

Measuring the “Managedness” and Covered Benefits of Health Plans

David E. Grembowski, Paula Diehr, Louise C. Novak, Amy Elizabeth Roussel, Diane P. Martin, Donald L. Patrick, Barbara Williams, Cornelia M. Ulrich

Study Aims. (1) To develop indexes measuring the degree of managedness and the covered benefits of health insurance plans, (2) to describe the variation in these indexes among plans in one health insurance market, (3) to assess the validity of the health plan indexes, and (4) to examine the association between patient characteristics and the health plan indexes. Measures of the “managedness” and covered benefits of health plans are requisite for studying the effects of managed care on clinical practice and health system performance, and they may improve people’s understanding of our complex health care system.

Data Sources/Study Setting. As part of our larger Physician Referral Study, we collected health insurance information for 189 insurance product lines and 755 products in the Seattle, Washington metropolitan area, which we linked with the study’s data for 2,277 patients recruited in local primary care offices.

Study Design. Managed care and benefit variables were constructed through content analysis of health plan information. Principal component analysis of the variables produced a managedness index, an in-network benefits index, and an out-of-network benefits index. Bivariable analyses examined associations between patient characteristics and the three indexes.

Principal Findings. From the managed care variables, we constructed three provider-oriented indexes for the financial, utilization management, and network domains of health plans. From these, we constructed a single managedness index, which correlated as expected with the individual measures, with the domain indexes, with plan type (FFS, PPO, POS, HMO), with independent assessments of local experts, and with patients’ attitudes about their health insurance. For benefits, we constructed an in-network benefits index and an out-of-network benefits index, which were correlated with the managedness index. The personal characteristics of study patients were associated with the managed care and benefit indexes. Study patients in more managed plans reported somewhat better health than patients in less managed plans.

Conclusions. Indexes of the managedness and benefits of health plans can be constructed from publicly available information. The managedness and benefit indexes are associated with the personal characteristics and health status of study patients. Potential uses of the managed care and benefits indexes are discussed.

Key Words. Health insurance, managed care, managed care organization, health

maintenance organization, health outcomes, plan satisfaction, utilization, costs, health policy, measurement

“It looks and feels like a PPO and yet underneath the hood
is our HMO management and cost containment.”

from *American Healthline*¹

In the era of managed care and market-driven health reform, fundamental changes are occurring in the U.S. health care system. Faced with higher costs that erode profits and competitiveness, employers, as well as government and nonprofit agencies, have replaced their traditional fee-for-service (FFS) health plans with one or more health plans offered by a variety of managed care organizations (MCOs), such as preferred provider organizations (PPOs), point-of-service (POS) plans, and health maintenance organizations (HMOs) (Miller and Luft 1994, 1997; Iglehart 1992; Miller 1988). To control the costs of their health plans, MCOs place a variety of constraints and incentives on physician and patient behavior. As more and more Americans obtain their health care through managed health plans (Winslow 1998), it becomes more important to understand the influence of their components on the delivery and outcomes of care.

Very little is known about the influence of managed health plans on the cost, utilization, and quality of care, partly because well-developed measures of managed care do not exist. Previous studies typically examined the association between the type of health plan (such as FFS, PPO, POS, or HMO) and the process and outcomes of care. However, these measures are problematic because MCOs manage care in different ways, and distinctions between types tend to blur (Johnson and Crystal 1997; Schoen and Davidson

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Address correspondence to David E. Grembowski, Ph.D., Professor, Dept. of Health Services, University of Washington, 1959 N.E. Pacific Street, Box 357660, Seattle WA 98195-7660. Paula Diehr, Ph.D. is Professor of Biostatistics and Health Services, University of Washington, Seattle; Louise C. Novak, M.P.H. is Research Consultant in the Dept. of Health Services; Diane P. Martin, Ph.D. is Professor of Health Services; Donald L. Patrick, Ph.D., M.S.P.H. is Professor of Health Services; and Barbara Williams, Ph.D. is Senior Computer Specialist in the Dept. of Health Services, University of Washington, Seattle. Amy Elizabeth Roussel, Ph.D. is Senior Research Health Analyst, Research Triangle Institute, Research Triangle Park, NC; and Cornelia M. Ulrich, Ph.D. is Assistant Member, Fred Hutchinson Cancer Research Center, and Research Assistant Professor of Epidemiology, Dept. of Epidemiology, University of Washington, Seattle. This article, submitted to *Health Services Research* on August 18, 1999, was accepted for publication on September 1, 1999.

1996; Isaacs 1996). As a consequence, associations between plan type and the delivery and outcomes of care are often inconsistent (Miller and Luft 1997). Even when consistent positive or negative associations are detected, it is often unclear which components produced them, undermining the ability of decision makers to pinpoint what does or does not contribute to quality care.

An alternative approach is to define managed care by the methods that health plans use to manage costs and improve quality of care (Grembowski et al 1998; Fraser 1997; Johnson and Crystal 1997; Schoen and Davidson 1996). Other things equal, as the number and strength of the methods increase, so does the intensity, or "managedness," of health plans. Because the methods vary in complex ways across MCOs (Schoen and Davidson 1996; Gabel et al. 1997), variation in the methods—and therefore, the intensity of managed care—may be associated with the delivery and outcomes of care (Hillman, Pauly, and Kerstein 1989). Developing measures of these managed care methods is requisite to studying ways in which they influence the delivery and outcomes of care, as well as patient selection and satisfaction with health plans.

Measuring these methods also may help consumers make informed choices among health plans. Hibbard, Sofaer, and Jewett (1996) report that people often have a "mental map" of key health issues, but that the mental maps of most people are for an outdated, fee-for-service environment. A national survey revealed that high percentages of Americans do not understand the basic differences between fee-for-service and managed health plans, nor can they identify the most basic features of managed plans (Isaacs 1996). Thus, the identification and measurement of specific features of managed plans also constitute a new lexicon that, along with plan performance ratings, may promote informed choice of health plans (Hibbard and Jewett 1997; Miller 1997).

MCOs and other health plans also may control costs through their decisions to cover standard categories of health services, such as office visits, prescription drugs, or in- or outpatient mental health services. Although this provision of benefits for a category of health services may increase use within the category, deductibles, coinsurance, copayments, or other forms of cost-sharing may curb utilization. Economic theory and empirical evidence suggest that lack of benefits for a category of health services (such as mental health) or minimal benefits with high out-of-pocket costs decreases a patient's utilization of those services (Broyles and Rosko 1988). To encourage their enrollees to use network providers, managed health plans typically offer better coverage for health services delivered by providers inside the network than for services delivered by providers outside the network. Thus, developing

measures of benefits and cost-sharing inside and outside the provider network is requisite for studying their influence on the delivery and outcomes of care, as well as for examining the correlation between patient- and provider-oriented cost controls.

In short, measures of the managedness of health plans and their covered benefits are important for studying the effects of managed care on clinical practice and health system performance, and such measures may improve people's understanding of our complex health care system. The aims of this article are (1) to develop indexes measuring the degree of managedness and the covered benefits of health insurance plans, (2) to describe the variation in these indexes among plans in one health insurance market, (3) to assess the validity of the health plan indexes, and (3) to examine the association between patient characteristics and the health plan indexes.

METHODS

The managedness and benefit indexes were developed as part of the Physician Referral Study, a larger investigation that examined the influence of managed care on physician referrals and health outcomes in King County (Seattle metropolitan area), Washington (Grembowski et al. 1998). We invited 834 primary care physicians (family practitioners, general internists, and general practitioners) in private practice at least half time to participate in the study. Of these, 261 physicians (31 percent) in 72 clinics consented to do so. A total of 17,187 English-speaking, literate patients age 18 and over were screened for two weeks in the clinics to identify 2,850 consenting patients with elevated depression scores on items from the symptom checklist for depression (Derogatis et al. 1974) and/or at least one of eight pain problems (back pain, chest pain, abdominal pain, sinus or facial pain, headache or migraine, pain from indigestion/constipation, pain or arthritis in arms/legs/joints, and pelvic pain from female problems). Patients received one-month, three-month (depression only) and six-month follow-ups (77–86 percent response rates).

At the waiting room screen, we collected information from patients about the name of their health insurance and the source of their insurance, such as the name of the employer providing the health plan, Medicare, Medicaid, an individual health plan purchased from an insurance firm, and so forth. After an eligible patient was enrolled in the study, we also collected information about the name and source of each patient's health plan from the patient's clinic. Based on this information, we collected detailed information

about the health plan's benefits and cost-sharing choices, as well as managed care constraints and incentives, at the product-line and product levels for each patient (Gold and Hurley 1997). That is to say, a health insurance firm may offer several "product lines," such as a health maintenance organization, a point-of-service plan, a preferred provider organization, or an indemnity plan, and each product line has its own managed care constraints and incentives. Each product line, in turn, is usually composed of several "products," which are the product line's benefit and cost-sharing arrangements for a specific employer or other purchaser. Thus, several employers may purchase the same HMO product line from a health insurance firm, but their benefits and cost-sharing arrangements, or products, may vary across those employers.

Product-line and product information for the health plans of patients in the study were collected from multiple sources. First, product-line and product information were collected for about 30 percent of the employers of patients from public records in the Office of the Insurance Commissioner, a Washington state agency. If the information was not available at the Commissioner's office (self-insured employers, for example, are not required to file their plans at the Commissioner's office), other public sources were contacted—primarily employer Internet sites, which frequently contained information about the employer's health plans. If the information was not available from a public source, study staff contacted the employer or health insurance firm to collect the information. Employers and health insurance firms were given an assurance of confidentiality that the names of their firm or product lines would not be reported in the study. Through this process we collected health insurance information for 189 product lines and 755 products for 2,277 patients, or about 80 percent of our total sample of 2,850 patients.² As a whole, the 189 product lines represent about 65 percent of the state's commercial market, based on records from the Office of the Insurance Commissioner.

Conceptual Model for Constructing the Managedness and Covered Benefits Indexes

The construction of the managedness and benefit indexes was based on a conceptual model derived from the prior work of the American Public Health Association (1996); Gold and Hurley (1997); Gold, Nelson, Lake, et al. (1995); Gold, Hurley, Lake, et al. (1995); the Physician Payment Review Commission (1995a,b); Kerr, Mittman, Hays, et al. (1995); Miller and Luft (1994); and Weiner and deLissovoy (1993). We defined a managed care organization as one that manages the provision and/or financing of medical care using provider-oriented and patient-oriented constraints and incentives

at one or more of three levels: health plan, clinic, and provider (Grembowski et al. 1998). In this article, our focus is on the methods of managing care in health plans.

Provider-oriented methods of managing care in health plans may be grouped into the following three domains. The *network characteristics* domain, a universal trait of health plans (Miller and Luft 1994), includes features such as gatekeeping and enrollee "lock-in" to network providers (i.e., when the health plan pays for services only when the enrollee sees providers in the plan's network). Through *utilization management*, health plans may stipulate that referrals to specialists, hospitalizations, and other forms of treatment must be reviewed and authorized by them before services are performed. *Financial incentives*, such as how the plan pays the clinic or physician, may influence clinical decisions (Hellinger 1996; Kwon 1996).³

Measures that capture the common features of health plans in the three provider-oriented domains are presented in Table 1. Measures were chosen if they satisfied three criteria: (1) based on the conceptual model, the item measured a characteristic or strategy that at least some types of managed plans used to control costs or improve quality, or both; (2) data were available from most plans to construct the measure; and (3) the measure had a reasonable amount of variation across plans. In addition, because the larger purpose of the Physician Referral Study was to estimate the effects of managed care on physician referrals, the measures reflected features of managed care primarily in ambulatory rather than inpatient settings. Inpatient measures of managed care (such as preadmission authorization) also were excluded because they typically had little variation across health plans (see criterion 3). The measures in Table 1 can be used individually, in groups, or as a composite to examine their relationship with the process and outcomes of health care.

Patient-oriented constraints and incentives were defined by the *benefit and cost-sharing* arrangements of health plans for provider-delivered services within the plan's network, and the arrangements for services delivered by providers outside the plan's network. In general, although HMOs impose more provider constraints and incentives than do fee-for-service plans, HMOs typically offer more generous benefits and less cost-sharing than fee-for-service plans (Dudley et al. 1998).

Index Construction

Based on our conceptual model, we constructed three indexes: (1) a managedness index measuring the intensity of provider constraints and incentives in each product line, (2) an "in-network" benefits index measuring the covered

Table 1: Provider-Oriented Measures of Managed Care in Health Plans

<i>Domain and Measure</i>	<i>Operational Definition</i>	<i>Values (No. Product Lines)</i>
<i>Network</i>		
Gatekeeping	Patient must see primary care physician before seeing specialist with coverage	0 = No gatekeeping (28) 1 = Must see primary care physician before visiting specialists in the network, but enrollees can visit out-of-network specialists on their own, usually at a higher cost (32) 2 = Must see primary care physician before visiting any specialist with coverage (91)
Enrollee lock-in	Whether the enrollee can only see network specialists with coverage	0 = No network defined; all providers are accessible (9) 1 = Network exists but enrollees may visit specialists outside the network with coverage (50) 2 = Network exists and enrollee must stay inside for specialist care with coverage (107)
<i>Utilization Management</i>		
Product authorization, initial specialist visit	Whether plan preauthorization is required before seeing a specialist	0 = None required (64) 1 = Telephone or written preauthorization is required (2) 2 = Written preauthorization only (64)
Physician authorization	Whether primary care physician preauthorization is required before seeing a specialist	0 = None required (22) 1 = Telephone or written preauthorization is required (66) 2 = Written preauthorization only (56)
<i>Financial Incentives</i>		
Financial risk	Whether the health plan pays the clinic or providers by fee-for-service or capitation	1 = Fee-for-service (52) 2 = Capitation (114)

benefits inside the provider network of each product, and (3) an “out-of-network” benefits index measuring the covered benefits outside the provider network of each product. Drawing on methods for constructing indexes described by Shortell and colleagues (Shortell, Morrisey, and Conrad 1985; Shortell and Hughes 1988), we used the method of principal components to summarize the relevant information for each index. The method of principal components is the first step in most factor analysis computer programs. The first principal component of a set of variables is the linear combination, or weighted sum, of the variables that accounts for the largest amount of the total variation in the data (Kleinbaum et al. 1998). The first principal component of the data tends to represent the characteristics that the variables have in common. For example, if there were two positively correlated variables, the first principal component would be approximately the mean of the two standardized variables. If the two variables were negatively correlated, the principal component would be a weighted sum, and the two variables would have different signs. If there were three variables, two positively correlated and a third uncorrelated with the other two, the first principal component would be approximately a weighted sum of the first two variables, and it would not be influenced much by the third variable. Based on our conceptual model, the provider-oriented variables in Table 1 are likely correlated with each other, and therefore we used the method of principal components to construct a managedness index. We also used this method to construct an in-network benefits index and an out-of-network benefits index.

Managedness Index. We constructed a managedness index (MI) measuring the “managedness” of the 189 product lines. The MI was calculated from the five variables in Table 1 that measured constraints and incentives in the three provider domains: financial incentives, network characteristics, and utilization management. The variables were created through content analysis of information describing each product line. Descriptive statistics were computed for the variables in each domain.

Next, we constructed a summary index for each of the three domains. The first domain, financial incentives, consisted of a single item (fee-for-service versus capitated) and was self-representing. For the second domain, network characteristics, we took the first principal component of enrollee lock-in and gatekeeping.^{4,5} The summary index of the third domain, utilization management, was the first principal component of product authorization and physician authorization. All three indexes were calculated at the product-line level. For each principal component analysis we checked to make sure that the individual variables were correlated in the appropriate way with the principal

component, and we examined the relationships among the individual items and the indexes. After constructing the domain indexes, we calculated an overall summary "managedness index" (MI) as the first principal component of the three indexes (financial, network, utilization management), which indicates the intensity of the managed care, or "managedness," of the product line. Finally, we re-scaled the managedness index so that the lowest possible value was zero and the highest possible value was 100.

Benefits Indexes. We developed two benefit indexes, an in-network benefit index measuring coverage for services delivered by providers inside the plan's provider network and an out-of-network benefit index measuring coverage for services delivered by providers outside the plan's network. Benefits were defined operationally by the 14 different benefit categories listed in Table 2. Each product's coverage of health services was measured by the different copayments and coinsurance rates of its 14 benefit categories, as well as individual deductibles and visit maximums, if present. Coders abstracted the in-network and out-of-network coverage variables for each of the 755 products in the study's database.⁶

Each benefit index was constructed through the following steps. First, each benefit category was assigned a "standard charge" (first column of Table 2), based on average charges for common services in the category for a large percentage of state employees in Washington state in 1998. Second, for each category we calculated the out-of-pocket cost that a patient with a particular product would have to pay for each of the 14 different benefit categories. For example, for "office visits" we set the cost at \$35. A person with 10 percent coinsurance would pay \$3.50 out-of-pocket, a person with a \$5 copayment would pay \$5 out-of-pocket, and a person with both would pay \$8.50 out-of-pocket. A person using a product that did not cover office visits would have an out-of-pocket cost of \$35. A separate value was calculated for services in and outside the network, since the benefits were often different. The average in-network standardized cost, averaged across the 755 products, is shown in the second column of Table 2. For instance, the average product had an out-of-pocket cost of \$9.20 for a standard office visit. The mean out-of-network costs are shown in the third column. The 15th measure in Table 2 is the amount of the individual deductible, and we used the actual yearly amount to calculate the average individual yearly deductible of the 755 products.

Third, to construct the indexes, we calculated the first principal component of the 15 in-network costs and the first principal component of the 15 out-of-network costs. Next, we changed the signs of the in-network and out-of-network standard patient costs, which transformed them into benefit

Table 2: Standard Charges for Calculating the Benefit Indexes

<i>Benefit Category</i>	<i>Standard Charge for Service</i>	<i>Mean Out-of-Pocket Cost Inside Network</i>	<i>Mean Out-of-Pocket Cost Outside Network</i>
1. Standard office visit	\$35	\$9.20	\$22.06
2. Diagnostic tests	\$45	\$3.94	\$25.29
3. Outpatient prescription drugs	\$100	\$8.37	\$74.10
4. Outpatient rehabilitation	\$45	\$10.30	\$27.64
5. Outpatient mental health	\$100	\$38.59	\$69.08
6. Outpatient surgery: physician	\$600	\$44.87	\$328.36
7. Outpatient surgery facility	\$1300	\$108.19	\$734.21
8. Outpatient chemical dependency	\$50	\$11.67	\$31.57
9. Inpatient hospital: physician	\$700	\$52.71	\$387.92
10. Inpatient hospital: facility	\$4000	\$329.36	\$2246.88
11. Inpatient mental health	\$2000	\$498.25	\$1271.79
12. Inpatient chemical dependency	\$2500	\$398.44	\$1542.96
13. Emergency room	\$150	\$55.79	\$71.06
14. Medical durable equipment	\$100	\$27.11	\$61.49
15. Individual deductible	—	\$231.78	\$271.01

indexes measuring the costs covered by the plan. Fifth, the in-network and out-of-network benefit indexes were re-scaled to have a minimum value of zero (e.g., a person with no insurance would pay the full standard charge for every item) and a maximum value of 100 (e.g., a person would pay nothing for any of the 14 benefits). Finally, to simplify the methods and reduce the burden of data collection in future studies, we used regression to calculate estimates of the two indexes based on a subset of the original 14 benefit categories.

We computed descriptive statistics and correlations of the provider-oriented health plan variables and indexes at the product line and product levels. Similar calculations were performed for the benefit indexes at the product level.

Validation

Managedness Index. To determine the content validity of the managedness index, we asked a panel of eight health insurance experts to rate the managedness of product lines in the Seattle market. The panel was composed of insurance brokers and consultants, managers for health insurance purchasers, physician network managers, former senior executives of integrated delivery systems, and a representative from the Office of the Insurance Commissioner. Panel members were asked to rate the managedness of 18 product lines on a scale of 1 to 7, where 1 represented “not managed,” 4 indicated “managed,”

and 7 represented "very managed," based on their own definition of managed care. The product lines, selected to be reasonably well known, consisted of three fee-for-service plans (including Medicare), three preferred provider organizations, five point-of-service plans, and seven health maintenance organizations. After their initial rating of each plan, we presented panelists with the study's definition of managed care, and then asked them to rate the 18 plans again with this definition in mind. We averaged the two scores for each panelist and calculated the median of the average scores for each plan. Finally, we compared the median expert rating with the MI score for each plan.

Construct validity was assessed by examining the correlations among the indexes. We expected the MI to be correlated positively with its three domain indexes. We expected that the MI would be correlated positively with the in-network benefits index and negatively with the out-of-network benefit index. We thought that the correlation between the two benefit indexes would depend on the mix of managed health plans, because we expected the two indexes to be correlated negatively in highly managed plans and correlated positively in less managed plans.

In addition, we examined the relationship between patient MI scores and attitudes of the patients about their health plan. At the one-month follow-up, patients ($n = 2,034$ respondents with baseline and follow-up information) were asked whether (or not) they thought their health plan interfered with their choice of specialist, whether it was easy (or difficult) getting approval from their health insurance to see a specialist, and whether (or not) their health insurance covered the kinds of specialists they wanted to see. We expected that the percentage of patients who agreed or disagreed with these statements would be correlated with the MI scores of their health plans.

Benefits Indexes. The benefits indexes were examined to see if products known to have higher benefits also had higher index values. We also asked patients whether they thought their out-of-pocket cost for seeing specialists was too high, and we expected that patients with fewer benefits (smaller benefit indexes) would agree with this statement more than other patients.

Index Associations with Patient Characteristics

Because patients are not distributed randomly across health plans, we expected that patient characteristics would be associated with the health plan indexes. ANOVA was used to determine whether the mean values of the indexes were associated with patients' age, gender, race, marital status, education, annual household income, and health status at the waiting room screen. Patient-reported health status measures included self-rated health

(excellent, very good, good, fair, poor), number of comorbidities, and the 20-item Symptom Checklist (SCL) for depression (Derogatis et al. 1974). Patient comorbidities were counted from a checklist of 20 conditions based on a similar instrument from the Medical Outcomes Study (Wells, Rogers, Burnam, et al. 1991). We used the standard form of the Symptom Checklist for depression, where patients with an average score of 1.75 or higher were defined as severely depressed (Goldberg, Wagner, Fihn, et al. 1998).

RESULTS

Managedness Index

Descriptive statistics and correlations of the provider-oriented health plan variables are presented in Table 3. The gatekeeping, product referral authorization, and physician referral authorization variables exhibit the greatest variation. Correlations at the product line and product levels are similar. Strong, positive correlations (.64 to .88) exist among capitation financing, gatekeeping, and enrollee lock-in. A similar pattern exists for physician referral authorization, but the correlations are slightly smaller. Product referral authorization has correlations between .25 and .50 with other variables.

We used the five variables in Table 3 to create three subindexes (financial, utilization management, and network) and then created a summary index of these three, which is called the managedness index (MI). Each index is described below.

Financial Incentives Index (FII). This index had only one variable, whether the plan was at financial risk and paid delivery organizations through some form of fee-for-service reimbursement, or if the plan instead shifted financial risk to providers through capitation payment (high values indicate more managed plans). About 62 percent of the product lines had capitation financing.

Utilization Management Index (UMI). We performed a principal component analysis on two variables: physician authorization required, and product authorization required. These variables were positively correlated ($r = .50$ at the product-line level). The first principal component accounted for 75 percent of the variance, and was positively correlated with both variables ($r = .87$). The index has mean zero and standard deviation 1, and can be calculated from the following equation (high values indicate more managed plans):

Table 3: Means, Standard Deviations, and Correlations of the Managedness Variables at the Product-line and Product Levels

<i>PRODUCT-LINE RESULTS</i>			
<i>DESCRIPTIVE STATISTICS</i> (n = 189 product lines)			
	<i>Mean</i>	<i>s.d.</i>	<i>Coefficient of Variation</i>
FFS/Capitation	1.49	0.50	0.34
Lock-in	1.09	0.68	0.62
Gatekeeping	0.76	0.84	1.11
Product authorization	0.19	0.45	2.37
Physician authorization	0.57	0.59	1.04

<i>PEARSON CORRELATIONS</i>				
	<i>Lock-in</i>	<i>Gatekeeping</i>	<i>Physician Authorization</i>	<i>Product Authorization</i>
FFS/Capitation	0.64	0.88	0.79	0.29
Lock-in		0.80	0.56	0.35
Gatekeeping			0.77	0.43
Physician authorization				0.50

<i>PRODUCT RESULTS</i>			
<i>DESCRIPTIVE STATISTICS</i> (n = 755 products)			
	<i>Mean</i>	<i>s.d.</i>	<i>Coefficient of Variation</i>
FFS/Capitation	1.56	0.50	0.32
Lock-in	1.24	0.65	0.52
Gatekeeping	0.94	0.87	0.93
Product authorization	0.27	0.63	2.33
Physician authorization	0.75	0.69	0.92

<i>PEARSON CORRELATIONS</i>				
	<i>Lock-in</i>	<i>Gatekeeping</i>	<i>Physician Authorization</i>	<i>Product Authorization</i>
FFS/Capitation	0.65	0.87	0.80	0.25
Lock-in		0.83	0.63	0.36
Gatekeeping			0.82	0.42
Physician authorization				0.46

$$UMI = -.80 + .98 (\textit{Physician Authorization}) + 1.30 (\textit{Product Authorization})$$

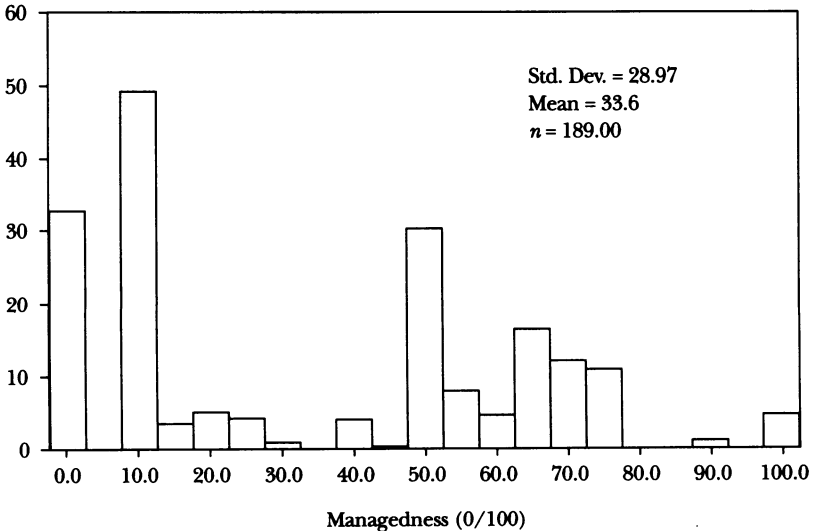
The coefficients are slightly different because the standard deviation of the former variable is larger than the standard deviation of the latter.

Network Index (NI). We constructed the network index from the gatekeeping and lock-in variables, which were correlated positively ($r = .80$). The first principal component of the two items accounted for 90 percent of the variability and was correlated positively with both variables ($r = .95$). It is thus a measure of the “tightness” of the network, with a higher value indicating a more managed network. The network index, which has mean zero and standard deviation 1, can be calculated using the following equation:

$$NI = -1.32 + .63 (\textit{Gatekeeping}) + .77 (\textit{Lock-in})$$

Managedness Index (MI). To obtain a single index of managedness, we calculated the first principal component of the financial, network, and utilization management indexes at the product-line level. The first principal component accounted for 79 percent of the variability. Figure 1 shows the distribution of the managedness index.

Figure 1: Managedness Index (Product-line Level)



We also computed a first principal component of the five measures used to construct the three original indexes, which accounted for 69 percent of the variation in the five measures. This principal component was correlated .998 with the managedness index. Thus, it did not matter which way we computed the index; we chose the former method, which gave equal importance to each domain rather than to each variable. The managedness index, based on the three network indexes, was re-scaled so that zero is the lowest possible managedness and 100 is the highest possible managedness. MI can be calculated from either of the following equations:

$$MI = -106.26 + 22.14 (FII) + 0.56 (NI) + 0.51 (UMI)$$

or as:

$$MI = -22.14 + 22.14 (Fee-for-Service/Capitation) + 7.01 (Gatekeeping) + 8.64 (Lock-in) + 3.27 (Product Authorization) + 10.01 (Physician Authorization)$$

Thus, a plan with capitation and strict gatekeeping, lock-in provisions, product authorization, and referral authorization would have a score of 100, and a plan with none of these features would have a score of 0.

Benefits Index

We created an in-network and out-of-network benefit index for each insurance product. The mean of the 15 variables used to calculate the in-network benefits index (BENIN) are shown in the second column of Table 2. The first principal component of the 614 products with complete data (81 percent of 755 products) accounted for 39 percent of the variability in the 15 variables. We used forward regression to predict the principal component from the five variables that were most frequently known. The regression accounted for 87 percent of the variation in the principal component, and the resulting index could be computed for 747 of the products. The resulting in-network index (where 0 is the lowest possible and 100 is the highest possible) is calculated as follows:

$$BENIN = 100 - .65 (Diagnostic Test) - .01 (Inpatient Hospital Facility Charge) - .28 (Standard Office Visit) - .12 (Outpatient Mental Health Visit) - .09 (Brand Name Prescription Drugs)$$

For example, a product with full benefits on these items would have the standard charge of each item as \$0, and BENIN = 100; if the product had no

coverage, the items would have standard charges of \$45, \$4,000, \$35, \$100, and \$100, respectively, and BENIN would be 0.

We performed a similar analysis for out-of-network benefits (BENOUT). The first principal component accounted for 69 percent of the total variation in the 15 measures, and the regression based on five variables accounted for 98 percent of the variation in the principal component. The resulting equation is:

$$BENOUT = 100 - .33 (\text{Diagnostic Tests}) - .01 (\text{Inpatient Hospital Facility Charge}) - .42 (\text{Standard Office Visit}) - .22 (\text{Outpatient Mental Health Visit}) - .06 (\text{Brand Name Prescription Drugs})$$

The distributions of the two benefit indexes are shown in Figures 2 and 3.

Index Correlations

Correlations among the three subindexes (financial, network, and utilization management) and the MI are presented in Table 4. Among the provider-oriented indexes, the network index is correlated highly with the financial

Figure 2: In-Network Benefits Index (Product Level)

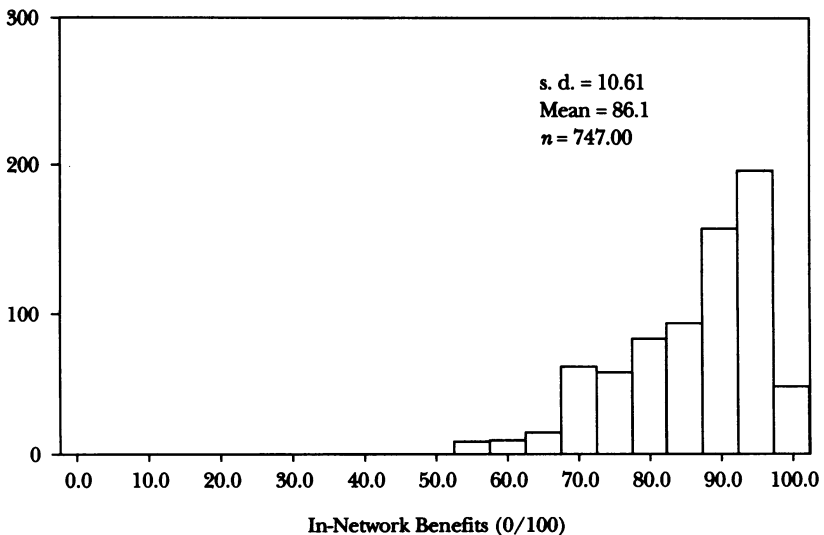


Figure 3: Out-of-Network Benefits Index (Product Level)

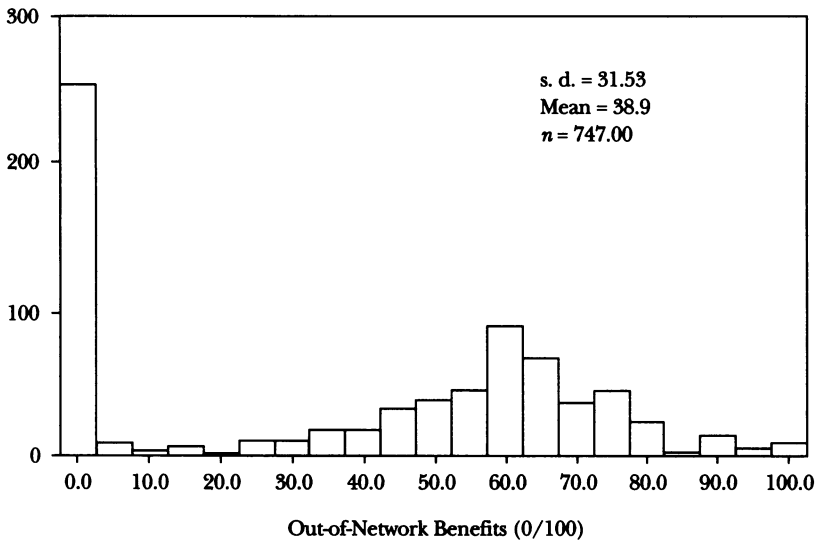


Table 4: Pearson Correlations Among the Six Indexes ($n = 755$ Products)

	<i>Network</i>	<i>Utilization Management</i>	<i>Managedness</i>	<i>In-Network Benefits</i>	<i>Out-of-Network Benefits</i>
Financial incentives	0.80	0.58	0.88	0.40	-0.51
Network		0.67	0.92	0.29	-0.83
Utilization management			0.86	0.02	-0.54
Managedness				0.25	-0.70
In-Network benefits					0.05

$p < .000$ for all correlations, except .02 ($p = .64$) and .05 ($p = .20$); $p = 755$ products.

incentive and utilization management indexes ($r > .67$), while financial incentives and utilization management are correlated moderately. As expected, the MI is correlated positively with the three subindexes.

The correlation between the in-network and out-of-network benefit indexes is small but positive. The MI is correlated positively with in-network benefits: more managed plans offer more in-network benefits. The MI is correlated negatively with out-of-network benefits: more managed plans offer

lower out-of-network benefits. The financial incentives, utilization management, and network indexes generally have a similar pattern of correlations.

Index Validation

Validation of the Managedness Index. The index has construct validity because it is correlated in the expected direction with all of the original variables. Table 5 shows the correlation of the five original, provider-oriented measures with the four indexes derived from them; all of the correlations are consistent.

Construct validity is demonstrated in Table 6, which shows the average MI score by product type. HMOs had the highest MI score, POS and PPO products scored second and third highest, respectively, and fee-for-service plans had the lowest MI score. The low standard errors, which are tabled, show that the differences are statistically significant.

In addition, we obtained ratings from local experts on 18 product lines. Their median ratings are plotted against the managedness index for the 18 product lines, as shown in Figure 4. There is a strong association between the two rating methods ($r = .75$). Thus, the managedness index has content validity.

As a final method of assessing the validity of the indexes, we examined patient responses to four questions about their health insurance (see Table 7). As expected, people who thought their health insurance interfered with their choice of specialists tended to be in more managed plans. Similarly, people in more managed plans also tended to report that it was not easy getting approval from their health insurance firm to see specialists, and their health insurance did not cover the kinds of specialists they wanted to see. People in less managed plans thought their out-of-pocket cost for seeing specialists was

Table 5: Correlations of Managedness Variables and Indexes
($n = 755$ Products)

	<i>Financial Incentives Index</i>	<i>Network Index</i>	<i>Utilization Management Index</i>	<i>Managedness Index</i>
FFS/Capitation	1.00	0.80	0.58	0.88
Lock-in	0.65	0.95	0.57	0.81
Gatekeeping	0.87	0.96	0.71	0.95
Product authorization	0.25	0.41	0.88	0.61
Physician authorization	0.80	0.76	0.83	0.90

All correlations are significant ($p = .0000$).

Table 6: Mean Index Scores by Product Type ($n = 755$ Products)

<i>Product Type</i>	<i>Managedness Index (Std. Error)</i>	<i>In-Network Benefits Index (Std. Error)</i>	<i>Out-of-Network Benefits Index (Std. Error)</i>
Health maintenance organization (HMO) ($n = 258$)	75 (0.90)	89 (0.56)	2 (0.74)
Point-of-service plan (POS) ($n = 181$)	48 (0.72)	89 (0.63)	58 (1.06)
Preferred provider organization (PPO) ($n = 226$)	11 (0.65)	82 (0.71)	52 (1.25)
Fee-for-service reimbursement (FFS) ($n = 90$)	2 (0.68)	80 (1.39)	74 (2.24)
Total products	41 (1.14)	86 (0.39)	39 (1.15)

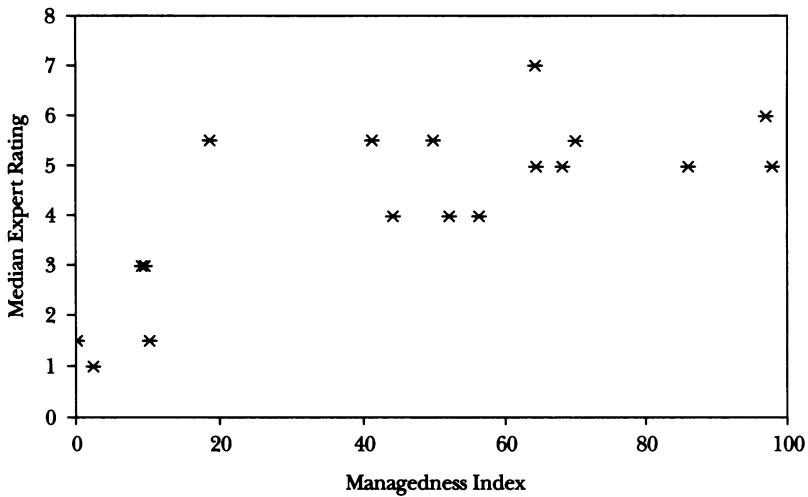
too high, probably because cost-sharing is greater in less managed plans (see Table 4). These consistent findings provide concurrent validity to the MI.

Validation of Benefits Indexes. Table 6 shows that in-network benefits varied with product type, with HMO and POS products having higher benefits than FFS or PPO products. This relationship was reversed for out-of-network benefits, however, with HMO products having an extremely low benefits score. These relationships are in the expected directions.

Table 7 presents evidence supporting the concurrent validity of the in-network benefits index. As expected, people who thought their out-of-pocket cost for seeing specialists was too high tended to have lower in-network benefits than people who thought otherwise. However, an unexpected, opposite relationship was found for the out-of-network benefits index: people with higher out-of-network benefits also thought their cost for specialists was too high.

We also found that patients with slightly more in-network benefits and much lower out-of-network benefits thought their health insurance interfered with their choice of specialists. These associations probably exist because more managed plans have greater in-network benefits and lower out-of-network benefits (see Table 4). In addition, patients who reported that it was easy getting approval from their health insurance to see specialists tended to have lower in-network benefits, perhaps because less managed plans tend to have lower in-network benefits. Finally, we also found that patients who thought their health insurance covered the kinds of specialists they wanted to see tended to have greater out-of-network benefits.

Figure 4: Managedness Index Versus Expert Ratings



Index Association with Patient Characteristics

For patients with baseline and follow-up data ($n = 2,034$), the average age of consenting patients was 46 years. About 66 percent of the patients were female, 90 percent were white, 35 percent were single, 22 percent had a high school education or less, and 21 percent had an annual household income below \$20,000. Patients averaged 2.8 comorbidities, 19 percent rated their health as fair or poor, and 20 percent of the patients had severe depression.

Table 8 presents the association between selected patient characteristics and the health plan indexes. Managedness of health plans was higher for people who were younger, married or living with a partner, and more educated, as well as for people who had higher incomes, one or two comorbidities, and better self-rated health. People with severe depression tended to be in less-managed plans ($p = .07$). Thus, there is some evidence that more intensely managed plans have a favorable, or more healthy, mix of patients than less-managed plans.

Reviewing the benefit indexes, people who were over age 65 or single, or who had more symptoms of depression, tended to have slightly lower in-network benefits. To check whether these associations could be attributed

Table 7: Association Between Patients’ Attitudes About Their Health Plans and the Managedness and Benefit Indexes of Their Health Plans

<i>Patient Statement</i>	<i>Mean Managedness Index</i>	<i>Mean In-Network Benefits Index</i>	<i>Mean Out-of-Network Benefits Index</i>
My health insurance interferes with my choice of specialists			
Patients who agree	47**	90**	38**
Patients who disagree	30	88	47
It is easy getting approval from my health insurance to see specialists			
Patients who agree	36**	89**	43
Patients who disagree	45	91	40
My health insurance covers the kinds of specialists that I want to see			
Patients who agree	37**	89	43*
Patients who disagree	44	89	38
My out-of-pocket cost for seeing specialists is too high			
Patients who agree	34**	87**	47**
Patients who disagree	40	90	40

* $p < .05$; ** $p < .01$.

Note: Excludes patients with “don’t know” responses and patients with no insurance.

to Medicare patients, we repeated the analysis with adults under age 65 ($n = 1,700$), and the same results were obtained, with the exception of age (as expected).

A different pattern is observed for out-of-network benefits: people who had less education, lower incomes, and health self-rated as fair or poor tended to have higher out-of-network benefits. These associations may reflect the influence of the Medicaid program, which covers people who have low incomes. Because most licensed providers can participate in the standard fee-for-service Medicaid program in Washington state, the in-network and out-of-network benefits for the fee-for-service Medicaid plan had high levels of covered benefits. However, when we repeated the analyses without the Medicaid patients, the same results were obtained, except that income was no longer significant (as expected) and the significance of self-rated health declined ($p = .06$).

Table 8: Association Between Patient Characteristics and Health Plan Indexes ($n = 1,660$)

<i>Patient Characteristic</i>	<i>Mean Managedness Index</i>	<i>Mean In-Network Benefits Index</i>	<i>Mean Out-of-Network Benefits Index</i>
<i>Age</i>			
18-39	39*	88**	42
40-64	37	89	44
65 and over	33	86	42
<i>Gender</i>			
Female	37	88	43
Male	37	88	44
<i>Race</i>			
White	37	88	43
Nonwhite	38	90	42
<i>Marital Status</i>			
Married/Living with partner	38*	89**	42
Single	35	87	45
<i>Years of Education</i>			
12 years or less	32**	88	48**
13 years or more	38	88	41
<i>Annual Household Income</i>			
Less than \$20,000	32**	87	47*
\$200,000 or more	39	88	42
<i>Number of Comorbidities at Waiting Room Screen</i>			
None	36**	88	45
1 or 2	39	88	42
3 or more	35	87	44
<i>Self-Rated Health at Waiting Room Screen</i>			
Excellent, very good, or good	38**	88	42**
Fair or poor	31	89	50
<i>Symptom Checklist Depression Score at Waiting Room Screen</i>			
Below severe depression cut-point	37	88*	43
At or above severe depression cut-point	34	86	45

* $p < .05$; ** $p < .01$.

DISCUSSION

Our findings indicate that indexes of the managedness and covered benefits of health plans can be constructed from public information. Created through

principal component analysis, the managedness index, the in-network benefit index, and the out-of-network benefit index range between 0 and 100, and the evidence supports their validity. To aid interpretation in policy analyses that examine the influence of managed health plans on satisfaction and on the utilization, cost, and outcomes of care, investigators may calculate “health plan elasticities”—or the percent change in utilization, for example, for a 10 percent increase in the managedness index or a benefit index. Alternatively, elasticities for the financial, utilization management, and network indexes also can be estimated.

We found that the provider-oriented indexes (financial incentives, network characteristics, utilization management, and managed care) were correlated positively. We also found that the managedness index was correlated positively with the in-network benefit index and negatively with the out-of-network benefits. This pattern indicates that health plans with high MI scores (such as HMOs) typically rely on provider constraints and incentives to control utilization, and then encourage enrollees to see those providers by offering more in-network benefits and fewer out-of-network benefits. Plans with low MI scores do the opposite; they typically contain fewer provider constraints and incentives but rely on cost-sharing (deductibles, copayments, coinsurance rates), benefit restrictions, and other mechanisms to control utilization. Given the interrelated provider and benefit controls in more managed plans, plus evidence that more highly managed plans have healthier patients than less-managed plans, we might expect lower utilization and costs in the plans managed more intensely than in the less-managed plans.

The measures were constructed from information that is available from most health plans. Clearly, other measures of the managedness of health plans also exist, such as whether or not a plan regularly monitors physician referrals and notifies physicians with the highest referral rates, or the number of primary care physicians in the plan’s network. However, collecting these measures increases the cost of data collection, and some plans may refuse to release this information, even with the promise of confidentiality, or (as we discovered), they may not have the capacity to extract the information from their databases, or they may not even have the information themselves.

The managedness index has a number of applications. The measure is well suited for studies where a sample or population of individuals have several types of health plans (FFS, PPO, POS, HMO) from a variety of insurance firms, and the goal is to estimate plan effects on utilization, cost, health outcomes, or satisfaction. In a single market, the indexes can be used to rank the managedness of product lines and products, which may be useful

information for those making choices among plan options—for either employers who shop for plans or their employees who enroll in them. National employers and their employees, as well as Medicare and its beneficiaries, could use the measures to make standardized comparisons of managed care plans both within and across markets on a nationwide scale (Pruter 1997). Once plan choices are made, the MI index may be useful for examining the influence of managed care on the process and outcomes of care among patients in a variety of plans. In future work, given that the indexes are correlated with patient health status and personal characteristics, we will use the indexes to examine whether selection bias from prior choice of health plan influences utilization and health outcomes.

Other researchers may wish to use the indexes in their own studies. To create the three indexes, an investigator must identify the firm or agency offering each health plan, collect the plan information from each source, code the health plan variables through content analysis of plan information, and enter the variables into a computer database. In general, as the number of product lines and products in the study increases, so will the amount of resources required to complete the study, and investigators should budget resources and time accordingly. Our study was a major undertaking, and future studies of this size should not be entered into lightly.

Our findings are based on a single market in the Pacific Northwest, and the generalizability of the indexes to other places is unknown. The managedness index is based primarily on a mixture of local and national commercial plans, self-insured plans offered by employers, and public plans. If these plans generally manage provider utilization and costs in similar ways, the managedness index may be generalizable to other places. The benefits indexes may be applied as well if charges and copayments in other markets are similar to the ones we used.⁷

Finally, our study has some limitations. Our findings apply mainly to ambulatory settings and do not capture constraints and incentives for inpatient and long-term care. Further, although information about selected inpatient constraints and incentives is publicly available for many plans, the evidence in our market indicates that these measures exhibit little variation and, therefore, that they may be less useful than more varied measures are for studying plan behavior. Finally, in the future, health plans may impose new and important constraints and incentives on providers that are not correlated with our managedness indexes. The indexes can be modified to incorporate such developments if and when they arise.

ACKNOWLEDGMENTS

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NOTES

1. This quotation is from an administrator of United HealthCare upon the company's introduction of a new managed plan, as cited in the December 11, 1996 issue of *American Healthline*. E-mail address: ahl@apn.com.
2. We could not assign a product line and product to 573 patients for the following reasons: (1) the health plan was actually a provider network and, therefore, the firm at financial risk was unknown ($n = 45$; 8 percent of 573); (2) the self-insured employer did not provide plan information to study ($n = 44$; 8 percent); (3) the national health plan did not provide information to the study ($n = 183$; 32 percent); (4) the employee union did not provide plan information to the study ($n = 26$; 5 percent); and (5) information was insufficient for product-line and product identification ($n = 275$; 48 percent). A majority of the patients in the last category did not complete one or more follow-ups. Because many of these patients are excluded in longitudinal analyses, we collected health insurance information less intensively for those patients.
3. A fourth provider-oriented domain, clinical guidelines and pathways, often exists in group practices to promote clinical decision making using evidence-based criteria to improve the quality of care (Grembowski et al. 1998). Because guidelines and pathways operate mainly at the clinic level, they were excluded from the health plan indexes.
4. A key feature of a network that is not included explicitly is its size (i.e., the number of participating providers). We did not include this variable in the index for several reasons. First, it was not clear how to define it. If we used a count of physicians who would be paid by a particular plan, then fee-for-service plans would not have an upper bound. If we restricted the count of providers to the geographic area covered by the study, that would allow us to count the number of fee-for-service physicians, but then we would need to restrict the managed care providers in the same way. This would lead to several unappealing consequences. One is that the MI for a fee-for-service plan would change depending on the size of the geographic area of interest, and that would severely restrict generalizability. The second reason for excluding size is that a plan with a large number of physicians, but with few in the geographic area of interest, would be characterized as a plan with a small network. Although this network might indeed be small from the patient's perspective, it would not be small for the plan that manages it, and it does not seem reasonable that the MI should depend on a catchment area

chosen by the researchers. Finally, information about the number of physicians in the study's geographic area, by plan, was difficult to obtain. We did obtain this information for a subset of the plans, and created some indexes using this information. Specifically, we included the logarithm of the number of physicians in the catchment area in this version of the network index. This network index was highly correlated (.98) with an index that did not use size of network as one of its components. For these reasons, we decided to calculate the network index based solely on the gatekeeping and lock-in information.

5. We considered creating an index that included whether or not the network had a mental health carve-out. However, when we included mental health carve-out in the principal component analysis, it did not load very highly on the first principal component ($r = .49$, compared to over .80 for the other variables), and index scores with and without the mental health carve-out were almost identical. Therefore, we did not include it in our network index.
6. Instructions for collecting and coding the health insurance information are available from the senior author upon request.
7. To calculate the benefits indexes for a new product, a researcher would need to identify the benefits of the five benefit categories; determine how much a person in that plan would have to pay, based on the standardized charges in Table 2; and then insert those out-of-pocket costs into the benefit equations to obtain the benefits scores. There could be a problem with this approach if the charges and copayments in another market were much higher than the standard charges that we used. The problem is that the relative influence of the copayments might become too high. For example, if copayments for office visits were ten times higher in another market, a product with a \$5 copayment in our market would have a \$50 copayment in the other market. If the \$35 standard charge for an office visit were used, this product would have no coverage for office visits, since the person would have to pay \$50 for the \$35 office visit. Thus, direct application of our method would not be appropriate if charges and copayments were substantially different, on average, than in our study.

Short of repeating the study, we recommend the following steps. If the average charges are similar to ours, the benefit equations can be used to calculate the product benefit scores. Otherwise, if the average charges are X times larger than those we used, divide each product's copayment by X before calculating the charge of the standard visit for that product. In the example, the \$50 copayment would be divided by 10, giving a \$5 copayment, which would be appropriate for the \$35 standard office charge.

REFERENCES

- American Public Health Association. 1996. *The Nation's Health*. APHA Policy Paper, pp. 12-13. Washington, DC: APHA. October.
- Broyles, R. W., and M. D. Rosko. 1988. "The Demand for Health Insurance and Health Care: A Review of the Empirical Literature." *Medical Care Review* 45 (2): 291-338.

- Derogatis, L. R., K. Rickels, E. H. Uhlenhuth, and L. Covi. 1974. "The Hopkins Symptom Checklist: A Measure of Primary Symptom Dimensions." In *Psychological Measurements in Psychopharmacology: Problems in Pharmacopsychiatry*, edited by P. Pichot, pp. 79–110. Basel, Switzerland: Kargerman.
- Dudley, R. A., R. H. Miller, T. Y. Korenbrot, and H. S. Luft. 1998. "The Impact of Financial Incentives on Quality of Health Care." *Milbank Quarterly* 76 (4): 649–86.
- Fraser, I. 1997. "Introduction: Research on Health Care Organizations and Markets, the Best and Worst of Times." *Health Services Research* 32 (5): 669–78.
- Gabel J., H. Whitmore, C. Bergsten, and L. P. Grimm. 1997. "Growing Diversification in HMOs, 1988–1994." *Medical Care Research and Review* 54 (1): 101–17.
- Gold, M., and R. Hurley. 1997. "The Role of Managed Care 'Products' in Managed Care 'Plans.'" *Inquiry* 34 (Spring): 29–37.
- Gold, M., R. Hurley, T. Lake, T. Ensor, and R. Berenson. 1995. "A National Survey of the Arrangements Managed Care Plans Make with Physicians." *The New England Journal of Medicine* 333 (25): 1678–83.
- Gold, M., L. Nelson, T. Lake, R. Hurley, and R. Berenson. 1995. "Behind the Curve: A Critical Assessment of How Little Is Known About Arrangements Between Managed Care Plans and Physicians." *Medical Care Research and Review* 52 (3): 307–41.
- Goldberg, H. I., E. H. Wagner, S. D. Fihn, and D. P. Martin. 1998. "A Randomized Controlled Trial of CQI Teams and Academic Detailing: Can They Alter Compliance with Guidelines?" *Joint Commission Journal on Quality Improvement* 24 (3): 130–42.
- Grembowski, D. E., K. Cook, D. L. Patrick, and A. E. Roussel. 1998. "Managed Care and Physician Referral." *Medical Care Research and Review* 55 (1): 3–31.
- Hellinger, F. J. 1996. "The Impact of Financial Incentives on Physician Behavior in Managed Care Plans: A Review of the Evidence." *Medical Care Research and Review* 53 (3): 294–314.
- Hibbard, J. H., and J. J. Jewett. 1997. "Will Quality Report Cards Help Consumers?" *Health Affairs* 16 (3): 218–28.
- Hibbard, J. H., S. Sofaer, and J. J. Jewett. 1996. "Condition-specific Performance Information: Assessing Salience, Comprehension and Approaches for Communicating Quality." *Health Care Financing Review* 18 (1): 95–109.
- Hillman, A. L., M. V. Pauly, and J. J. Kerstein. 1989. "How Do Financial Incentives Affect Physicians, Clinical Decisions and the Financial Performance of Health Maintenance Organizations?" *The New England Journal of Medicine* 321 (2): 86–92.
- Iglehart, J. K. 1992. "The American Health Care System: Managed Care." *The New England Journal of Medicine* 327 (10): 742–47.
- Isaacs, S. L. 1996. "Consumers' Information Needs: Results of a National Survey." *Health Affairs* 15 (4): 31–41.
- Johnson, R. W., and S. Crystal. 1997. "Insurance Coverage at Midlife: Characteristics, Costs and Dynamics." *Health Care Financing Review* 18 (3): 123–47.
- Kerr, E. A., B. S. Mittman, and R. D. Hays. 1995. "Managed Care and Capitation in

- California: How Do Physicians at Financial Risk Control Their Own Utilization?" *Annals of Internal Medicine* 123 (7): 500–504.
- Kleinbaum, D. G., L. L. Kupper, K. E. Muller, and A. Nizam. 1998. *Applied Regression Analysis and Other Multivariable Methods*. Pacific Grove, CA: Duxberry Press.
- Kwon, S. 1996. "Structure of Financial Incentive Systems for Providers in Managed Care Plans." *Medical Care Research and Review* 53 (2): 149–61.
- Miller, F. H. 1988. "Vertical Restraints and Powerful Health Insurers: Exclusionary Conduct Masquerading as Managed Care?" *Law and Contemporary Problems* 51 (1): 195–236.
- Miller, R. H., and H. S. Luft. 1997. "Does Managed Care Lead to Better or Worse Quality of Care?" *Health Affairs* 16 (5): 7–25.
- . 1994. "Managed Care Plan Performance Since 1980: A Literature Analysis." *Journal of the American Medical Association* 271 (19): 1512–19.
- Miller, T. E. 1997. "Managed Care Regulation in the Laboratory of the States." *Journal of the American Medical Association* 278 (13): 1102–109.
- Physician Payment Review Commission. 1995a. *1995 Annual Report to Congress*. Washington, DC.
- . 1995b. "Arrangements Between Managed Care Plans and Physicians: Results from a 1994 Survey of Managed Care Plans." Selected External Research Series, No. 3. Washington, DC.
- Pruter, R. 1997. "Today's Benefits Communication Packages Exhibit Wide Variety and Comprehensiveness." *Employee Benefit Plan Review* 52 (2): 18–24.
- Schoen, C. A., and P. Davidson. 1996. "Image and Reality: Managed-Care Experiences by Type of Plan." *Bulletin of the New York Academy of Medicine* 73 (winter, Supplement): 506–31.
- Shortell, S. M., and E. F. X. Hughes. 1988. "The Effects of Regulation, Competition, and Ownership on Mortality Rates Among Hospital Inpatients." *The New England Journal of Medicine* 318 (17): 1100–107.
- Shortell, S. M., M. A. Morrisey, and D. A. Conrad. 1985. "Economic Regulation and Hospital Behavior: The Effects on Medical Staff Organization and Hospital-Physician Relationships." *Health Services Research* 20 (5): 597–628.
- Weiner, J. P., and G. deLissovoy. 1993. "Razing the Tower of Babel: Taxonomy for Managed Care and Health Insurance Plans." *Journal of Health Politics, Policy and Law* 18 (1): 75–103.
- Wells, K. B., W. Rogers, M. A. Burnam, S. Greenfield, and J. E. Ware, Jr. 1991. "How the Medical Comorbidity of Depressed Patients Differs Across Health Care Settings: Results from the Medical Outcomes Study." *American Journal of Psychiatry* 148 (12): 1688–96.
- Winslow, R. 1998. "Health-Care Inflation Kept in Check Last Year." *Wall Street Journal* (20 January): B1, B4.