, which corresponds to their current national reimbursement value. Costs for emergency department visits were estimated based on the University of California San Diego Hospitals' average for the 1998-1999 fiscal year. Average costs for inpatient stays were obtained from the Agency for Healthcare Research and Quality (formerly the Agency for Health Care Policy and Research) *Hospital Inpatient Statistics, 1996*.<sup>38</sup> Retail values of the medications prescribed were obtained directly from patient medical records. Overall cost was then summed for each participant.

### Statistical Analyses

For the intervention study, a power analysis was conducted before the study and indicated that the number of participants was adequate to achieve a power of 0.80. To compare women with higher and lower healthcare costs, the sample was divided using a median split (\$2714) on healthcare costs for the year after baseline assessment. A multivariate analysis of covariance controlling for costs during the year preceding baseline assessment was performed on the following variables: age, number of comorbid conditions, duration of symptoms, 3 subscales of self-efficacy (pain, functioning, and symptoms), depression, social support, disease severity (FIQ scores), and 2 measures of health status (QWB Scale scores and self-perceived health status).  $\chi^2$  Analyses were conducted on marital status (married or unmarried) and income (<\$20,000, \$20,000-\$50,000, or >\$50,000).

## ... RESULTS ...

### Descriptive Statistics

Descriptive statistics are presented in **Table 1**; a correlation matrix is presented in **Table 2**.

The distributions of healthcare costs were heavily skewed in the positive direction; therefore, a natural log transformation was performed on the healthcare data.<sup>39</sup>



**Correlations Among Variables**

As shown in Table 2, the strongest associations among variables are those between healthcare costs at the 2 times (1 year before and 1 year after baseline assessment). Most need variables were significantly associated with healthcare costs at both times; greater need was associated with higher costs. However, duration of symptoms and disease severity (as measured by the FIQ) were not significantly related to costs at either time. Income, our measure of an enabling characteristic, was significantly correlated with costs; people reporting higher income had lower healthcare costs at both times. Self-efficacy for both pain and functioning and depression were significantly correlated with costs 1 year before the intervention; lower levels of self-efficacy and higher depression scores were associated with greater costs. However, none of the predisposing variables were significantly correlated with healthcare costs 1 year after baseline assessment.

Moderate to strong correlations were observed among the dependent variables; most notably, depression was highly related to disease severity ( $r = 0.72$ ), and QWB Scale scores and self-perceived health status were highly related to depression, disease severity, and self-efficacy ( $r = 0.32-0.49$ ); better health, less disease severity, and lower depression scores were related to higher self-efficacy. Age was related to comorbidity ( $r = 0.30$ ), with older people reporting more health problems. Finally, marital status was related to income ( $r = 0.37$ ), with married individuals reporting more income.

**Multivariate Analysis of Covariance Comparing Higher- and Lower-Cost Groups**

A multivariate analysis of covariance controlling for costs 1 year before baseline measures were taken was performed. The overall F score was significant ( $F_{11,524} = 2.69; P = .002$ ). Differences between the high- and low-cost groups were found on the following variables: comorbidity, QWB Scale scores, FIQ scores, self-perceived health status, self-efficacy for functioning, depression, and social support. Low-cost patients had fewer comorbid conditions, better health status (as measured using the QWB Scale or the FIQ), higher self-perceived health status, greater self-efficacy for functioning, lower

depression scores, and higher social support scores. Effect sizes were small, ranging from 0.007 (for FIQ scores) to 0.028 (for self-perceived health status). See Table 3 for means and effect sizes.

**$\chi^2$  Analyses**

$\chi^2$  Analyses showed no significant difference between the 2 groups on marital status ( $P = .16$ ). There was, however, a significant difference between groups on income ( $\chi^2 = 8.76; P = .01$ ). Low-cost patients were more likely to report income greater than \$50,000 (35% vs 25%), and high-cost patients were more likely to report incomes less than \$20,000 (19% vs 12%).

... DISCUSSION ...

Our results support the Anderson model in that after controlling for previous healthcare costs, people who had higher healthcare costs during the following year differed from those with lower

**Table 1.** Descriptive Information for Dependent Variables in 537 Women With Fibromyalgia

| Dependent Variable                                      | Value         |
|---|---------------|
| Age, mean (SD), y                                       | 53.99 (11.32) |
| Presence of other medical conditions, %                 | 78.2          |
| Married, %  | 64.8          |
| Duration of symptoms, mean (SD), y                      | 13.86 (13.21) |
| Income, %   |               |
| <\$20,000   | 15.6          |
| \$20,000-\$50,000                                       | 54.4          |
| >\$50,000   | 30.0          |
| Self-efficacy for pain, mean (SD) [range, 0-100]        | 46.88 (21.93) |
| Self-efficacy for functioning, mean (SD) [range, 0-100] | 65.90 (22.87) |
| Self-efficacy for symptoms, mean (SD) [range, 0-100]    | 47.00 (18.85) |
| Depression score, mean (SD) [range, 0-60]               | 19.62 (11.45) |
| Social support score, mean (SD)                         | 11.91 (1.60)  |
| QWB Scale score, mean (SD) [range, 0-1]                 | 0.56 (0.07)   |
| FIQ score, mean (SD) [range, 0-100]                     | 61.17 (16.28) |
| Self-reported health rating, %                          |               |
| Very poor   | 4.3           |
| Poor  | 15.5          |
| Fair  | 37.8          |
| Good  | 37.8          |
| Excellent   | 4.7           |

QWB = Quality of Well-Being; FIQ = Fibromyalgia Impact Questionnaire.

healthcare costs on need variables (comorbidity, general health status, disease severity, and perceived health), predisposing variables (depression, social support, and self-efficacy for functioning), and enabling variables (income). Specifically, people with higher healthcare costs had more comorbid conditions, had lower health status, and perceived their health to be worse than people with lower healthcare costs. People with higher healthcare costs also had lower self-efficacy for functioning, lower social support, and lower incomes than did those with lower healthcare costs after the previous year's healthcare costs were controlled for.

The finding that need variables were related to healthcare costs after controlling for previous costs is consistent with other research<sup>4,8-10</sup> indicating that need was a consistent predictor of healthcare use. People with higher and lower healthcare costs differed on all of the need variables. Although some need variables are not easily changed through interventions, perceived health could be targeted through a behavioral intervention and had the largest effect size among the variables measured. For instance, people could be taught that experiencing high levels of pain does not necessarily mean that one is in poor health.

People who had higher and lower healthcare costs differed significantly on 3 predisposing variables: depression, social support, and self-efficacy for functioning. This finding is consistent with studies<sup>40-44</sup> showing that lower levels of social support and higher levels of depression are correlated with increased healthcare use. Research<sup>45,46</sup> has shown that improvements in all 3 variables can improve psychological or physical well-being; all of the predisposing variables could be targeted by behavioral interventions. For example, people with strong efficacy beliefs cope more adaptively with pain and anxiety.<sup>47,48</sup> A relationship between self-efficacy and health outcomes extends to patients with chronic pain and has been demonstrated in rheumatic disease groups<sup>49</sup> and in patients with FMS.<sup>50,51</sup> It is interesting that self-efficacy for functioning differed between people with high and low healthcare costs but self-efficacy for symptoms and pain did not. Because the treatments available to people with FMS to control either their pain or their symptoms (eg, sleep disturbances or fatigue) are limited, it is possible that people with lower healthcare costs believe that they have more control over their functioning but not that they can control their pain and symptoms.

**Table 2.** Correlations Among Variables\*

|                                    | 1                   | 2                   | 3                   | 4                  | 5                   | 6                   |
|------------------------------------|---------------------|---------------------|---------------------|--------------------|---------------------|---------------------|
| 1. Cost before baseline assessment | —                   |                     |                     |                    |                     |                     |
| 2. Cost after baseline assessment  | 0.688 <sup>†</sup>  | —                   |                     |                    |                     |                     |
| 3. Age                             | 0.006               | 0.052               | —                   |                    |                     |                     |
| 4. Marital status                  | -0.009              | -0.026              | 0.030               | —                  |                     |                     |
| 5. Income                          | -0.112 <sup>†</sup> | -0.102 <sup>‡</sup> | -0.205 <sup>†</sup> | 0.367 <sup>†</sup> | —                   |                     |
| 6. Duration of symptoms            | 0.009               | 0.026               | 0.294 <sup>†</sup>  | -0.081             | -0.125 <sup>†</sup> | —                   |
| 7. QWB Scale score                 | -0.135 <sup>†</sup> | -0.091 <sup>‡</sup> | 0.030               | 0.027              | 0.139 <sup>†</sup>  | -0.023              |
| 8. Perceived health                | -0.145 <sup>†</sup> | -0.090 <sup>‡</sup> | 0.138 <sup>†</sup>  | 0.007              | 0.127 <sup>†</sup>  | 0.118 <sup>†</sup>  |
| 9. Comorbidity                     | 0.171 <sup>†</sup>  | 0.152 <sup>†</sup>  | 0.300 <sup>†</sup>  | 0.015              | -0.115 <sup>†</sup> | 0.0833              |
| 10. FIQ score                      | 0.075               | 0.001               | -0.217 <sup>†</sup> | -0.050             | -0.123 <sup>†</sup> | -0.098 <sup>‡</sup> |
| 11. Self-efficacy for pain         | -0.119 <sup>†</sup> | -0.014              | 0.061               | -0.001             | 0.101 <sup>‡</sup>  | 0.071               |
| 12. Self-efficacy for function     | -0.128 <sup>†</sup> | -0.069              | -0.058              | 0.009              | 0.165 <sup>†</sup>  | 0.031               |
| 13. Self-efficacy for symptoms     | -0.053              | 0.028               | 0.136 <sup>†</sup>  | 0.020              | 0.120 <sup>†</sup>  | 0.111 <sup>‡</sup>  |
| 14. Depression                     | 0.101 <sup>‡</sup>  | 0.053               | -0.195 <sup>†</sup> | -0.060             | -0.115 <sup>†</sup> | -0.081              |
| 15. Social support                 | -0.034              | -0.021              | 0.016               | 0.102 <sup>‡</sup> | 0.122 <sup>†</sup>  | -0.037              |

QWB = Quality of Well-Being; FIQ = Fibromyalgia Impact Questionnaire.

\*Marital status coded as 0 = not married and married = 1.

<sup>†</sup>*P* < .01.

<sup>‡</sup>*P* < .05.

The finding that people with lower incomes had higher healthcare costs seems surprising given research<sup>8,13,52</sup> indicating that people with higher incomes are more likely to use healthcare services. However, patients in the present study were HMO members who pay only nominal fees for services. Thus, costs may be a minimal influence on this group's health-seeking behavior. Thus, need variables, rather than enabling variables, probably dominate healthcare use in our populations, and lower income is correlated with higher values of all of our need variables (Table 2).

People with higher and lower healthcare costs did not significantly differ in age, although participants' ages ranged from 25 to 89 years. Other researchers<sup>10</sup> have found that increased age is associated with increased healthcare use. Patients in the present study reported having symptoms for an average of more than 10 years; the duration of symptoms did not differ between women with higher and lower healthcare costs. It is possible that with age, women with FMS learn that they do not have direct control over their symptoms. In a study recently completed with the same participants, older people fared better with the symp-

toms of FMS, providing support for the idea that with age, patients become either less symptomatic or habituated to their symptoms (H.R. Walen, PhD, unpublished data, 2001).

The variables associated with healthcare costs of our primarily white, female HMO patients may be different from those of patients who have other healthcare plans or other demographic characteristics and thus may not represent those of the population at large. It is also possible that because all the patients volunteered to participate in a health intervention study that assessed the effects of social support and education on health status and healthcare use, they differed from those who did not volunteer. Only 1 study reports the prevalence rates of patients with FMS in minority groups; Wolfe et al<sup>53</sup> reported that 86.2% of 583 participants were white. In 5 of the 6 centers where this multicenter study was conducted, the percentage of whites varied from 88.7% to 100%. The exception was San Antonio, Texas, where 56.2% were white. Thus, the ethnic composition of participants in our study is similar to that of patients with FMS in other studies.

Despite these potential limitations, the participants probably represent other HMO members with

| 7                   | 8                   | 9                   | 10                  | 11                  | 12                  | 13                  | 14                  | 15 |
|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----|
| —                   |                     |                     |                     |                     |                     |                     |                     |    |
| 0.481 <sup>†</sup>  | —                   |                     |                     |                     |                     |                     |                     |    |
| -0.161 <sup>†</sup> | -0.127 <sup>†</sup> | —                   |                     |                     |                     |                     |                     |    |
| -0.489 <sup>†</sup> | -0.449 <sup>†</sup> | 0.031               | —                   |                     |                     |                     |                     |    |
| 0.292 <sup>†</sup>  | 0.326 <sup>†</sup>  | -0.095 <sup>†</sup> | -0.444 <sup>†</sup> | —                   |                     |                     |                     |    |
| 0.472 <sup>†</sup>  | 0.387 <sup>†</sup>  | -0.198 <sup>†</sup> | -0.457 <sup>†</sup> | 0.408 <sup>†</sup>  | —                   |                     |                     |    |
| 0.319 <sup>†</sup>  | 0.389 <sup>†</sup>  | 0.027               | -0.566 <sup>†</sup> | 0.679 <sup>†</sup>  | 0.506 <sup>†</sup>  | —                   |                     |    |
| -0.460 <sup>†</sup> | -0.433 <sup>†</sup> | -0.037              | 0.715 <sup>†</sup>  | -0.335 <sup>†</sup> | -0.404 <sup>†</sup> | -0.495 <sup>†</sup> | —                   |    |
| 0.126 <sup>†</sup>  | 0.152 <sup>†</sup>  | -0.025              | -0.175 <sup>†</sup> | 0.139 <sup>†</sup>  | 0.110 <sup>†</sup>  | 0.184 <sup>†</sup>  | -0.207 <sup>†</sup> | —  |

the same diagnosis. In addition, the characteristics of our sample provided certain advantages for examining the Anderson model. Two variables in the model, sex and access to healthcare (predisposing and enabling factors, respectively), were controlled for because the sample included only female HMO members. Controlling for these prominent variables affecting healthcare costs allowed us to identify less salient variables.

Although there were a variety of significant differences between people with higher and lower healthcare costs after previous healthcare costs were controlled for, the effect sizes associated with the dependent variables were small. This finding is consistent with previous research.<sup>10</sup> However, the number of people within the healthcare industry is so enormous that even very small improvements in physical and psychological well-being would translate into tremendous cost savings.

Several variables included in this study may be responsive to intervention. For example, physicians who screen for depression may be able to refer depressed patients to psychosocial services for counseling, which may reduce healthcare costs and improve their perceived health and psychological well-being. Patients could also be encouraged to involve their family members in their medical care

to increase their levels of social support. Longitudinal studies are valuable and may provide researchers and healthcare providers with more information about how healthcare services change over time and factors that are associated with both increases and decreases in healthcare costs. This information may help in finding effective methods to reduce healthcare costs while increasing health status and psychological well-being.

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**Table 3.** Results of Multivariate Analysis of Variance Comparing High- and Low-Cost Patients

| Dependent Variable            | Cost Group*   |               | Univariate F       | $\eta^2$ |
|-------------------------------|---------------|---------------|--------------------|----------|
|                               | High          | Low           |                    |          |
| Age, y                        | 54.34 (11.82) | 53.65 (10.81) | 0.48               | <.001    |
| Comorbidities, No.            | 1.69 (1.25)   | 1.25 (1.08)   | 9.61 <sup>†</sup>  | .018     |
| Duration of symptoms, y       | 14.38 (12.79) | 13.34 (13.62) | 0.81               | .002     |
| QWB Scale scores              | 0.55 (0.07)   | 0.57 (0.07)   | 8.15 <sup>†</sup>  | .015     |
| FIQ scores                    | 62.90 (16.56) | 59.45 (15.83) | 3.95 <sup>‡</sup>  | .007     |
| Self-perceived health         | 3.04 (0.90)   | 3.42 (0.90)   | 15.64 <sup>†</sup> | .028     |
| Self-efficacy for pain        | 44.61 (21.55) | 49.14 (22.10) | 2.34               | .004     |
| Self-efficacy for functioning | 62.33 (23.61) | 69.44 (21.57) | 7.67 <sup>†</sup>  | .014     |
| Self-efficacy for symptoms    | 45.23 (19.34) | 48.77 (18.21) | 3.49               | .006     |
| Depression                    | 21.17 (11.82) | 18.08 (10.86) | 6.14 <sup>‡</sup>  | .011     |
| Social support                | 11.74 (1.69)  | 12.08 (1.49)  | 5.55 <sup>†</sup>  | .010     |

QWB = Quality of Well-Being; FIQ = Fibromyalgia Impact Questionnaire.

\*Data are given as mean (SD).

<sup>†</sup>P < .01.

<sup>‡</sup>P < .05.



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