Producing disease-based price indexes

Using a total-expenditure scope and adjusting for utilizations under a treatment concept for measuring health care costs slows down the rate of growth of medical prices; the downside is that most of the saving is seen in insurance benefit payments and not in out-of-pocket payments or lower insurance premiums for consumers

Ralph Bradley,
Elaine Cardenas,
Daniel H. Ginsburg,
Lyubov Rozental,
and
Frankie Velez

There are two basic ways of measuring health care costs. The first, labeled the "goods-and-services" concept, measures the cost of each medical good and service separately. The second, called the "treatment concept," measures the cost of all the goods and services used to treat a particular disease. With an eye toward improving the accuracy of the Consumer Price Index (CPI), the National Academies' Committee on National Statistics (CNSTAT) recommends the latter approach. In pursuit of satisfying the CNSTAT recommendation, this article compares these two concepts as they apply to constructing price indexes for medical care. The article does not select which concept is best: each approach provides different information. The first measures the contribution of each medical input to total health care inflation, whereas the second indicates how each disease influences health care inflation.

Ideally, what is sought to be measured is the cost of the healing that is derived from using medical goods and services. However, the amount of healing derived from a service cannot be directly measured; instead, only what is readily observable, such as the physician office visit, the hospital stay, or the prescription drug purchase, can be measured. Accordingly, in measuring medical care inflation as part of the CPI, the BLS collects prices for goods and services such as physician visits, emergency room visits, and prescription drug purchases. The resulting measures of medical price change are published, under the goods-and-services concept, as distinct indexes for physicians' services, hospital and related services, prescription drugs, and nonprescription drugs and medical supplies.[1]

As long ago as 1967, it was recognized that "the average consumer of medical care is not as interested in the price of a visit or hospital day as he is in the total cost of an episode of illness."[2] Several well-known economists have been interested in the "total cost of an episode of illness" (the treatment concept) because there is evidence that, over time, the mix of goods and services used to treat a particular disease has changed and less expensive treatments have become substitutes for more expensive ones. In addition, interest has arisen in the economic effects of improved healing outcomes for certain diseases.

Over the years, economists have attempted to compute price indexes for the entire treatment of an episode of disease, rather than computing separate indexes for each of the

Ralph Bradley is a research economist, Elaine M. Cárdenas is an economist, and Daniel H. Ginsburg and Frankie Vélez are supervisory economists, all in the Office of Prices and Living Conditions, Bureau of Labor Statistics; Lyubov Rozental is a software engineer with BAE Systems, a contractor for the Bureau of Labor Statistics. E-mail: bradley.ralph@bls.gov

goods and services used to treat a particular disease. Matthew D. Shapiro and David Wilcox constructed a price index for treating a cataract and found that, during the last quarter of the 20th century, there was a shift in point of service for this procedure from an inpatient hospital setting to an outpatient surgical center.[3] This move away from the inpatient hospital reduced the price of treating an episode of surgery for removal of a cataract. David M. Cutler, Mark McClellan, Joseph P. Newhouse, and Dahlia Remler examined how acute myocardial infarction (one kind of heart attack) was treated and found that prices for treating the condition had actually decreased when the increased longevity resulting from new surgical procedures was taken into account.[4] Finally, Ernst R. Berndt and colleagues argued that prices for treating depression fell with the introduction of a new generation of antidepressants—the selected serotonin reuptake inhibitors—as the improved pharmaceuticals became a cheaper alternative to expensive psychotherapy.[5]

In treating medical conditions, not only do the relative proportions of goods and services change over time, but the average intensity of use also changes. For instance, in the treatment of diabetes, the utilization of all medical goods and services has increased. The treatment concept allows changes to be incorporated into the composition and intensity of use of the goods and services utilized to treat particular diseases. But because the BLS computes medical indexes under the goods-and-services concept, it does not incorporate either the substitution of less expensive treatments for more expensive ones or the change in intensity of use of treatments into its medical price indexes.[6]

Although current national accounts measure medical consumption and output with a goods-and-services concept, the U.S. Bureau of Economic Analysis (BEA) is seeking to create an alternative, or satellite, account that would redefine the final medical good as the entire treatment of a disease under the treatment concept.[7] Deriving a real-dollar amount for this nominal expenditure requires a price index that is categorized by disease, not medical services and products. As a result, there is a need for experimental disease-based price indexes that would properly deflate medical expenditures measured under a treatment concept.[8] This article is a summary of BLS research into the production of these indexes.

The BLS is not the only agency that is producing indexes under the two concepts described. Having found evidence of input substitution and changes in intensity of use of treatments, Ana Aizcorbe, of the BEA, and Nicole Nestoriak have generated disease-based indexes that account for both phenomena.[9] The Steering Committee for the Workshop to Provide Guidance for Development of a Satellite Health Care Account at the BEA published the proceedings of a meeting between academic economists and government agencies that discussed implementing a satellite account for medical expenditures by disease. Disease-based price indexes also were discussed at the meeting.[10]

The BLS's first experience with the production of disease-based indexes derives from the following recommendation made by CNSTAT:

> BLS should select between 15–40 diagnoses from the ICD (International Classification of Diseases), chosen randomly in proportion to their direct medical treatment expenditures and use information from retrospective claims databases to identify and quantify the inputs used in their treatment and to estimate their cost. On a monthly basis, the BLS could reprice the current set of specific items (e.g., anesthesia, surgery, and medications), keeping quantity weights temporarily fixed. Then, at appropriate intervals, perhaps every year or two, the BLS should reconstruct the medical price index by pricing the treatment episodes of the 15 to 40 diagnoses—including the effects of changed inputs on the overall cost of those treatments. The frequency with which these diagnosis adjustments should be made will depend in part on the cost to BLS of doing so. The resulting MCPI [medical consumer] price indexes should initially be published on an experimental basis. The panel also recommends that the BLS appoint a study group to consider, among other things, the possibility that the index will "jump" at the linkage points and whether a prospective smoothing technique should be used.[11]

Rather than producing the indexes in-house, the BLS contracted with Thomson Healthcare Company to construct price indexes using insurance claims filed by self-insured companies. Medical indexes were constructed for three metropolitan areas by randomly selecting from 40 narrowly defined diseases, with a probability of selection proportional to the area's expenditure share on each disease. Each year, the inputs used to treat the selected diseases were updated and reflected in the index. The results of this study were reported in a work by Xue Song, William Marder, William Houchens, John E. Conklin, and Ralph Bradley.[12]

In the process of completing the Thomson study, BLS researchers discovered important characteristics and limitations of the data used to calculate the disease-based indexes. First, the insurance claims data did not represent those who had only public insurance or who were uninsured; this was because the data contained records for privately insured patients

alone. Second, because the claims data covered just those companies which had contracted with Thomson, the data may not have been representative of the overall privately insured population. Third, the data included unobserved additions of patients, as well as attrition; therefore, it was not possible to determine whether the change in inputs was the result of using inputs more efficiently or the result of a change in the patient mix.[13] Fourth, several claim records did not have a diagnosis (records of this kind are known as orphan records); hence, it could not be guaranteed that all the treatments being used to treat a particular disease were included. Fifth, under the CNSTAT recommendation, it was possible to track only the price indexes of randomly selected diseases; consequently, the aggregate treatment price for a disease that was not in the sample could not be tracked.

The price indexes computed under the method recommended by CNSTAT did not differ statistically from the currently published medical CPI under the goods-and-services concept. The point estimates from the CNSTAT indexes, however, were lower than those of the BLS indexes.

Because of the limitations of the Thomson study, it was decided to recalculate disease-based price indexes with a data source that is more representative and has less attrition than an insurance claims database. Thus, instead of randomly selecting 40 narrowly defined disease categories, a price index was computed for every major disease so that it could readily be understood how each disease source contributed to the overall medical inflation rate. The final set of indexes computed complies with the CNSTAT recommendations and is representative of what the Nation is paying for treating each disease.

In what follows, the methods of computing medical price indexes under the goods-and-services concept and under the treatment concept are described and compared. Then, the data and the methods used to construct the disease-based indexes are presented. Finally, the resulting indexes are analyzed, and the article closes with an explication of how the disease-based indexes differ from indexes based on the goods-and-services concept.

No quality adjustment issues are addressed, because many improvements in medical care cannot be immediately observed—if they can be observed at all. The CPI is a real-time index; consequently, the BLS must generate and publish indexes for price movements roughly 2 to 3 weeks after the end of each month. This schedule does not allow enough time to observe the quality changes associated with, for example, the increased longevity resulting from heart bypass surgery, which could be measured only years after the surgery has been performed. When the BLS collects a price quote for heart surgery, it cannot adjust for this increased longevity because it will not occur until long after the quote has been collected and the index published.

The CPI: the goods-and-services concept

The BLS currently publishes medical price indexes under the goods-and-services concept. The prices used in the generation of these indexes are collected from medical goods and services outlets (such as physicians' offices) and hospitals. Indexes are calculated by the type of provider, expressed as a service (that is, physicians' services, hospital and related services, and so forth) or good.

Sampling for prices is done at the outlet level. Outlets of a particular medical good or service are selected with a probability proportional to their share of total spending. The BLS identifies the responses of medical outlets through a household survey. For example, suppose that there are three physicians' offices, labeled A, B, and C, in a certain geographical area. Suppose also that office A accounts for 50 percent of the area's expenditures on physicians; then it will have a 50-percent chance of getting selected in a sample draw.

Once the outlet is selected, a particular good or service must be selected inside the outlet. Taking the example of physicians' offices again, suppose that office B offers three services. Then, if each of the services accounts for a third of the office's revenue, each service will have a one-third chance of being sampled.

The published CPI has four major medical indexes: prescription drugs, nonprescription drugs and medical supplies, professional services (physician, dental, and so forth), and hospital and related services (inpatient, outpatient, and emergency room). A fifth, minor, index, health insurance, essentially prices the part of the premium that does not finance the insurance benefit.

Implicit quantity weights are derived when the sample is initiated, and they stay fixed throughout the entire sample period. Many claim that this method produces an upward bias because the savings from substituting less expensive or more efficient inputs are not incorporated into the index. But it also could be a source of downward bias because the method does not adjust for increases in utilization.

Disease-based indexes: the treatment concept

Under the treatment concept, disease-based indexes are computed for each disease, following the guidelines of the

CNSTAT recommendation. The disease categories used are set forth in the chapters of the ICD-9 manual and are as follows:

- Infectious diseases
- Neoplasms
- Endocrine, nutritional, and related diseases
- Diseases of the blood
- Mental disorders
- Diseases of the nervous system
- Diseases of the circulatory system
- Diseases of the respiratory system
- Diseases of the digestive system
- Diseases of the genitourinary system
- Complications of pregnancy
- Diseases of the skin
- Diseases of the musculoskeletal system
- Congenital anomalies
- Certain conditions in the prenatal period
- Injury and poisoning
- Other conditions

To compute disease-based indexes, data are needed on the amounts of goods and services used to treat each disease for each year.[14] For example, one needs to know how many emergency room visits took place in 2003 to treat diseases of the skin. The data source for this important information is the Medical Expenditures Panel Survey (MEPS), a survey administered by the U.S. Agency for Healthcare Research and Quality. This panel survey queries households about the diseases they contract and their expenditures and utilizations for the goods and services used to treat those diseases.[15]

Because monthly indexes had to be computed, but MEPS data had only yearly prices, a monthly update was imputed by increasing the yearly price by the growth in the monthly price index counterpart in the CPI. For physicians' services, the yearly price was increased by the growth in the monthly CPI index for that expenditure category. For outpatient and inpatient services, the monthly price was increased by the CPI index for hospital services; for pharmaceuticals, the yearly price was increased by the CPI for pharmaceutical goods.

The year-opening quantities of each type of good and service used to treat any disease were updated to account for substitutions of products or services and changes in their intensity of utilization. Thus, if there was a substitution away from expensive inpatient hospitals to inexpensive prescription medicines, then the index would be lower than it would have been if that substitution had not been incorporated.

A simple example will serve to explain how disease-based indexes are generated, both for this article and in general. Suppose that there are two diseases, A and B, and two services, 1 and 2, used to treat these diseases. Suppose also that in 2002 the price of service 1 is $1,000 per visit and the price of service 2 is $100 per visit. To treat disease A in 2002 requires 2 visits of service 1 and 2 visits of service 2. (These figures represent the utilization of the two services.) To treat disease B in 2002 requires 1 visit of service 1 and 1 visit of service 2. Now, suppose further that there is a substitution away from the higher priced service 1 to the lower priced service 2 in 2003, so that the treatment of disease A now requires 1 visit of service 1 and 4 visits of service 2. Suppose also that it has become more difficult to treat disease B in 2003, so that utilizations have doubled for both services and it now requires 2 visits each of service 1 and service 2 to treat disease B. Finally, suppose that the price for both services increases by 10 percent from 2002 to 2003. Then, under the services approach, the price index for medical care would increase by 10 percent. Under the disease approach, there would be a 30-percent *drop* in the price index for treating disease A, because the index would account for the substitution from the high-priced to the low-priced service. By contrast, the price index for treating disease B would *increase* by 120 percent, because the utilization of each service has doubled and the price for each service has increased by 10 percent. Applying the broad outlines of this example to utilizations in the MEPS database reveals that there are some diseases like disease A, such as mental disorders, for which there has been a substitution from higher priced services, such as visits to a therapist, to lower priced pharmaceuticals, and some diseases like disease B, such as endocrine disease, for which the utilization of all goods and services has increased over time.

In constructing disease-based indexes, the problem of *comorbidities*—instances in which the patient has more than one condition or disease and the doctor is treating more than one disease in a single office visit—needs to be addressed. As table 1 shows, comorbidities for physician visits are increasing over time. What is the best approach to measure utilizations in situations with comorbidities? In what follows, two sets of indexes are generated that treat comorbidities differently. Under the first method, if a patient uses a service to treat more than one disease, then the use of that service is recorded for each disease treated. In the second method, the use of the service is prorated to each disease, so that if a patient had three diseases treated in one physician visit, only one-third of

Table 1. Indicators of comorbidity, 1996–2004

Year	Physician office visits			
	Mean number of diseases per visit	Number of visits for one disease	Number of visits for two diseases	Number of visits for three diseases
1996	1.532	914,097,000	88,510,626	23,576,756
1997	1.802	857,015,927	105,222,051	27,585,681
1998	1.780	877,451,281	110,900,249	30,690,505
1999	1.800	845,212,132	116,441,032	27,143,362
2000	1.939	847,517,668	103,487,437	31,378,739
2001	1.900	936,244,257	110,942,893	36,068,550
2002	2.085	1,006,756,597	131,275,941	39,673,678
2003	2.216	1,012,850,592	143,401,176	40,693,481
2004	2.033	1,026,306,773	156,835,092	40,904,072

a visit is recorded for each of the diseases treated. Both methods have their shortcomings. The first method will overcount utilizations if the patient would have used less of the service if he or she were treated for just one of the diseases alone. In the second method, the increase in comorbidities by itself will increase the productivity of medical services solely because the patient is sicker and the service is treating more diseases per visit. This result might not be desirable.

Another price index problem is that a substantial fraction of providers are not paid for their services and the cost of these uncompensated services must be defrayed from other sources. Current CPI methods do not account for this situation, because the price that the BLS collects is for services that get full reimbursement. However, when a patient pays nothing, the BLS does not collect any price data. The MEPS database, by contrast, does account for nonpayment. Average prices computed by sampling only those who do ultimately pay puts an upward bias on the average price that all patients pay. Tables 2 and 3 and the following tabulation of the relationship between growth in the incidence of unpaid emergency room visits and the difference of price growth for all emergency room visits and for reimbursed visits illustrate the problem:

Year	*Yearly growth in incidence of unpaid emergency room visits (percent)*	*Difference of price growth for all visits and price growth for reimbursed visits*
1999	5.61	0.46
2000	15.64	1.32
2001	5.62	.61
2002	–29.64	–3.10
2003	17.28	1.28
2004	10.39	1.08

Six percent to nine percent of emergency room visits go unreimbursed. In years when there was an increase in the incidence of unreimbursed visits, the average price for reimbursed visits rose more rapidly than that for all visits. It is plausible to assume that part of this price increase for reimbursed visits financed the increases in delinquencies (unpaid visits). Likewise, in 2002 there was a dramatic drop in the unreimbursed share, and only in that year did the average price for all emergency room visits grow more rapidly than that for just the reimbursed visits. Over the 1998–2004 period, the reimbursed price grew more rapidly than the all-visits price while, at the same time, the incidence of unpaid visits also increased. However, the all-visits price is reflective of all consumers, not just those who pay. The BLS prices reimbursed visits only and does not account for those patients who, for example, have been able to receive emergency room care for which no reimbursement was made on their behalf.

Finally, the notion of *expenditure* scope is important in the construction of price indexes. In the medical sector, there are several alternative scopes. At the Bureau of Economic Analysis, the scope for personal consumption expenditures is all expenditures, regardless of how they are financed. Their corresponding price deflators are then also based on total expenditures. In addition, there is an out-of-pocket scope covering only expenditures that are financed directly from consumers' disposable income. Medicare, Medicaid, and private insurance reimbursements are included in measured medical expenditures under the total-expenditure scope, but are not included in that expenditure category under the out-of-pocket scope. Different expenditures scopes generate different prices. For the total-expenditure scope, the price is the total price, regardless of the source of financing, whereas for the out-of-pocket scope, the price is merely the out-of-pocket price that the consumer pays directly. The BLS scope is a hybrid between the total-expenditure scope and the out-of-pocket scope: all out-of-pocket payments are included, and the portion of both public and private insurance reimbursement that is attributed to the consumer's out-of-pocket payments for premiums also is included. So, too, are all employee contributions to employer-sponsored plans, as well as the individual's payment of the Parts B and D Medicare insurance premium. In what follows, indexes are generated for the total-expenditure scope, the out-of-pocket scope, and the BLS scope.

Table 2. Incidence of unreimbursed emergency room visits, 1998–2004

Year and status of patient	Percent of visits unreimbursed
1998	
All	7.14
Privately insured	4.34
Publicly insured	6.87
Uninsured	24.32
1999	
All	7.54
Privately insured	4.13
Publicly insured	8.17
Uninsured	28.33
2000	
All	8.72
Privately insured	5.75
Publicly insured	7.38
Uninsured	31.12
2001	
All	9.21
Privately insured	6.67
Publicly insured	8.15
Uninsured	27.74
2002	
All	6.48
Privately insured	4.01
Publicly insured	5.67
Uninsured	26.16
2003	
All	7.60
Privately insured	5.04
Publicly insured	6.15
Uninsured	27.34
2004	
All	8.39
Privately insured	5.73
Publicly insured	5.98
Uninsured	33.34

Table 3. Average prices for emergency room visits, 1998–2004

Year and type of visit	Price per visit	Standard error	Yearly price growth
1998			
All visits	$381.38	6.4	...
Reimbursed visits	410.69	6.5	...
1999			
All visits	399.60	9.1	4.78
Reimbursed visits	432.21	9.4	5.24
2000			
All visits	410.21	8.2	2.65
Reimbursed visits	449.39	8.5	3.97
2001			
All visits	463.82	9.1	13.07
Reimbursed visits	510.85	9.5	13.68
2002			
All visits	493.93	9.1	6.49
Reimbursed visits	528.16	9.4	3.39
2003			
All visits	524.84	8.2	6.26
Reimbursed visits	567.98	8.4	7.54
2004			
All visits	646.73	14.7	23.22
Reimbursed visits	705.99	15.3	24.30

Results

Table 4 lists the number of diagnoses for each major disease category for the United States. The endocrine and nutritional disease category, which includes all diabetes diagnoses and confirms the rapid growth in type II diabetes in the Nation, grew the most rapidly between 1998 and 2004, increasing nearly 61 percent. The challenge here is that diabetes leads to additional comorbidities and is in part the reason for the growth in comorbidities depicted in table 1. Growth in the number of visits for one disease increased 12.3 percent between 1998 and 2004, while the growth rates in the number of visits for two and three diseases increased 77.2 percent and 73.5 percent, respectively. The increase in diabetes is perhaps also part of the reason for the 33.2-percent increase in the incidence of circulatory system diseases between 1998 and 2004, given that diabetes and circulatory problems are common comorbidities.

The following tabulation lists the aggregate medical indexes based on the different methods outlined in this article for the period from 1999 to 2004 (because of rounding, differences of columns may not exactly equal the resulting number shown):

Scope	*(1) Goods and services*	*(2) Treatment with updated utilization*	*(3) Adjusted for comorbidities*	*(2) – (1)*	*(3) – (2)*
Total expenditures	1.3585	1.3342	1.3091	–0.0243	–0.0251
Out of pocket only	1.2831	1.3163	1.3057	.0332	–.0106
BLS scope	1.3032	1.3055	1.2881	.0024	–.0175

Column 1 lists the results obtained from the treatment concept, in which utilizations are updated annually. Column 2 lists the results for indexes computed by the goods-and-services concept, for which there is no utilization update. Column 3 lists the indexes computed under the treatment concept by prorating comorbidities such that if a service treated more than one disease, the utilization of that service would be prorated across the diseases treated. Under the total-expenditure scope, accounting for utilization changes results in a 2.43-percent drop in the cumulative index, compared with computing no utilization adjustment. When utilizations are prorated for comorbidities, there is a further 2.51-percent

Table 4. Number of diagnoses for major categories of disease, 1998–2004

[In millions]

Disease	1998	1999	2000	2001	2002	2003	2004
Infectious diseases	25.1	23.8	24.5	26.2	26.1	26.0	23.9
Neoplasms	17.2	16.9	17.2	18.9	20.7	20.6	20.1
Endocrine, nutritional, and related diseases	47.1	50.2	55.0	60.8	64.7	67.7	75.6
Diseases of the blood	3.1	3.3	3.9	4.2	4.2	4.1	4.2
Mental disorders	40.7	38.2	39.8	45.7	54.5	56.0	59.7
Diseases of the nervous system	85.5	79.1	76.9	81.7	82.6	86.6	88.2
Diseases of the circulatory system	65.7	65.1	68.8	72.4	80.0	83.6	87.5
Diseases of the respiratory system	175.6	172.7	168.9	183.2	179.1	184.4	177.4
Diseases of the digestive system	79.1	82.1	82.7	83.4	90.4	93.8	92.2
Diseases of the genitourinary system	34.7	35.3	38.0	40.8	41.3	41.8	41.3
Complications of pregnancy	13.7	14.6	16.9	18.4	18.0	19.0	18.8
Diseases of the skin	27.4	25.8	28.2	31.4	31.6	30.9	29.2
Diseases of the musculoskeletal system	75.9	75.8	76.4	86.3	96.6	99.6	102.6
Congenital anomalies	2.3	1.6	1.6	1.7	1.7	1.8	1.9
Certain conditions in the prenatal period	.4	.5	.8	.8	.9	1.1	.9
Injury and poisoning	64.3	60.1	60.8	64.7	66.1	68.0	68.5
Other conditions	64.2	66.6	71.3	79.2	81.7	83.4	83.7

drop in the cumulative index, reflecting the effect of growing comorbidities on the productivity of medical services. Both differences are statistically significant.

When an out-of-pocket scope is used, the results differ. Here, utilization adjustment actually *increases* the index by a statistically significant 3.32 percent. There are two major reasons for this difference. First, most of the savings that occur are the result of shifting from inpatient hospital services to outpatient services. The share of total medical expenditures that finance inpatient services is much higher than the out-of-pocket counterpart. Therefore, the savings from the inpatient-to-outpatient shift are higher for the total-expenditure approach. Adjusting for comorbidity then yields a drop in the index; for example, under the BLS scope, the drop is a statistically significant 1.75 percent.

Table 5 lists the ratio of out-of-pocket payments to total payments for various services from 1998 to 2004. In 2004, out-of-pocket payments were 1.8 percent for inpatient facilities and 6.7 percent of total payments for outpatient facilities. Suppose that there was a shift in 2004 from inpatient to outpatient facilities that resulted in a 50-percent saving for total expenditures. Then, given the preceding ratios, consumer out-of-pocket payments would still have risen 86 percent, because their rate of insurance reimbursement on outpatient services was less than their rate of reimbursements on inpatient services. A second reason that the utilization-adjusted out-of-pocket index is higher than the unadjusted indexes is that the utilization intensity of pharmaceutical products has increased, disproportionately affecting out-of-pocket payments.

Because the BLS scope is a hybrid of the total-expenditure and out-of-pocket scopes, the results are mixed. There is no statistically significant difference in the indexes between adjusting and not adjusting for utilization. Note, however, that table 5 covers only the 1998–2004 period, and another period might produce differences that are statistically significant. Accounting for comorbidities does create a significant 1.75-percent drop in the index.

The savings from the substitution toward less expensive inputs have been concentrated in several disease categories that have relatively large expenditure shares—such as neoplasms, mental disorders, and pregnancies—for which inpatient utilization has dropped dramatically.

THE BLS RESPONSE TO CNSTAT'S RECOMMENDATION that the BLS construct disease-based consumer medical price indexes has produced mixed results. With the total-expenditure scope, adjusting for utilizations under the treatment concept results in a drop in the rate of medical price growth for the 1999–2004 period. But this drop does not extend to all diseases and all scopes. Most of the savings accrues to insurance benefit payments; the consumer sees no drop in either out-of-pocket payments or lower insurance premiums. Thus, using an out-of-pocket scope actually results in an *increase* in the index when utilization changes are taken into account. During the 1999–2004 period, had the BLS kept its expenditure scope and shifted

Table 5. Ratio of out-of-pocket payments to total payments, selected services, 1998–2004

[In percent]

Year	Total expenditures	Emergency room facilities	Emergency room physicians	Outpatient facilities	Outpatient physician	Inpatient facilities	Inpatient physician	Office based visits	Prescriptions
1998	19.3	15.7	13.0	8.1	6.4	2.7	4.4	18.2	48.0
1999	19.2	14.7	10.4	5.1	6.2	2.6	3.7	18.0	46.2
2000	19.4	11.7	14.6	8.1	5.5	2.0	3.5	16.8	46.1
2001	19.7	11.6	13.6	6.8	7.0	1.8	5.6	15.2	44.0
2002	19.1	11.0	13.1	5.9	8.1	2.0	5.1	16.0	42.3
2003	19.6	12.5	11.0	5.9	7.6	1.9	3.7	15.2	44.9
2004	19.0	11.5	13.1	6.7	7.6	1.8	5.1	14.1	42.2

from pricing services directly to pricing diseases, there would have been little change to the medical CPI.

Unlike the study by Song and colleagues, most of the results presented here are statistically significant. Significance was achieved by computing indexes for broad disease categories, rather than randomly selecting 40 disease categories from a narrowly defined classification system. This approach resulted in more degrees of freedom and reduced the variance of the parameter estimates. One might argue that there is little homogeneity within these broadly defined groups and that, consequently, overall disease severity could vary widely. The proper reply to this critique is that, although it is true that there is much within-group variance in the broad categories used in this article, it is evident that narrowing the categories will not substantially reduce that variance.

The results presented here are likely more representative of U.S. consumers than are the results obtained in Song and colleagues' study, because the sample used herein is representative of the entire U.S. civilian noninstitutional population. By contrast, Song and colleagues used a private claims database that perhaps is not representative of the privately insured population, and the scope of the study was limited to three metropolitan areas.

Even if more narrowly defined disease categories were used here, the within-category variance would still be large. Bradley computed summary statistics for utilizations within a more narrowly defined clinical classification system than the one used in this study.[16] Even under that system, the standard deviations were large relative to their means. For example, the number of hospital nights used to treat an episode of acute myocardial infarction ranged from 0 to 325. The diagnosis can give only limited information about the overall severity of the disease and therefore only limited information about the resources used to treat the disease. Other factors, such as age and stage of the disease, play key roles. Perhaps the use of reporting reforms recommended in the next paragraph would reduce some of the variance.

As is true of any medical care statistic, the accuracy of the disease-based index depends on the accuracy of the records kept by the medical system. If physicians do not diagnose patients accurately or do not report their diagnoses accurately, then the resulting indexes will contain measurement error. Oftentimes, the physician cannot immediately diagnose an ailment, and the recordkeeping system must allow for this possibility. If a physician makes a misdiagnosis, there needs to be a process by which both the misdiagnosis and the corrected diagnosis can be reported. If misdiagnoses are not reported, then it is not possible to estimate the true quantity of services used to treat a disease.

Another area of reform centers around the documentation of treatments. Usually, it is the responsibility of the primary physician to organize and record all treatments, including the use of any additional physician specialties. However, when physicians submit their claims to insurers, they often do not give the insurer this information, so the insurer must use a "grouper" to try to determine which treatments the physician actually used when he or she treated a particular disease. Bradley found that the groupers utilized by insurers generally fail to link all the goods and services that are used to treat a particular disease.[17] Frequently, there are treatments that cannot be assigned a diagnosis, and this generates what is called an "orphan" record. Consequently, for many diagnoses, utilizations are underreported. For instance, if an expenditure for Glucophage does not have a diagnosis linked to it, then there is a diagnosis (most likely, diabetes) for which the total amount of money spent on Glucophage by prescription will be underreported. This situation can introduce a systematic downward bias in disease-based indexes. At other times, there are diagnoses that do not have links to all the treatments used to treat the disease in question. Both the MEPS database and claims data have records of

acute myocardial infarction diagnoses that have no physician office visit assigned to them,[18] yet, in order to establish the diagnosis, there had to be at least one such visit.

Finally, improved outcomes have not been factored into these indexes. Whether or not the BLS publishes disease-based indexes, accounting for improvements in outcomes will continue to be a deficiency. At this point in time, it is difficult to estimate a reliable value that a consumer places on an outcome. Using an approach such as that of Cutler and colleagues,[19] in which a dollar value is placed on an additional "quality-adjusted life year," is likely too controversial to incorporate into a monthly published index.

The findings presented in this study show that there have been both productivity gains and substitutions toward less expensive services that have reduced the total price of health care. However, it is also evident that these price reductions have not "trickled down" to patient out-of-pocket payments. Nor have they led to any significant reduction in premiums. In another study, Bradley constructed a cost-of-living index that directly prices health insurance and that accounts for increases in productivity.[20] However, the main conclusion drawn by Bradley was no different from that presented in this article: although these savings from substituting toward less expensive inputs generated savings in insurance benefit payments, they did not induce reductions in premiums. □

Notes

[1] A full description of how the CPI measures medical care price movement can be found in "Consumer Price Index: Measuring Price Change for Medical Care in the CPI" (Bureau of Labor Statistics, Feb. 23, 2010), on the Internet at **www.bls.gov/cpi/cpifact4.htm** (visited Feb. 28, 2010).

[2] *A Report to the President on Medical Prices* (U.S. Department of Health, Education, and Welfare, 1967), p. 13.

[3] Matthew D. Shapiro and David Wilcox, "Mismeasurement in the Consumer Price Index: An Evaluation," *NBER Macroeconomics Annual,* December 1996, pp. 93–142.

[4] David M. Cutler, Mark McClellan, Joseph P. Newhouse, and Dahlia Remler, "Are Medical Prices Declining? Evidence from Heart Attack Treatments," *Quarterly Journal of Economics*, November 1998, pp. 991–1024.

[5] See Ernst R. Berndt, Iain M. Cockburn, Zvi Griliches, Theodore E. Keeler, and Martin Neil Baily, "Pharmaceutical Innovations and Market Dynamics: Tracking Effects on Price Indexes on Anti-Depressant Drugs," *Brookings Papers on Economic Activity, Microeconomics* (Washington, DC, Brookings Institution, 1996), pp. 133–99; and Ernst R. Berndt, Anupa Bir, Susan H. Busch, Richard G. Frank, and Sharon-Lise T. Normand, "The Medical Treatment of Depression, 1991–1996: Productive Inefficiency, Expected Outcome Variations, and Price Indexes," *Journal of Health Economics*, May 2002, pp. 373–96.

[6] An exception is the substitution of less expensive generic drugs for brand-name drugs.

[7] See Ana M. Aizcorbe, Bonnie A. Retus, and Shelly Smith, "BEA Briefing: Toward a Health Care Satellite Account," *Survey of Current Business*, May 2008, pp. 24–30.

[8] The Federal Medicare Part A program sets its schedule of reimbursement by diagnosis-related groups, which some private insurers use. However, reimbursement is for a particular medical service that treats a particular disease, not for all the treatments for a given diagnosis-related group.

[9] See Ana Aizcorbe and Nicole Nestoriak, "The Importance of Pricing the Bundle of Treatments," BEA working Paper no. 2008-04 (Bureau of Economic Analysis, July 2008), on the Internet at **www.bea.gov/papers/pdf/wp2008-04_bundle_treatments_paper.pdf** (visited Mar. 4, 2010).

[10] See Christopher J. Mackie and the National Research Council, *Strategies for a BEA Satellite Health Care Account: Summary of a Workshop/Committee on National Statistics, Division of Behavioral and Social Sciences and Education, Christopher Mackie, Rapporteur* (Washington, DC, National Academies Press, 2009).

[11] See Charles Schultze and Christopher Mackie, eds., *At What Price? Conceptualizing and Measuring Cost-of-Living and Price Indexes* (Washington, DC, National Academies, 2002). "ICD-9" is an abbreviation used in the medical field that stands for "International Classification of Diseases, ninth revision." The ICD-9 provides a standard classification of diseases for the purpose of maintaining health records. The World Health Organization assigns, publishes, and uses the ICD-9 to classify diseases and to track mortality rates on the basis of death certificates and other vital health records. Medical conditions and diseases are translated into a single format by means of ICD-9 codes.

[12] Xue Song, William Marder, William Houchens, John E. Conklin, and Ralph Bradley, "Can a Disease Based Price Index Improve the Estimation of the Medical CPI?" in *Price Index Concepts and Measurement* (NBER, 2008), pp. 329–72.

[13] As a rule, patients move in and out of databases. Thus, when an increase in, for example, the number of patient visits used to treat diabetics is observed in a database, it is unclear whether the change was due to a less effective use of physicians' services or an increase in the number of relatively less healthy patients.

[14] In the medical field, the quantity (amount) of a service or good used to treat a disease is oftentimes referred to as utilization. In this article, the quantity of a service (that is, the number of hospital visits) is synonymous with the utilization of that service.

[15] Additional information on the MEPS may be found on the Internet at **www.meps.ahrq.gov/mepsweb** (visited Feb. 28, 2010).

[16] Ralph Bradley, "Issues in Computing Disease Based Price Indexes," unpublished BLS manuscript, 2006.

[17] *Ibid.*

[18] *Ibid.*

[19] Cutler, McClellan, Newhouse, and Remler, "Are Medical Prices Declining?"

[20] Ralph Bradley, "The Effects of Health Insurance Prices on the Cost of Living Index: The Shadow Price of Worry," unpublished BLS manuscript, 2008.