

PRICE INDEXES FOR THE TREATMENT
OF DEPRESSION

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ABSTRACT

We construct price indexes for treatment of a specific illness, acute phase major depression, using treatment episodes of care (rather than fixed input bundles) to define quantity. We identify different treatment service bundles that combine varying quantities of prescription drugs, medical management and psychotherapy. We make use of results from clinical research and official government guidelines for standards of care to identify therapeutically similar treatment bundles. We then employ various index number formulae that involve differing assumptions on the extent of **ex ante** substitutability among these treatment bundles. Rather than using list prices, we utilize actual transactions data based on a MEDSTAT retrospective medical claims data base covering more than 400,000 individuals over the 1991-95 time period. We distinguish between consumers' direct payments (a CPI index) and total payments received by providers (a PPI). Although not directly comparable to BLS indexes indicating 15-25% price growth 1991-95, our CPI and PPI price indexes **decline** 20-30%, implying an average annual price differential from BLS indexes of about -15%.

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by

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I. INTRODUCTION

The conceptual foundations and interpretation of the Bureau of Labor Statistics (BLS) medical care price index have long been controversial. Echoing ideas discussed even earlier¹, Anne Scitovsky [1967] suggested that instead of collecting data on prices of selected medical care inputs such as physicians' fees for office visits, hospital room rates and prescription drugs as the BLS did at that time (and to some extent still does today), a preferable medical care price index would be based on the entire episodic treatment cost of selected illnesses or conditions, including any effects on changed medical outcomes. Scitovsky concluded that it was feasible, albeit perhaps more costly, to implement a cost-per-episode-of-illness approach. Estimating the average costs of treatment in 1951-52 and 1964-65 for five specific illnesses/conditions using administrative records data from the Palo Alto Medical Research Foundation, Scitovsky found that the BLS price index rose considerably **less** rapidly than those based on her average cost of treatment approach.²

Three decades after Scitovsky's study, the U.S. Senate Finance Committee's Advisory Commission To Study The Consumer Price Index [1996] concluded that its best estimate was that over the previous two decades the CPI **overstated** annual cost of living increases by about 1.1% overall, and by 3.0% in several medical care categories.³ Clearly the medical care marketplace in the 1990s is quite different from that in the 1950s and 1960s, for now cost containment pressures are cutting back on laboratory and diagnostic testing, use of specialist physicians is being de-emphasized, and pressures from managed care organizations are apparently bringing about greater discounts and physician price discrimination, even as health care policy analysts worry about possible deterioration in outcomes. The CPI Commission

strongly endorsed a move in the CPI away from the pricing of health care inputs to an attempt to price medical care outcomes. It also recommended that the BLS develop and publish two separate cost of living indexes, one on a monthly basis and another annually, the latter incorporating more attention to quality issues and introducing improvements arising from new information and new research results.

Recent research has generated medical care price indexes that value health care outcomes rather than health care inputs for certain treatments, and thereby begin to take quality change into account. Cutler, McClellan, Newhouse and Remler [1996], for example, contrast input price indexes for the cost of heart attack treatment that rise by 3.3% over 1983-94, with an outcomes adjusted index that takes into account a conservative valuation for the extension of life expectancy attributable to new heart attack treatments and **falls** by 1.1% per year, implying a net upward bias of 4.4% per year. Shapiro and Wilcox [1996] construct a price index for cataract surgery, 1969-93, and find that a CPI-like fixed weight input-based index increases by a factor of about nine; a preferred alternative price index incorporating realized reduced levels of hospital services, but ignoring any improvements in the quality of medical outcomes, increases by only a factor of three, implying an annual differential of 4.6%.

In this paper we build on the earlier work of Scitovsky, Cutler et al. and Shapiro-Wilcox in a number of ways. First, we consider a different category of illness, a mental health illness. Specifically, we focus on major depression, a prevalent and recurring illness which has been estimated to produce widespread impairment and disability.⁴ As in the case of other chronic illnesses, mortality is not a key endpoint and thereby outcomes may be more difficult to measure than in the case of, say, heart attacks. Second, we identify different service bundles for treating acute phase depression which combine varying quantities of prescription drugs, medical management and psychotherapy, and use transactions data to "price" these different bundles.

Third, we make use of results from clinical research to identify therapeutically similar treatment bundles that can then be linked and weighted to construct price indexes for treatment of specific forms of major depression. We employ various index number formulae that involve

differing assumptions on the extent of *ex ante* substitutability among therapeutically similar treatment bundles. Because the treatment bundles are viewed by the medical community as being therapeutically similar in terms of efficacy, our linking of treatment bundles provides an important initial step toward incorporation of medical outcomes. Fourth, we distinguish a Producer Price Index (PPI) representing the supply price or total receipts received by providers of the medical treatment (from the insurer and the patient), from the CPI that incorporates the out of pocket costs (via co-payments and deductible payments) by the patient/consumer. Finally, we present some initial price index calculations for the years 1991-1995 that demonstrate the feasibility of implementing the approach and illustrate some striking differences in price movements for treatment of depression relative to the traditional medical CPI and PPI series.

II. BRIEF OVERVIEW OF CURRENT BLS PROCEDURES FOR THE CPI AND PPI

We begin with a brief overview of procedures and concepts currently employed by the BLS in its construction of CPI and PPI medical care price indexes.⁵ Medical care currently accounts for about a 7.4% expenditure weight in the total CPI. Although total medical care expenditures as a percentage of GDP are about twice this weight, the medical care CPI (MCPI) weight reflects only a portion of total medical care outlays. Specifically, the MCPI weight reflects direct out-of-pocket (OOPs) cash outlays, plus household purchases of health insurance (including Medicare Part B), plus employee contributions to health insurance premiums purchased through work. The MCPI excludes employer health insurance premium contributions, treating them as a business expense, and also excludes Medicare Part A as well as Medicaid outlays.⁶

The four major sub-indexes of the MCPI and their percentage weights within the aggregate MCPI are prescription drugs (12.1%); nonprescription drugs and medical supplies (5.3%); professional medical services (also called physicians' services, 47.1%); hospital and related services (30.7%); and health insurance (4.9%).⁷ For each MCPI component, OOPs plus the consumer-paid health insurance premium allocation yields a total component weight, which

is then typically applied to prices paid by cash-paying customers; note that prices for many transactions could be quite different from cash prices, particularly in the last decade as discounts to managed care organizations have become more common.⁸

Current procedures for the MCPI involve pricing specific input items rather than average prices for episodes of treatment, e.g., x-rays, laboratory tests, and physicians' office visits are priced rather than the average price of treatment of, say, a child's forearm fracture.⁹ Hence the MCPI ignores potential input substitution and much quality change, nor does it take changes in outcomes into account.

Although the MCPI currently employs fixed weights for the higher levels of aggregation based on the 1982-84 Consumer Expenditure Survey, at the lowest level of aggregation (entry level items, ELIs) the set of goods and services sampled are completely rotated over a 5-year time period, and thus at least 20% of the sampled items change each year.¹⁰

Once items have been sampled, they are weighted and aggregated using a modified Laspeyres-type price index with fixed weights. Specifically, if the n items sampled do not change, a price index could be computed using the traditional Laspeyres formula,

$$L_t = \sum_{i=1}^n w_{i0} \left[\frac{p_{it}}{p_{i0}} \right]; \quad w_{i0} = \frac{p_{i0} q_{i0}}{\sum_{i=1}^n p_{i0} q_{i0}} \quad (1)$$

where p_{it} is the price of the i^{th} item in time period t , p_{i0} is the base period price, q_{i0} are fixed base period quantities, and w_{i0} is the fixed base period weight. When, as is always the case, the sampled items change (due to items dropping out of the sample, and/or the introduction of new items from sample rotation), the BLS employs a modified and chained Laspeyres price index formula,

$$L'_t = \sum_{i=1}^{n_{t-1}} w_{i,t-1} \left[\frac{p_{it}}{p_{i,t-1}} \right] \cdot L'_{t-1}, \quad w_{i,t-1} = \frac{p_{ib} q_{ib}}{\sum_{i=1}^{n_{t-1}} p_{ib} q_{ib}} \quad (2)$$

where the base period b could be that for time period 0, that for time period $t-1$, or some other time period.

For our purposes, it is sufficient to note that the BLS does not publish price indexes for the treatment of depression, although it does publish MCPIs for a physicians' services aggregate (that includes psychiatrists but does not identify their price series separately) and for an aggregate of prescription pharmaceutical drugs (but not for antidepressants as a separate category).

The BLS' producer price index (PPI) reflects average changes in selling prices received by domestic producers for their output.¹¹ Currently no aggregate medical care PPI is computed or published by the BLS. PPIs for various medical commodities (e.g., pharmaceuticals, ophthalmic goods, medical instruments) have been published for quite some time as PPIs for distinct manufacturing industries. PPIs for health services industries are quite new, with the BLS' hospital PPI beginning in December 1992, a physicians' services PPI beginning in December 1993, and a composite health services PPI beginning in December 1994. Among the industries within the health services PPI, the BLS publishes monthly price data for six aggregates, including offices and clinics of doctors of medicine (with 12 separate components, including psychiatry), skilled and intermediate care facilities, general medical and surgical hospitals (a large category, with a separate index for mental diseases and disorders, among others), psychiatric hospitals, specialty hospitals except psychiatric, and medical laboratories.

The PPI includes revenues from Medicare, Medicaid, and other private sources (such as third party insurance and direct patient cash payments). For hospitals, the unit of output is the services performed during a single hospital visit. Based on ICD-9 and DRG data from, among others, HCFA, randomly selected itemized patient bills are chosen to form a sample frame, and then the components of these itemized bills are re-priced monthly. For physicians' services, the unit of output is represented by the patient's bill covering the services provided by a physician during a single patient-physician encounter. Note that unlike the CPI, the PPI prices an actual

treatment bundle, but it assumes use of identical inputs over time and thus does not allow for changes in the components of the treatment bundle, e.g., substitution of prescription drugs for psychotherapy in the treatment of depression. Moreover, the PPI attempts to obtain net transactions prices that may vary by payer rather than list prices, but as of 1995 43.4% of its sampled inpatient price quotes and 64.6% of its outpatient price quotes were based on list prices.¹²

III. DEFINITION AND MEASUREMENT OF THE PRICE FOR THE TREATMENT OF DEPRESSION

We now provide some background information on the nature of the illness known as major depression, its diagnosis, various forms of treatment for acute phase major depression, and research findings on comparisons of treatment efficacy for specific forms of major depression. We then define alternative treatment bundles.

III.A. MAJOR DEPRESSION

Depression is commonly characterized by melancholy, diminished interest and pleasure in all or most activities, and feelings of worthlessness. The clinical definition of major depression provides a very specific set of clinical criteria that must be met in order for a patient's condition to be considered as an episode of major depression. Specifically, the Diagnostic and Statistical Manual of the American Psychiatric Association (Fourth Edition) DSM-IV, defines major depression as:

The presence of one of the first two symptoms, as well as at least five of nine total symptoms. The symptoms must be present most of the day almost every day, for at least two weeks. The symptoms include:

- 1) depressed mood most of the day nearly every day;
- 2) markedly diminished interest or pleasure in almost all activities most of the day;
- 3) significant weight loss/gain;
- 4) insomnia/hypersomnia;
- 5) psychomotor agitation/retardation;
- 6) feelings of worthlessness (guilt);
- 7) fatigue;

- 8) impaired concentration (indecisiveness); and
- 9) recurrent thoughts of death or suicide.¹³

There are two dimensions of depression with respect to persistence: single episode and recurrent major depression. A single episode is self explanatory. Recurrent depression is defined by two or more major depressive episodes each separated by at least two months of return to usual functioning.¹⁴ Episodes of depression are also classified according to severity: mild, moderate or severe. Mild depression typically involves the minimum number of symptoms required to meet clinical criteria and minor functional impairment. Moderately severe episodes are characterized by an excess in symptoms above the minimum to meet clinical criteria and by greater degrees of functional impairment. Severe major depression involves a number of excess symptoms above the minimum and significant degrees of functional impairment including the inability to work or conduct usual activities.

It has been estimated that in the early 1990s 10.3% of the U.S. population met the criteria for major depression at sometime during a 12 month period¹⁵. The vast majority of individuals who experience an episode of major depression will return to their original level of functioning. However, between 20 and 35% experience persistent symptoms; these cases are commonly referred to as chronic depression. Furthermore, approximately 50% of all people having depressive episodes are expected to have a recurrence.¹⁶ Once an individual has a second episode, recurrence is 70% likely.

III.B. ALTERNATIVE TREATMENTS

In this research we focus on treatment for the acute phase of care. Research on the continuation phase of treatment is less developed and definitive protocols have not been as widely adopted in many clinical settings. Treatments for major depression have advanced rapidly during the past twenty years. In the area of psychotherapy a variety of new techniques has expanded treatment options well beyond psychodynamic or psychoanalytic approaches. Interpersonal therapy (IPT), behavior therapy (BT), family therapy, and cognitive behavior therapy (CBT) are each relatively new. Evidence from controlled clinical trials suggests that

when applied as the single mode of treatment for less severe forms of acute major depression, each of these therapies reduce depressive symptoms. Moreover, relative to anti-depressive medication as the sole treatment, each has generally been shown to perform at comparable levels of efficacy and to have similar outcomes.¹⁷

Extraordinary advances have been achieved in the area of antidepressant medication. Antidepressant medication has three general classes. These are: (i) cyclic antidepressants which include the widely used tricyclic antidepressants (TCAs) and a number of lesser known drugs such as trazodone; (ii) selective serotonin reuptake inhibitors (SSRIs) which include brand name drugs such as Prozac, Zoloft, Paxil and Luvox; and (iii) monoamine oxidase (MAO) inhibitors which, due to side effects and dangerous interactions, are generally used only for cases that are resistant to other forms of treatment. The newer SSRIs offer some distinct advantages over older TCAs. SSRIs are associated with lower risk of overdose, and fewer and lower levels of a number of side effects. Key side effects associated with TCAs include drowsiness, dry mouth, impaired ability to concentrate, seizures and weight gain.¹⁸ SSRIs have been associated with side effects related to sexual dysfunction and anxiety. The advantages of SSRIs come at a significantly higher pecuniary cost than most TCAs.

Psychotherapeutic interventions have been frequently combined with antidepressant medication as a strategy for treating major depression. The specific interventions that have been most intensively studied are the use of TCAs in combination with either IPT, BT or a general unspecified form of short term psychotherapy. No studies in the literature have been reported at this time which systematically assess the combination of SSRIs and psychotherapy. It is generally presumed that such combinations will be at least as efficacious as the combination of TCAs and psychotherapy.

Electroconvulsive therapy (ECT) can be quite effective but is typically limited to rather special circumstances where the depression is severe and complicated by a number of other psychiatric symptoms including psychosis, catatonic stupor, and high risk of suicide. In the analysis of treatment bundles presented here we focus on outpatient treatments for major

depression, which constitute the vast majority of treatment episodes (75 to 80%). There are several reasons for this choice. First, inpatient claims do not contain information on the drugs prescribed for treatment; thus our characterization of care would be incomplete. A second reason for focusing on outpatient care is that it is more difficult to use administrative data to make judgments about the appropriate use of hospital services for treating depression. Finally, because there was considerable evidence of overuse of hospital services in the aggregate during the late 1980s and early 1990s, the inclusion of hospital services in a base year such as 1991 would create a downward bias in price changes as general reductions in the use of psychiatric hospitals occurred. We therefore focus on the use of various drugs alone, several forms of psychotherapy alone, and several drug-psychotherapy combination treatments; we do not incorporate ECT or the MAO inhibitors.

We now turn to a brief discussion on research results concerning the efficacy of alternative treatments for depression of varying severity. A typical treated population consists of patients with varying levels of severity, and for given levels of severity, alternative treatments are provided. We develop a set of treatment “bundles” that groups therapies in what we term therapeutically similar groups for treatment of a specific form of major depression. Our goal here is to identify treatment bundles that result in similar expected mental health outcomes. The implicit assumption we adopt is that obtaining similar outcomes from alternative treatments begins to approximate similar utility levels.¹⁹

We divide levels of depression into two classes: severe and less severe (hereafter, mild). In order to classify therapies into therapeutically similar treatment bundles, we have reviewed approximately 30 major clinical trials and meta-analyses from the clinical literature dealing with acute phase treatment.²⁰ This literature points to several key conclusions:

- 1) Psychotherapies of all kinds have been shown to result in superior outcomes compared to no treatment. When compared amongst themselves, the different forms of psychotherapy appear to have no significant differences in outcomes.

The AHCPR Guidelines Panel [1993] provides a summary and interpretation of the evidence on this point.²¹

- 2) For less severe forms of depression, psychotherapies alone, TCAs with medical management, TCAs alone, and SSRIs alone appear to produce comparable outcomes. All of the therapies tested produced significantly better outcomes than placebo treatments. Versions of these results have been reported in numerous large treatment trials and by meta-analyses of smaller clinical trials. Combination treatments with these as components also generate equivalent levels of efficacy for less severe forms of depression.
- 3) For more severe forms of depression, the bulk of the evidence suggests that TCAs alone, SSRIs alone, and combinations of drugs and psychotherapy have comparable levels of efficacy, and each results in superior outcomes compared to psychotherapy alone. Recently some evidence has emerged showing some extra improvement from the combination treatments relative to medication alone.²² We believe it is premature to conclude that combination treatments offer significantly higher levels of efficacy than do drugs alone (or with medical management, as is typically the case).

Based on these observations from the literature, we view all the major treatment technologies as offering comparable outcomes for the average care of less severe acute phase depression. For severe depression we view TCAs and SSRIs alone as comparable to each other and to combinations of TCAs and SSRIs with psychotherapy.

III.C. TREATMENT BUNDLES FOR DEPRESSION

To determine prices of treatment bundles for depression we use a data set consisting of insurance claims for four large self-insured employers that offered 25 health plans to 428,168 people. The data were obtained from MEDSTAT Inc. and contain information for the years 1991 through 1995. Information on drug claims, inpatient hospital treatment, outpatient visits,

diagnoses, procedures and the demographic characteristics of all employees are reported. The health insurance benefits offered to enrollees are generally quite generous relative to the general market for private health insurance in the U.S. The mental health benefits are especially generous relative to typical private insurance (this will become evident in the discussion about cost sharing below). During the five years observed there were important changes in the terms of mental health coverage. While the majority of plans represent so-called managed indemnity plans (90%-94%), the management of mental health care changed for a substantial number of enrollees during the five years. Beginning on January 1, 1994 about 33% of the enrollees' mental health coverage was "carved-out" to a specialty managed care company. In January of 1995 an additional 16% of enrollees had their mental health benefits carved-out.²³ These changes are expected to affect both the input prices and quantities of specific services delivered (e.g. visits). Managed care arrangements have also been shown to affect the general clinical strategies used in treating depression. Recent analyses by Berndt, Frank and McGuire (1997) and Wells et al (1996) show clear differences in treatment patterns between managed care plans and indemnity insurance, with managed arrangements being associated with a higher likelihood of using prescription drug treatments.

In developing our treatment bundles we focus on the outpatient claims and the prescription drug files. By focusing on outpatient treatment we reduce the number of observed severe cases of depression. Each outpatient and drug claim can accommodate two ICD-9 diagnostic codes. The point of departure was to identify cases of major depression. ICD-9 codes 296.2 (major depressive disorder - single episode) and 296.3 (major depressive disorder - recurrent episode) were used to define depression.²⁴ Using the diagnostic information and dates contained in the claims, we construct episodes of treatment. In the case of prescription drugs, we consider the number of days of treatment provided by the prescription as the time period for which an individual received care. We follow previous research in identifying episodes of treatment as ending when no treatment is received for a period of time.²⁵ Specifically, the **Practice Guidelines for Major Depressive Disorder in Adults** of the American Psychiatric

Association (APA [1993]) define an episode of depression as new if a diagnosis is preceded by a period of two months of not meeting clinical criteria for depression. Since we do not directly observe symptoms in claims data, we cannot make our claims-based definition of an episode of care correspond directly to an episode of illness.²⁶

In defining our episodes of care we use an eight week period without treatment to separate treatment episodes.²⁷ Applying these criteria, we defined 20,603 episodes of care for the five years, 1991 through 1995. Censoring of episodes occurred at both the beginning of 1991 and at the end of 1995. Because we cannot fully observe the treatment received for the censored cases, we confine our attention to the 13,324 uncensored episodes in which we observe at least eight weeks without treatment at both the beginning and end of the episode. In order to limit the samples to less severe forms of major depression we eliminated individuals with episodes involving inpatient hospital treatment at any time during the five years. This reduced the number of episodes to 10,368. Using information on procedures (e.g. type of visit) described by the CPT codes, we describe the composition of outpatient treatment that occurred within a treatment episode.

Drug treatment is based on the drug codes reported on the claim (NDC). The NDC classification of antidepressant medications revealed use of seven TCAs, three SSRIs, three MAOIs, four anxiolytics and four heterocyclics for treatment of depression.²⁸ The data show that 45% of the drug claims involved SSRIs, 22% TCAs, 19% anxiolytics and 10% heterocyclics. These figures are consistent with IMS aggregate national sales data for antidepressant medication reported by Berndt, Cockburn and Griliches [1996].

For this initial analysis we only consider “pure” treatments. That is, we only consider episodes of care that correspond directly to treatments tested in the clinical trials literature. In this way we can directly link the “price” of an episode of a well defined treatment to the price of other therapeutically similar treatments.

We identify nine major classes of treatment that have been proven effective in the treatment of depression: (i) psychotherapy alone, 6-15 visits; (ii) short term TCA treatment alone

or with medical management, 30-180 days; (iii) short term SSRI treatment alone or with medical management, 30-180 days; (iv) short term TCA treatment of 30-180 days with some psychotherapy; (v) short term SSRI treatment (30-180 days) with some psychotherapy. The four remaining treatments are identical to the last four above, except for the provision of anxiolytic medication.

As previously mentioned, when claims data was converted to uncensored episodes of major depression, 10,368 episodes of depression were identified. Based on the definitions noted above, the number of episodes treated with each of the nine pure protocol treatments was calculated. It is notable that of the 10,368 episodes identified, a substantial share of treatments (75% to 80%) do not resemble standard protocol treatments. For example, 1818 episodes (47% of the 3900) treated with psychotherapy alone consisted of a single visit. In addition, 1672 or 16% of all episodes received neither psychotherapy nor an antidepressant drug. The result was that the number of episodes receiving guideline standards of care was relatively small (20% to 25%). In order to improve the precision of the estimated mean “prices” of treatment bundles we aggregate several closely related bundles (e.g. short term SSRI treatment with an anxiolytic drug and short term SSRI treatment alone). The result was five treatment bundles used in the analyses reported here.²⁹ We also examine a set of 14 treatment bundles that relax the criteria for inclusion that defined the nine pure treatments discussed above. This larger set of treatments nearly accord with guideline standards and account for between 20% and 40% of episodes.

The interpretation of the observed patterns of care is complex. For instance, in the case of single visit episodes, those visits may have taken place for the purposes of “ruling out” major depression as the relevant condition to be treated in favor of a somatic condition or another mental disorder. In this case, the visit should not be viewed as “inappropriate treatment” but as an appropriate assessment. Similarly, the depression guidelines published by the Agency for Health Care Policy and research (AHCPR) state:

“Effective treatment rests on accurate diagnosis. The practitioner must

first determine whether the patient has a clinical depression or is simply suffering normal sadness or distress....For patients who have very mild cases of major depression or whose diagnosis is unclear and who are not in immediate danger or are not suffering significant functional impairment, the practitioner may want to schedule one or two additional weekly evaluation visits to determine whether symptoms will abate without formal treatment..." (p.36)

For this reason, distinguishing treatment and assessment is very difficult with claims data. The implication is that we are somewhat uncertain as to whether 20% to 40% of care lies on the production frontier or whether 30% to 45% of treatment are close to the frontier. We now examine the various treatment bundles in greater detail.

III.C.1. PSYCHOTHERAPY

Of the 10,368 episodes, 3900 were treated with psychotherapy alone. No distinction was made in the claims data between different types of psychotherapy. Considering the 2802 treatments involving 50 minute psychotherapy sessions, we find that 2094 received five or fewer visits and 1140 only a single visit.

One thousand ninety eight episodes were treated with psychotherapy sessions of twenty minute duration, without antidepressant medication (eight of those treatments included anxiolytic medication). Of those, 863 episodes were treated with just a single short visit, while 198 episodes were treated with between two and five short sessions. An additional 26 episodes were treated with some form of group therapy, with only half of those treatments having more than three visits.

While clinical trials indicate that individuals typically show partial response to psychotherapy by six weeks of treatment (with weekly sessions) and remission in twelve weeks, published guidelines for the treatment of acute phase depression do not indicate any demonstrated effectiveness for fewer than six visits. The benefits of short psychotherapy visits, in the absence of antidepressant medication, have not been studied and therefore cannot be considered either effective or ineffective treatment. Although clinical trials and published treatment guidelines indicate psychotherapeutic treatment is an effective treatment, in our data of

the 2802 episodes given this treatment, only 708 episodes (25%) can be considered to have completed a psychotherapy regimen that is consistent with guideline treatments.³⁰

III.C.2. ANTIDEPRESSANT MEDICATION

Claims data do not include information on how many days' medication was actually taken, so we use as a proxy the number of days of treatment for which a prescription was filled. Our data also do not provide adequate information on the dose of medication; moreover, the definition of an adequate dose varies by individual. For these two reasons, our estimates of individuals receiving clinically proven effective treatment may be conservative.

Of the 10,368 episodes considered, 224 were treated with TCA either alone (186) or in combination with anxiolytic medication (38). Of these 224 episodes, 65 (29%) were treated with less than 30 days of medication and 45 with ten or fewer days. Generally, the clinical literature (and the APA guidelines) indicate that while patients may show some improvement to antidepressant medication by the end of the first week, full response to acute phase depression may take four to six weeks.

An additional 765 episodes were treated with SSRIs either alone (635) or in combination with anxiolytic medication (130). One hundred five (17%) of these episodes were treated with fewer than 30 days of medication. Because individuals have different reactions to drugs, some individuals are appropriately treated with one class of antidepressants, and then switched to another class. In our sample, 470 episodes were treated with both TCAs and SSRIs.

III.C.3. USE OF OTHER PRESCRIPTION DRUGS

Several episodes were treated with drugs other than SSRIs and TCAs. In our sample 10 episodes were treated with MAO inhibitors, while 64 were treated with heterocyclics. An additional 131 episodes were treated with anti-anxiety medication alone, a protocol which has not been approved by the FDA for the treatment of depression. The use of anti-anxiety medication in the treatment of depression is controversial. The use of alprazolam may be appropriate, if other medication is contraindicated. There is no evidence for the efficacious use of other anxiolytic medications.³¹

III.C.4. COMBINATION TREATMENTS

The share of episodes treated with a combination treatment involving both psychotherapy and an antidepressant grew over the five years. Four hundred four treatments consisted of both some TCA and some psychotherapy, while 1491 included both SSRI and some psychotherapy. A large share of the episodes treated with combination treatments had three or fewer psychotherapy visits (48 percent). An additional 363 episodes were treated with some TCA, some SSRI and some psychotherapy.

III.C.5. COMPARISON WITH RESULTS FROM OTHER STUDIES

The patterns of care observed in this data set raise issues related to the likely effectiveness of treatment in the presence of efficacious treatment technologies. One potential criticism of the patterns of treatment bundle data presented above is that it is based on claims data. Claims data are useful in that the retrospective medical treatment of many individuals can be analyzed efficiently and at minimal expense. In addition, such observational data indicates the ‘real world’ practice of medicine. Claims data are also used for quality assessment by organizations constructing “report cards” on health care organizations. Yet claims data has been fairly criticized for several reasons. The accuracy of diagnoses and recorded data are sometimes questioned and omissions in records are common. For example, depression has been shown to be under-diagnosed by primary care physicians, and over-diagnosed by psychiatric clinicians.³²

Other studies have found less dramatic but corresponding treatment patterns for depression. The Medical Outcomes Study (MOS) consists of 635 individuals diagnosed with depression or with current depressive symptoms for whom data was collected by self-administered questionnaires, patient diaries, phone interviews, and health exams. The MOS found that 23% of depressed patients had used an antidepressant medication in the prior month or used it daily for a month or more in the prior six months. Of those patients using an antidepressant medication, 39% used an inappropriately low dose.³³

The MOS did not report number of psychotherapy visits. Instead it reported ‘counseling’, defining it as three or more minutes of counseling during the screening interview. This makes

comparison with published standards on care difficult. Although 90% of patients of mental health specialists were counseled, among general medical practitioners where most study participants were treated, only 20% of managed care and 40% of fee-for-service patients were counseled.

Another study of 88 outpatients enrolled in the NIMH Clinical Research Collaborative Program on the Psychobiology of Depression: Clinical Study found that only 19% of patients received an adequate dose and duration of antidepressant medication, while 24% received some anti-anxiety medication. Regarding psychotherapy visits, 44% were seen for at least one hour weekly.³⁴ Although these two studies have somewhat higher rates of treatments that have been shown to be efficacious than we observe in our claims data, these patients and their physicians knew they were participating in research studies, and since patients had sought care, one would expect to observe high rates of utilization. Thus the low levels of efficacious treatments found in the MOS and NIMH studies, while surprising, are consistent with the treatment patterns found in the claims data we observe here.

For our purposes of constructing price indexes for the treatment of depression, we must make a decision on whether to utilize the data suggesting treatment not consistent with FDA approvals and AHCPR guidelines. Since the interpretation of such treatments is problematic, we confine our attention to episodes of treatment defined as being consistent with AHCPR guidelines. Additional research on guideline-incompatible care is currently underway.

IV. PRICES OF TREATMENT BUNDLES

In Table 1 we report the average supply (PPI) and demand (CPI) “prices” of each of the five aggregated treatment bundles in 1995. Prices for the nine treatment bundles and their disaggregated components are reported in the appendix. The PPI in Table 1 measures the supply price, which includes both the payment made by the health plan and the patient’s out of pocket payments (OOPs) to the provider. The CPI reports the OOPs or consumer demand price components for the same bundles, i.e., the co-payments or deductible contribution made by the

patient/consumer.

{Insert Table 1 around here}

Table 1 reveals rather dramatic differences in the supply “price” of treatment bundles for depression. This is even the case for therapeutically similar bundles. For example, short term psychotherapy alone (5-15 visits) has an estimated price of about \$924 during the 1991 base year. Short term TCA treatment alone (30-180 days) in contrast is priced at about \$267 if assessment and medical management costs are included, and SSRI alone (30-180 days) is slightly lower at \$254 per episode. Note that all three of these treatments have similar levels of efficacy for treatment of acute phase less severe depression, even though the total costs per episode of treatment range by a factor of almost four, from \$924 to \$254.

Table 1 also shows even greater variation in the consumer demand price across treatments. For example, the demand price for the psychotherapy alone bundle is \$151, while TCA and SSRI treatments alone are about \$25 and \$11. The implied patient co-payment/deductible percentage contributions for short term psychotherapy alone, TCA alone, and SSRI alone are 16%, 9% and 4%, respectively. From the patient’s vantage, therefore, the required OOPs percentage is highest for psychotherapy alone and lowest for SSRI alone.

The estimated prices for the combined treatments are generally based on a smaller number of cases and should therefore be viewed as less reliable. The most common form of mixed treatment is a combination of at least one psychotherapy visit along with a 30-180 day protocol level of treatment with an SSRI. In that case the supply price is \$762 and the demand price \$103 (14% of supply price). Psychotherapy with TCA is estimated to have a supply price of \$791 and a demand price of \$124 (16% of supply price). Thus the relative supply prices are quite comparable largely due to the extra monitoring associated with TCAs. Table 1 reports the supply and demand prices for 1995 in parentheses in the final two columns of the table. Nominal supply prices for all the five treatment bundles fell over the five years. In some cases the price decreases were substantial such as the 30% fall in the price of psychotherapy alone. This was due primarily to a decrease in the price of psychotherapy visits as opposed to a reduction in the

number of visits within the acceptable range. Specifically, the mean number of visits for episodes treated with psychotherapy alone fell from 8.05 visits in 1991 to 7.7 visits in 1995. While the fall in drug treatment supply prices appears to be largely due to a fall in quantity (duration of drug treatments in the SSRI alone category fell from 90 to 69 days), this result is primarily an artifact of censoring and quantity remains essentially constant.

V. CONSTRUCTION OF PRICE INDEXES

We now outline the construction of a PPI and a CPI for the treatment of depression. Recall that based on information from the medical literature, we are able to collect different types of treatment into groups of basically similar expected efficacy. We began with the nine bundles of treatment that are similarly efficacious for the treatment of acute phase mild depression. In order to increase the precision of the estimated mean bundle prices we aggregated the nine bundles into five. In this section we present price indexes for the five bundles. The appendix contains price index results using the 14 bundles based on the broader criteria for inclusion of observed treatments.

V.A. PRICE INDEXES EXAMINED

Alternative formulae for constructing price indexes correspond to differing assumptions on the extent of *ex ante* substitutability among the treatment bundles. Denote the quantity of bundle i in year t as B_{it} , and its supply price as P_{it} ; set the base period (say, 1991) quantities and prices at B_{i0} and P_{i0} .

One possible approach is to assume that in spite of their therapeutic similarity, the treatment bundles are completely non-substitutable, with idiosyncratic patients expected to respond to only one form of treatment. The Laspeyres fixed base-period quantity weight formula in Eqn. (1) is implied by this zero substitutability assumption, and results in the following price index formula:

$$I_t^L = \frac{\sum_{i=1}^5 P_{it} B_{i0}}{\sum_{i=1}^5 P_{i0} B_{i0}} \quad (3)$$

A fixed weight Paasche index is computed in an analogous manner, but where the fixed quantity weights are those of the final time period.

An alternative extreme assumption is that of perfect substitutability among the five treatment bundles. In such a case, one simply computes the average price over all episodes treated in year t , and divides this by the average price over all treated episodes in the base period:

$$I_t^P = \frac{\sum_{i=1}^5 \frac{P_{it} B_{it}}{B_t}}{\sum_{i=1}^5 \frac{P_{i0} B_{i0}}{B_0}} \quad (4)$$

where $B_0 = \sum_{i=1}^5 B_{i0} = 0$ and B_t is analogous.

Two other alternatives involve less extreme assumptions. If one assumes that the elasticity of substitution between treatment bundles is unity, then one can construct the Cobb-Douglas index as

$$I_t^C = \frac{\prod_{i=1}^5 P_{it}^{w_i}}{\prod_{i=1}^5 P_{i0}^{w_i}} \quad (5a)$$

which in logarithmic form is written as

$$\ln I_t^C = \sum_{i=1}^5 w_i \ln \left(\frac{P_{it}}{P_{i0}} \right) \quad (5b)$$

where the w_i are fixed expenditure share weights, computed as, say, the mean expenditure shares

for each of the five bundles over the 1991-1995 time period.

Finally, as Diewert [1976] has shown, one can compute a Tornqvist discrete approximation to the continuous Divisia index that makes no a priori assumption about the elasticity of substitution among the five treatment bundles. It is worth noting, incidentally, that use of the discrete Divisia index is consistent with the recommendations of the CPI Commission, whereas use of the other index numbers is not. Letting I_t^D denote the value of the discrete Divisia price index, calculate this index as

$$\ln\left(\frac{I_t^D}{I_{t-1}^D}\right) = \sum_{i=1}^5 \bar{w}_{it} \ln\left(\frac{P_{it}}{P_{i,t-1}}\right) \quad (6a)$$

where the time varying mean expenditure shares $\bar{w}_{it} \equiv \frac{(w_{it} + w_{i,t-1})}{2}$, and

$$w_{it} \equiv \frac{P_{it} B_{it}}{\sum_{i=1}^n P_{it} B_{it}} \quad (6b)$$

The Laspeyres and Paasche price indexes can involve either fixed or sequentially updated or chained quantity weights. In the fixed weight Laspeyres we employ 1991 weights, whereas in the fixed weight Paasche we employ 1995 weights. Laspeyres and Paasche indexes with chained weights are also computed. A common finding from other price index research is that the chained Divisia index falls in between the chained Laspeyres and Paasche indexes (Diewert 1976).

To this point we have not specified precisely what prices P_{it} and quantities B_{it} one would employ in these index number calculations. In the case of the Laspeyres index of Eqn. (4), we use mean treatment bundle “prices” for each of the five aggregate bundles (built up from the nine efficacious bundles identified in the data). We follow the same approach for the other indexes as

well. Note also that while the above discussion has focused on the construction of a PPI (supply price), the construction of a CPI (demand price) proceeds in an analogous manner.

V.B. RESULTS OF PRICE INDEXES 1991-1995

Tables 2 and 3 report the results of constructing the PPI and CPI versions of the price indexes discussed above, as well as of using the five aggregate treatment bundles. The results for Laspeyres, Paasche, Perfect Substitutes and Cobb-Douglas indexes reported on Table 2 offer a consistent view of price movements for acute phase treatment of major depression. Specifically, the fixed weight Laspeyres, Paasche and Cobb-Douglas indexes all indicate supply "price" reductions of about 30% over the 1991-1995 period. The fixed weight Laspeyres index shows the largest fall, to an index value of 68.4 compared to values of 70.6 for both the fixed weight Paasche and the chained Laspeyres. The perfect substitutes index value for the PPI fell to 77.1 by 1995. The chained and fixed weight Paasche indexes, as well as the chained discrete Divisia, show similar price declines of about 28%; the 1995 indexes are 71.8, 71.9 and 71.2, respectively (1991=100).

Thus, although all price indexes reveal a decline in the supply price of treating acute phase depression in a manner consistent with AHCPR guidelines, the extent of the decline varies modestly with the choice of weights and substitution assumptions. The fact that we observe this sensitivity to choice of weights in turn implies that weights must have changed during the 1991-95 time period.

Among the changes occurring in the market for mental health services, we expect to observe substitution across treatment bundles over time, from more psychotherapy intensive and expensive care to greater utilization of lower cost drug and less psychotherapy intensive care. Figure 1 reflects the changes in the quantity weights for the five treatment bundles. This figure reveals several important trends that have been generally noted in the treatment of depression. It should be pointed out that 1995 represents a departure from the trend in the four previous years.³⁵ One important trend is the shift towards treatments which make use of SSRI drugs as inputs. This is evidenced by the increasing shares of mixed treatments using SSRI drugs and the general

growth in use of SSRI drugs alone. The diminishing role of psychotherapy alone is shown in the Figure (and appendix tables). For example from 1991 to 1994, the psychotherapy alone bundle quantity share fell from 40% to 21%, although it rebounded to 48% in 1995. Finally, treatments that use TCA drugs have declined as a share of all treatments for depression.

All of these price reductions are rather dramatic and contrast sharply with changes in the published medical PPIs. The final three rows of Table 2 report the BLS' health services PPI, the psychotherapeutics category of the pharmaceutical PPI, and the inpatient general hospital PPI. All three of these indexes estimate price increases for mental health related services. The psychotherapeutics index rises 20% during the 1991-1995 period while the inpatient treatment PPI increases about 10% between 1992 and 1995. The differential between the indexes for treatment of depression and say, the psychotherapeutics PPI is one the order of 15% per year. One implication of these results is that analysis of expenditure data for mental health services is very likely confusing the price and volume components of care increases.

Table 3 reports the demand price or CPI results. As in the case of the PPI, the demand prices for acute phase treatment of depression have moved downward during the 1991-1995 period. The price reductions have ranged from 22% for the Cobb-Douglas and perfect substitution indexes to about 30% for the fixed weight Laspeyres. As with the PPI, the sequentially updated / chained Laspeyres, and Paasche indexes reveal smaller price declines (about 22% and 26%, respectively) than their fixed weight counterparts over the full 1991-1995 time period. This result shows that fixed weight indexes can be biased downward. The similarity between the PPI and CPI results in part reflect the stability in benefit design within the data set analyzed. Nevertheless there are some differences to note that are reflected in the Divisia index values. For the PPI, the largest changes in price occur in 1993 and 1995. The CPI for depression shows large price reductions in 1992 and 1995 reflecting perhaps the differences in the level of OOPs, stemming from both shifts of utilization across treatment bundles (as they are substituted) having different cost sharing provisions (e.g. psychotherapy vs. drug treatments) as well as price falls within bundles (which are also reflected in the PPI).

In the bottom two rows of Table 3 we report the BLS' medical care CPI (or MCPI) and the CPI for prescription drugs. These serve to contrast the behavior of the price of treating acute phase depression with the more common indexes that are applied to health and mental health services. As with its PPIs, the BLS CPI indexes that relate to mental health treatment have both increased substantially during the 1991-1995 period. The MCPI increases nearly 27% while the prescription drug CPI increases by almost 18%. Again, the average annual differential between the depression indexes and the MCPI is on the order of 10 - 15%. Both the supply and demand price growth differentials from the BLS indexes are about three times larger than those reported by Cutler et al. (1998) for heart attack treatment.

The analyses of mental health spending performed by HCFA and actuaries in the analysis of legislative proposals typically rely on the MCPI and its components to project growth and composition of spending. An important implication of our results is that the composition of spending will result in a significant underestimate of growth in the quantity of effective care delivered, and may also incorrectly project total spending into the future.

One concern with drawing inferences based on the indexes for treatment of acute phase depression reported above is that by using relatively strict criteria for identifying effective care (guideline standards), we omit much of the care actually delivered which is not on the production frontier. We consider the implications of this point by relaxing the guideline criteria to include treatment episodes that were "near misses" of the guideline standards. This led us to define 14 treatment bundles which accounted for between 20% and 40% (depending on the year) of all treatment episodes. The resulting recalculation of the indexes are quite similar both in terms of the qualitative finding of falling index values between 1991-1995 and the magnitude of the fall. These index calculations are reported in the appendix. Thus, to the extent that we are able to expand criteria to increase substantially the share of total treatments on the frontier, we obtain price indexes with robust time trends from 1991 to 1995.

VI. CONCLUDING OBSERVATIONS

The results reported above suggest that by constructing a price index for treatment of a specific illness that uses the episode of care to define quantity, that attempts to incorporate outcome information in defining output, and that focuses on transactions prices for both suppliers and consumers, one may obtain results that depart substantially from the MCPI and specific health care PPIs (Dranove, Shanley and White [1991]). We began our investigation with the notion that this might well be the case as suggested, or conjectured, in prior research (Scitovsky [1967], CPI Commission [1996]). Our results should be viewed as suggestive that the MCPI and PPIs may be particularly prone to distortion for medical treatments where 1) managed care has potentially large impacts on both input prices and the composition of treatment; and 2) there has been important technical change in treatment methods. This is certainly the case with treatment of major depression. The substantial fall in prices for all index formulations is dramatic and points to potentially important misinterpretations of spending data on mental health services over the past ten years. Specifically, our work points to the possibility that recent increases in spending are primarily generated by quantity increases in the volume of care delivered rather than input price increases. Nevertheless, our results represent only an initial examination of price indexes for the treatment of depression. A number of important issues need to be addressed before we can confidently arrive at conclusions about the movement of prices and quantities for treatment of depression.

First, we have not accounted for quality differences across similarly effective treatment bundles. Characteristics of an individual's specific illness (e.g. co-morbid substance abuse, risk of suicide), the treatment (e.g. likelihood and type of side effects) and the delivery system (e.g. managed care) may affect the preferences of specific individuals (and their agents) for different treatment technologies. For this reason hedonic prices need to be estimated and corresponding quality adjusted price indexes should be constructed. A second issue relates to the potential precision of estimated costs and shares for specific treatment bundles. While the data set used in the analysis consisted of over 400,000 people, many of the specific treatment bundles in a given

year contained only a small number of cases for estimating the “average price”. Obtaining still larger data bases is an important next step in the research program. A third issue concerns the characterization of the mental health production function used in the analysis above. We have defined treatments in terms of their adherence or proximity to patterns of care defined by practice guidelines. While this has the benefit of approximating an isoquant for the expected outcome of treatments for depression, it also implies a production function that has a “step function” shape. It is clear that there are treatments for particular classes of patients below and above the guideline levels of care where the expected outcome is positive and less, or greater, than that implied by the guideline treatments, thereby suggesting a more traditional shape for the production function. For this reason we believe that developing a price index based on a broader characterization of the mental health production function is necessary to meet the normative assumptions underlying price indexes. We expect to find that the majority of treatments will lie on the production frontier. Nevertheless, our findings concerning the significant number of treatments involving a single therapy visit or inappropriate drug treatments does suggest that an important portion of the care received for treatment of depression may not be on the frontier.

The approach to price index calculation proposed here also raises practical problems if it is to be implemented by public statistical agencies. One potential problem concerning BLS implementation is that the retrospective claims data we have employed are typically not available in real time, but instead come with a lag of nine months to two years. Two possibilities come to mind that would still permit computation and publication of price indexes for episodes of treatment in a timely manner. First, the BLS could consider adding treatment questions to its survey form, questions that essentially replicate the information we have obtained from the retrospective claims that have enabled us to construct average price by treatment bundle. Alternatively, the BLS could utilize the annual time series of supply price and demand prices of the final different treatment bundles, and then regress these treatment bundle prices on the BLS’ official PPI or CPI data on physician office visits, pharmaceuticals and selected other variables;³⁶ parameters from such a regression equation could then be used along with existing CPI or PPI

data to generate a preliminary predicted treatment bundle price. This preliminary predicted price could then be substituted into the preliminary price index, which could be calculated and published in a timely manner, and then be revised as additional data become available.

Finally, a difficult issue we have not dealt with in this paper is how the CPI for treatment of episodes of a disease should deal with the fact that the typical insured patient has prepaid his/her health insurance which then covers the non-deductible and non-copayment components of the supply price. Integrating the *ex ante* cost of insurance with the OOPs component to produce a readily interpretable MCPI is an important issue for future research.³⁷

TABLE 1
1991: AVERAGE COSTS OF TREATMENT*

		Number of Psychotherapy Visits	Drug Regimen	N	Anxiolytics Allowed?	PPI	CPI
1	Short term psychotherapy	5-15 visits	none	78 (197)	no	924 (646)	151 (95)
2	Short term TCA treatment	none	30-180 days	18 (8)	allowed	267 (117)	25 (39)
3	Short term SSRI treatment	none	30-180 days	33 (66)	allowed	254 (214)	11 (21)
4	Short term psychotherapy and TCA	1-15 visits	30-180 days	25 (13)	allowed	791 (391)	124 (59)
5	Short term psychotherapy and SSRI	1-15 visits	30-180 days	41 (128)	allowed	762 (582)	103 (90)

*1995 values in parentheses

TABLE 2
SUPPLY PRICE (PPI) INDEX
FIVE AGGREGATE TREATMENT GROUPS*

	1991	1992	1993	1994	1995
Laspeyres - fixed	100	98.4	86.7	79.2	68.4
Chained	100	98.4	86.1	81.9	70.6
Paasche - fixed	100	98.3	88.9	82.1	71.9
Chained	100	99.3	84.9	82.0	71.8
Perfect Substitutes	100	99.3	81.5	78.2	77.1
Cobb-Douglas	100	99.7	87.4	82.2	70.6
Divisia - chained	100	98.9	85.6	81.9	71.2
Health Services PPI*				100	102.4
Psychotherapeutics PPI*	400	430.7	453.5	464.7	481.7
	(100)	(107.6)	(113.4)	(116.2)	(120.4)
Inpatient treatment PPI*		100	102.4	106.0	109.9

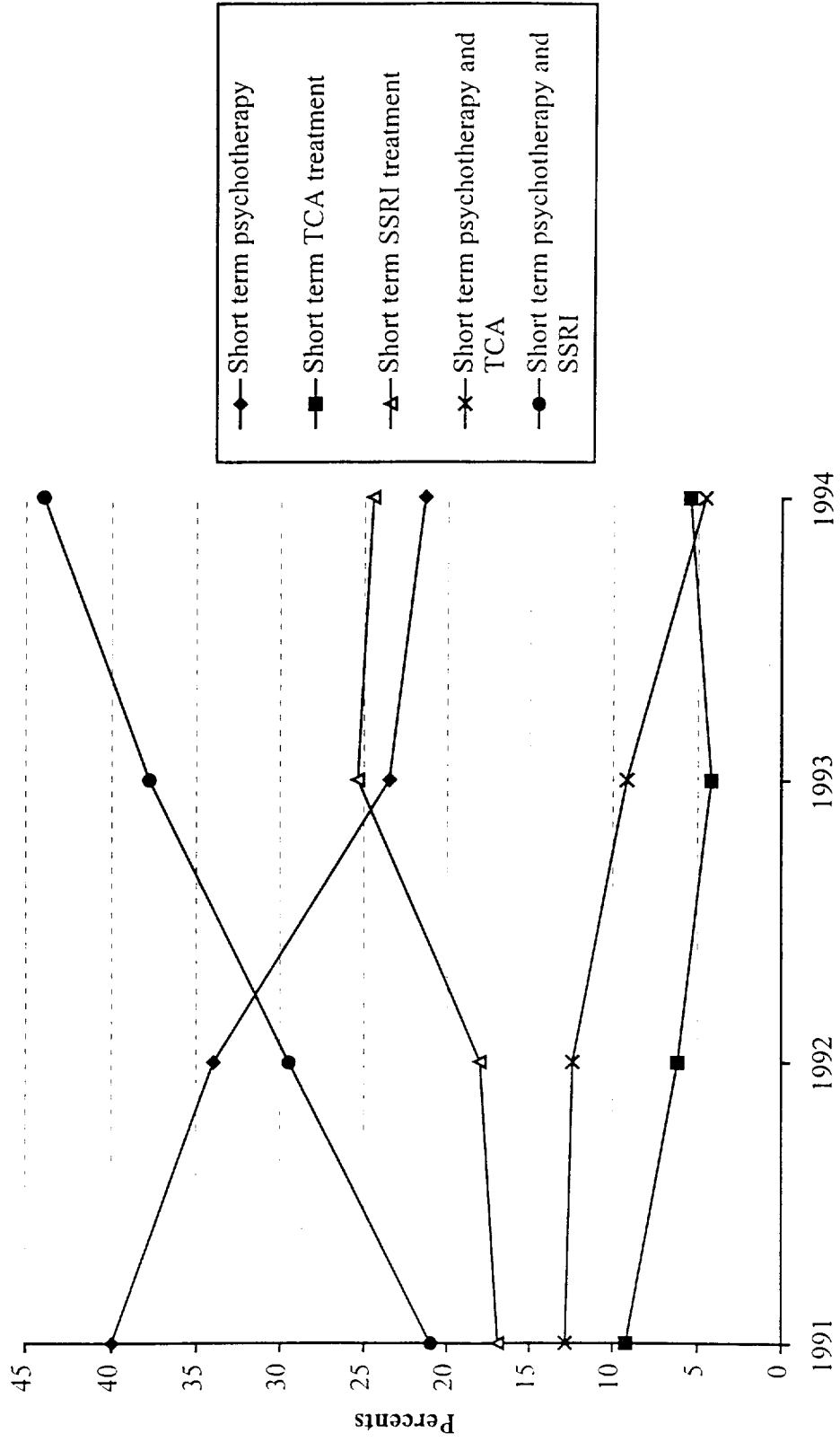
* Indexes normalized to 1991 base in parentheses

TABLE 3
DEMAND PRICE (CPI) INDEX
FIVE AGGREGATE TREATMENT GROUPS*

	1991	1992	1993	1994	1995
Laspeyres - fixed weight	100	91.3	83.7	79.6	70.2
Chained	100	91.3	84.0	81.8	77.7
Paasche - fixed weight	100	87.6	84.5	80.9	71.9
Chained	100	90.9	83.7	83.0	73.8
Perfect Substitutes	100	89.5	74.2	72.1	77.7
Cobb-Douglas	100	89.5	74.2	72.1	77.8
Divisia	100	91.2	83.8	82.3	73.7
Medical Care Services*	177.1	190.5	202.9	213.4	224.2
	(100)	(107.5)	(114.6)	(120.5)	(126.6)
Prescription Drugs*	197.7	214.7	223.0	230.6	235.0
	(100)	(107.5)	(111.7)	(115.5)	(117.7)

* Indexes normalized to 1991 base in parentheses

Figure 1
Quantity Shares of Treatment Bundles



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APPENDIX TABLE A

PRICE INDEX (PPI)

Including protocols somewhat more or less than guideline treatment

Fourteen treatments

Includes 30% of sample

See Table 3

	1991	1992	1993	1994	1995
Laspeyres	100	95.9	87.4	80.8	66.5*
Chained Laspeyres	100	95.9	85.9	80.9	72.2
Paasche	100	98.3	89.6	83.1	72.2
Chained Paasche	100	95.3	84.7	79.8	69.4
Perfect Substitutes	100	95.5	84.9	81.8	65.5
Cobb-Douglas	100	96.1	86.4	80.8	69.5
Divisia	100	95.7	85.2	80.2	70.5

* Due to no price in one cell

APPENDIX TABLE B

PRICE INDEX (CPI)

Including protocols somewhat more or less than guideline treatment

Fourteen treatments

Includes 30% of sample

See Table 3

	1991	1992	1993	1994	1995
Laspeyres	100	92.9	94.1	85.7	75.8*
Chained Laspeyres	100	92.9	94.8	91.6	92.3
Paasche	100	90.6	88.1	83.8	76.9
Chained Paasche	100	91.2	90.1	87.8	80.5
Perfect Substitutes	100	89.7	80.4	79.5	74.5
Cobb-Douglas	100	90.9	89.9	85.1	79.6
Divisia	100	92.3	92.1	89.3	85.5

* Due to no price in one cell

NOTES

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- ¹ See Griliches [1962] and Gilbert [1961, 1962].
- ² The BLS medical care price index rose about 59% from 1951-65, whereas the percentage increases she found for acute appendicitis were 87%, maternity care 72%, otitis media in children 68%, cancer of the breast 106%, and fracture of the forearm from 55 to 315%. Scitovsky [1967], pp. 1183-4.
- ³ U.S. Senate Finance Committee, Advisory Commission To Study The Consumer Price Index [1996], p. 60.
- ⁴ See Greenberg et al. [1993].
- ⁵ For more detailed discussion, albeit somewhat dated, see Getzen [1992] and Newhouse [1989].
- ⁶ For further discussion, see Armknecht and Ginsburg [1992], particularly pp. 124-142, and Fixler [1996].
- ⁷ Taken from U.S. Senate Finance Committee [1996], Table 2, p. 63.
- ⁸ On this, see Dranove, Shanley and White [1991].
- ⁹ For further discussion, see Armknecht-Ginsburg [1992], Cardenas [1996], Daugherty [1964], Ford-Sturm [1988], and Ginsburg [1978].
- ¹⁰ For further discussion in the context of a CPI for pharmaceuticals, see Cleeton, Goepfrich and Weisbrod [1992].
- ¹¹ For further discussion of the PPI, see Catron-Murphy [1996] and Early-Sinclair [1983]; also see Heffler et al. [1996].
- ¹² Catron-Murphy [1996], Table 4 and Appendix 2.
- ¹³ American Psychiatric Association [1994], p. 161.
- ¹⁴ See American Psychiatric Association [1993].
- ¹⁵ Kessler et al. [1994], p. 12.
- ¹⁶ American Psychiatric Association [1993].
- ¹⁷ See Beck et al. [1979], Elkin et al. [1989], Frank et al. [1990], Kupfer et al. [1992], and Beach et al. [1990].
- ¹⁸ It should be noted that there is considerable variation in side effects among the TCAs. See Berndt, Cockburn and Griliches [1996], Table 1, pp. 142-3 for details.

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- ¹⁹ We recognize this is only an approximation. This is especially true for depression where the constellation of side effects across treatments can differ significantly. Further indications of differences in preferences are reflected in the differential compliance with SSRI and other drug treatments (see Crown et al., 1996).
- ²⁰ See Busch, Frank and Berndt [1996].
- ²¹ See Depression Guideline Panel [1993]; also see Irene Elkin et al. [1989].
- ²² See APA [1993].
- ²³ Specialty carve-out arrangements occur when a portion of the health risk is managed separately from the rest of health care. For another discussion of these arrangements see Frank, McGuire and Newhouse (1995).
- ²⁴ We exclude the remaining 296 ICD-9 diagnoses as well as some other broad depression related conditions, such as neurotic depression.
- ²⁵ Kessler et al. [1980].
- ²⁶ For a useful discussion of defining episodes of care, see Keeler et al. [1986] and Wingert et al. [1995].
- ²⁷ As implied above, we count days without treatment only after the number of days of supply in a drug prescription has been exhausted, thereby assuming full compliance with the daily recommended dosage.
- ²⁸ The anxiolytics are not indicated by the FDA for treatment of depression, but could be prescribed for comorbid conditions associated with depression and/or as responses to side effects from antidepressants.
- ²⁹ We report the disaggregated results in the appendix.
- ³⁰ For a related discussion, see Katon et al. [1992].
- ³¹ See Wells et al. [1994, 1996] for further discussion.
- ³² See Schulberg et al. [1985].
- ³³ Wells et al. [1994].
- ³⁴ Keller et al. [1986].