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# Consumer Demand for Pharmaceuticals:

## Heuristics or Rational Choice?


**Abstract**

How do financial factors affect consumer demand for drugs? Standard theory predicts that consumers will respond to out of pocket costs for drugs. At the same time, there is considerable evidence that consumers have poor information about such costs. In such a case, behavioral economics predicts that consumers may employ heuristics to deal with this information shortfall. For example, they may base their demand decisions, not on prices, but on their perceptions about whether their coverage is generous or not. Using a unique set of data that includes information on what consumers pay for of pocket for brand name and generic drugs, we test these two hypotheses. We find strong evidence to indicate that consumer demand is unresponsive to out of pocket drug costs. Instead, consumers appear to be taking a heuristic approach based on the generosity of their drug coverage in forming their demand decisions.

# INTRODUCTION

## Background

The rising cost of prescribed medicines is a critical public policy issue confronting policymakers, consumers, and drug manufacturers. Spending on prescription medications is the fastest growing segment in health care. Pharmaceuticals account for a substantial share of health care expenditures in the United States. In recent years, they have ranked third after hospital care expenditures and expenditures on physician services. For example, in 2000 hospital care accounted for 32.8% of health care expenditures in the United States, while physician services accounted for an additional 22.8%. During this same period, 9.7% of expenditures were incurred for pharmaceuticals (Berndt 2002).

In terms of actual dollars, the pharmaceutical industry's 9.7% share of health care expenditures in 2000 translates into nearly $122 billion, or approximately $450 per person (Berndt 2002). Pharmaceutical costs have trended upward, both in absolute terms and as a share of total health care expenditures. Thus, such expenditures accounted for 5.1% of total health care expenditures in 1980, 5.6% in 1990, 5.9% in 1995 and, as mentioned above, 9.7% by 2000 (Berndt 2002).

In gauging the impact of efforts to achieve cost control, and in understanding the nature of competition in this market, it is necessary to have better evidence on how consumers demand pharmaceutical products. Most available evidence has found the demand for pharmaceuticals to be quite insensitive or even unresponsive to price. The conventional wisdom to explain these results is that the wrong prices are being used. For instance, average wholesale price has often been used in pharmaceutical demand studies, even though these prices bear little relationship to what the individual consumer pays for out of pocket. In their study of drug demand, Rosenthal et

al. (2003) use payments made by drug purchasers to wholesalers as their price measure. The researchers note, however, that

> The appropriate price to measure in a traditional consumer demand model is the out-of-pocket cost of the drug to the consumer. For a variety of reasons this measure is not available. (p. 12)

They find little evidence that prices affect consumer demand, a result they attribute to price measures that bear little resemblance to consumer out-of-pocket prices. In this view, once the correct prices are used, more accurate assessments of price sensitivity will be attained. Thus standard neoclassical theory offers the reasonable prediction that consumers are sensitive to their out of pocket costs -- the relevant prices to them.

An alternative hypothesis, however, recognizes that consumers have difficulty observing the prices of health care treatments and may thus rely on heuristic approaches to guide their health care purchases. In the context of pharmaceutical products, for example, consumers may have difficulty observing the prices that they must pay out of pocket, because this price depends on the product of their coinsurance rate (about which they may reasonably good information) and actual drug prices (about which they may have little information). Moreover, insurance coverage for pharmaceutical products often involves a complex mix of co pays, deductibles, and coinsurance. Often, these co pay and coinsurance structures are multi-tiered. Given this complexity, it may be quite challenging for the consumer to determine what the relevant out of pocket price for an individual drug is. In such a circumstance, the consumer may take a heuristic approach. For example, he may base his decision on whether to seek or fill prescriptions on whether his perceived coverage is good, fair or poor, while knowing little about the actual prices of drugs and the complexities of his insurance plan. In this case, the consumer's out of pocket cost *share* may

provide a closer approximation to his heuristic decision-making rule than actual out of pocket price.

Using a unique set of data -- the Medical Expenditure Panel Survey (MEPS) -- that includes consumer-specific information on out of pocket prices and cost shares for brand name and generic pharmaceutical products, we estimate the demand for pharmaceuticals used to treat 12 major diseases. The results are striking. Overwhelmingly, we find that out of pocket cost share, not out of pocket price, affects demand. For both brand name and generic drug products, a higher out of pocket cost share leads to significantly lower drug use. In contrast, out of pocket price has no discernable effect on drug use. Thus, the results are strongly consistent with the notion that consumers take a heuristic approach in determining their demand for pharmaceutical products, relying, not on actual out of pocket prices (which may be difficult for them to observe), but on the perceived generosity of their coverage.

These results have implications, not only for the theory of consumer demand, but for understanding the nature of competition in the pharmaceutical industry. If consumers base their demand decisions, not on price, but on the perceived generosity of their coverage, the utility of the price mechanism for defining a drug product space is blunted.

The remainder of this paper is divided in five parts. Part I reviews existing evidence on price competition in pharmaceutical markets. Part II discusses the importance of heuristics in economic decision-making, and discusses the evidence on consumer information about health care costs, including pharmaceuticals. Data, empirical models, and estimation issues are described in Part III, and the results presented in Part IV. Part V summarizes the results and their policy implications.

## I. PREVIOUS WORK

The literature on the price sensitivity of the demand for pharmaceuticals is limited and inconclusive. Some studies have suggested that demand is unresponsive to price (O'Brien 1989; Van Vliet 2001; Rosenthal et al. 2003), while others (Ellison, Cockburn, Giliches and Hausman 1997; Rizzo 1999; Stern 1996) have found some evidence that demand exhibits greater price sensitivity. Advertising may affect price sensitivity for specific drugs. Thus, in a study of the demand for antihypertensive drugs, Rizzo (1999) reports that demand is price elastic when advertising is low and becomes inelastic only when advertising efforts intensify. Stern (1996) also notes that demand becomes more price sensitive in less advertising intensive drug markets. This suggests that advertising serves to differentiate products, lowering price sensitivity.

Our study focuses on demand at the level of the individual consumer and as a result, the role of health insurance is particularly relevant. There is very little evidence on how drug benefits affect the price elasticity of demand for pharmaceuticals. Mortimer (1997) reports the surprising result that prescription drug demand is least price sensitive among consumers who have no insurance for prescription medicines. Leibowitz, Manning, and Newhouse (1985) report that the demand for prescribed medicines declines with higher coinsurance rates. Although that study did not explicitly estimate the impact of drug prices on demand, it does suggest that insurance affects consumers demand for pharmaceuticals.

As noted earlier, at the consumer level, the out of pocket cost to the consumer for a drug is the correct price according to standard demand theory. On the other hand, limited price information may limit consumer's ability to use such information effectively, causing them to rely instead on heuristic approaches, such as whether they perceive their drug coverage to be good or

not. We will test these hypotheses below. Before turning to empirical testing, however, the following section discusses the role of heuristics in economic decisions and what role it may play in the consumer demand for pharmaceuticals.

## II. HEURISTICS AND CONSUMER CHOICE

That heuristics frame economic decisions is not a new idea. Yet its prominence in the applied microeconomics literature is a relatively recent phenomenon. By heuristics, we mean the use of rules of thumb or other simple approximations in place of optimal decision-making that comports to the assumptions of standard economic theory. Often, heuristics are used when agents lack sufficient information to behave optimally.

The study of heuristics in economic decision making and the development of behavioral economics has been influenced by a number of authors, most notably by the work of Kahneman and Tversky (1974; 1979),[1] as well as by Herbert Simon's work on bounded rationality (1998).

### Heuristics and the demand for pharmaceuticals

In the present application, we investigate whether consumers might employ heuristics in their pharmaceutical demand decisions. This hypothesis is made plausible by two considerations. First, the literature indicates that consumers and even physicians have quite limited information regarding the prices of health care services, including pharmaceuticals. Second, there is good evidence that consumers employ short cuts or heuristics in their decision-making when they lack sufficient information to frame their choices in a manner more consistent with rational optimization objectives.

Regarding the first point, a number of studies highlight limited consumer and physician information regarding health care prices. Silcock et al. (1997) surveyed 1000 general practitioners

[1] For a review of this work, see Laibson and Zeckhauser (1998).

in the United Kingdom to ascertain the accuracy with which they understood the prices of pharmaceuticals. Only one-third of the price estimates given by these physicians were within 25% of the actual prices. These results are consistent with an earlier study by Long et al. (1983), which concluded that "…physicians generally incorrectly estimate prices…" (p. 243).

Consumers have even less information about prices than do physicians. Gaynor and Polachek (1994) quantified this effect, concluding that their measure of incomplete patient information exceeded that for physicians by a factor of 1.5. The researchers also found that incomplete patient information was particularly large relative to physicians for:

> Smaller ticket items, less frequently purchased items, more heavily insured items, and treatments associated with severe illness…. (pp. 829-830)

Moreover, consumers appear to be quite unresponsive to health care information in their decisionmaking, including comparative price information. In reviewing the evidence on efforts to provide consumers with health information, Sofaer and Gruman (2003) note that:

> Decades of research in health promotion demonstrates that information, even if it succeeds in increasing awareness and knowledge, is rarely if ever enough to lead, without other supports, to behavior change. (p. 153)

Consistent with this view, Hibbard and Weeks (1987) report evidence indicating that most insured individuals do not engage is such "consumerist" activities as seeking out information on health care, and basing their decisions to see physicians and follow their orders on costs. Consistent with these findings, in a subsequent study (Hibbard and Weeks 1989) the researchers report that an intervention providing consumers with comparative price information for medical treatments had little effect on health care utilization and costs.

With regard to out of pocket costs for a pharmaceutical product, the information requirements may be quite substantial. Consider an individual who must pay coinsurance for his drug costs. Then his out of pocket costs $P^c$ will be equal $\gamma P^m$, where $P^m$ is the market price and $\gamma$

is the coinsurance rate. In fact, however, many insurance plans include co pays and deductibles, and divide drugs into multiple tiers, based on whether the drug is preferred by the plan or not. In this case, it may be that it is very challenging for consumers to ascertain their out of pocket prices.[2]

While estimating prices directly may be quite difficult, consumers are likely to have some notion of whether their drug coverage is "generous" or not. Clearly, more generous plans will pay a larger share of costs. If consumers base their demand for pharmaceuticals on this heuristic, then demand may be more sensitive to *cost share* than to *out of pocket price.*

## III. DATA, VARIABLES, AND ESTIMATION

### Data

This study uses data from the Medical Expenditure Panel Survey (MEPS). This database, cosponsored by the Agency for Healthcare Research and Quality (AHRQ) and the National Center for Health Statistics (NCHS), provides nationally representative estimates of medical treatments, pharmaceutical and other health care expenditures, health status, health insurance coverage, and sociodemographic and socioeconomic characteristics for the civilian, non-institutionalized population in the United States.[3] Our sample includes working age adults between 25-64 years of age, and covers the period 1996-2000. The MEPS validates information on medical care utilization by contacting health care providers and pharmacies identified by survey respondents.

[2] Moreover, if consumers have difficulty gauging the quality or other nonprice attributes of drugs, this would also serve to mitigate the value of the price mechanism in their treatment decisions.

[3] The MEPS sample was chosen as a nationally representative subsample of the ongoing National Heath Interview Survey (NHIS) conducted by the National Center for Health Statistics, and may be linked to the NHIS database as well. The MEPS survey respondents were interviewed in person. The survey achieved a response rate of 77.7 percent (see Cohen, Monheit, Beauregard, et al., 1996 for further details).

The MEPS data consist of s number of databases. The MEPS Household survey includes person-year information on health care utilization and expenditures and socioeconomic and demographic factors. To this basic file, we have linked information from the MEPS Prescribed Medicines and Medical Conditions databases. The Prescribed Medicines data includes drug specific information on utilization, numbers of prescriptions filled, and patient and total expenditures. Because this database include NDC codes, it was possible to separate brand name and generic drugs. The Medical Conditions data includes information on specific illnesses, which allowed us to identify drug use for common medical conditions. Using these databases, we were able to construct measures of annual numbers of prescriptions filled, out of pocket prices per drug, and patient cost share for all brand name and generic drugs and for 12 major disease areas.

Each year, the MEPS database is drawn from approximately 200 primary sampling units. These units are counties or groups of contiguous counties, and are stratified by census region and state urban status, and sociodemographic characteristics (Cohen 1997). Because of this feature of MEPS, we are able to construct market level measures of particular variables of interest, such as prescribed medicine prices.

The MEPS database has a complex survey design which, in addition to sample stratification by sampling units, includes clustering and over sampling of certain subgroups such as minorities. Therefore, we perform all statistical analyses using weights provided in MEPS to correct mean values

**Dependent variables**

Dependent variables are measured as the natural logarithms of annual numbers of brand name and generic prescriptions filled for all drugs and for drugs designed to 12 treat major disease areas. Variables that pertain to brand name drugs have the prefix “brd”, while generics have the

prefix "gen." All brand and prescription drugs filled are denoted as lnbrdDRUG and lngenDRUG, respectively. We examine the following illnesses: asthma (lnbrdASTHMA and lngenASTHMA); chronic obstructive pulmonary disease (lnbrdCOPD and lngenCOPD); hypertension (lnbrdHTN and lngenHTN); diabetes (lnbrdDIABETES and lngenDIABETES); lipid disorders (lnbrdLIPID and lngenLIPID); anxiety and related personality disorders (lnbrdANXIETY and lngenANXIETY); back problems (lnbrdBACKPROB and lngenBACKPROB); headache, including migraine (lnbrdHEADACHE and lngenHEADACHE); sprains and strains (lnbrdSPRAINS and lngenSPRAINS); upper respiratory infections (lnbrdRESPINFECT and lngenRESPINFECT); intestinal infections (lnbrdINTESTINFECT and lngenINTESTINFECT); and urinary tract infections (lnbrdURINFECT and lnURINFECT).

**Explanatory variables**

**Cost share and out of pocket price variables.** Cost share is measured as the patient's annual share of total expenditures of drugs designed to treat one of the twelve major illnesses (e.g., brdASTHMASHR, genASTHMASHR, etc.), and as overall cost share for all branded and generic drugs. Out of pocket prices are measured as the average price paid by the patient for a prescription for each of the twelve illnesses considered (e.g., brdASTHMAPRICE, genASTHMAPRICE, etc.), and as overall average out of pocket prices for all brand and generic drugs.

**Other explanatory variables.** Other explanatory variables include sociodemographic factors (age, gender, race, income, and educational attainment) and measures of health status. In particular, we control for a subject's overall assessment of health and for the number of major chronic illnesses the subject has. Controlling for these health status measures should mitigate concerns about adverse selection; namely, that sicker patients will select to plans that have more

generous prescribed medicines benefits.[4] In addition, we include binary variables controlling for year from which the observation is taken, census region, and whether the subject lives in an urban or rural location. Table 1 provides the names and summary statistics for the variables used in this study.

**Empirical models**

For the *ith* medical condition, we estimate equations of the form:

$$(1)\ \ln RxCOND_i = \alpha_0 + \alpha_1 SLFPRICE_i + \alpha_2 SLFSHR_i + \boldsymbol{\theta X} + \mu,$$

where

| | | |
|---|---|---|
| $\ln RxCOND_i$ | = | the natural logarithm of annual prescriptions filled to treat the *ith* medical condition; |
| $SLFPRICE_i$ | = | average out of pocket price for drugs to treat the ith medical condition; |
| $SLFSHR_i$ | = | patient's out of pocket cost share for drugs to treat the ith medical condition; |
| X | = | a vector of other covariates that affect the demand for prescribed medicines; |
| $\alpha_0$-$\alpha_2$, $\boldsymbol{\theta}$ | = | coefficients to be estimated; and |
| $\mu$ | = | an error term. |

Standard theory would predict that out of pocket price rather than cost share is the important cost factor affecting demand. That is, theory predicts that $\alpha_0 < 0$ and $\alpha_2 = 0$. On the other hand, if consumers cannot observe prices and use a heuristic based on whether they perceive their coverage to be generous, we would expect that $\alpha_0 = 0$ and $\alpha_2 < 0$. We test these hypotheses

[4] In fact, however, we found very weak correlations between any of our health measures and the generosity of insurance as measured by the patient's out of pocket Rx cost share.

empirically using equations as described in (1) above. We also estimate additional models that include only SLFPRICE and SLFSHR, respectively.

## IV. RESULTS

Table 2 shows pharmaceutical demand results for branded drugs; Table 3 provides similar information for generics. In each case, we see that a higher patient cost share is associated with significantly less drug utilization. In contrast, the coefficients on out of pocket prices are positive and quite small in magnitude.

(INSERT TABLES 2,3)

Other results appear reasonable and in expected directions. Thus, older people and people in worse health are heavier users of both brand name and generic drugs. Controlling for health status, more educated subjects use pharmaceuticals more intensively. Better-educated individuals may have a better understanding of the value and use of drugs and more resources available for purchasing these treatments. Females use drugs significantly more. In contrast, exhibit significantly lower demand for drugs.

Might these findings reflect endogeneity in the key explanatory variables; namely, brdSLFSHR and brdSLFPRICE? To investigate this issue, we reestimated the equations shown in Tables 2 and 3, using aggregated market-level measures for brdSLFSHR and brdSLFPRICE, respectively.[5] The results are given in Table 4. As may be seen, for both brand name and generic drugs, cost share continues to have a negative and significant effect on demand while out of pocket prices are unrelated to demand.

[5] The MEPS database was collected from some 190 market areas. Although it is not possible to identify these areas by name for confidentiality reasons, the MEPS database does provide a variable allowing one to identify which subjects came form the same market areas. Using this information, we calculate d mean out of pocket cost share and mean out of pocket price for each market area. In making these calculations for any subject *i, i's* values were excluded. That is, only subjects in the market besides individual i were used.

(INSERT TABLE 4)

Do these results continue to hold for drugs designed to treat specific medical conditions? Table 5 provides the evidence from our sample of twelve common medical conditions. In the interest of brevity, only price and cost share results are shown. The full sets of regressions (available from the authors on request) were generally similar to the results reported in Tables 2 and 3 for the remaining variables.

Overwhelmingly, the results indicate that demand responds, not to out of pocket prices, but to patient's cost share. Turning first to brand name drugs, in every instance we see that cost share has a negative association with drug use, a relationship that achieves statistical significance in 9 out of 12 cases. In contrast, out of pocket price never bears a significant relationship to price and has a very small and usually positive estimated coefficient. The results are even stronger with respect to the generics. In this case, cost share demonstrates a negative and significant relationship to drug use in 11 or 12 cases. Once again, there is no evidence that a higher price reduces demand.

(INSERT TABLE 5)

## V. CONCLUSION

This study has examined the effect of cost on prescribed medicine use. We have tested the null hypothesis that out of pocket cost effects demand against the alternative that cost share is more important in driving demand. The null hypothesis is justified on the grounds of standard neoclassical theory. The alternative hypothesis rests on evidence that both physicians and their patients have poor information on the prices of drugs, and the observation form behavioral economics that consumers employ heuristic approaches to aid decision-making when they lack

sufficient information to observe factors such as price that motivate behavior according to standard theory.

The results are strongly consistent with the alternative hypothesis. Lacking good information about pharmaceutical prices, consumers appear to be basing their treatment decisions on a perception of whether their coverage is generous or not. Such a heuristic would be reasonably approximated by patients' out of pocket cost share. Consistent with this view, we find that out of pocket cost share has a negative and significant effect on demand across a wide variety of drug classes.

Most previous literature has found that consumer demand is insensitive to price, and the failure to demonstrate that price has a significant effect on demand is common. The popular explanation has been that the "wrong" prices have been used. For example, measures of average wholesale price have typically been employed, whereas out of pocket prices would seem to be the conceptually more relevant measure. While this view is reasonable, it is predicated on the assumption that consumers have enough information to know what these conceptually correct prices are. In our study, we find that price continues to bear little relationship to demands, even when these conceptually correct out of pocket price measures are used.

Our findings have implications for both conceptual models of consumer choice and for understanding the implications of competition and regulation in the pharmaceutical industry. At the conceptual level, our findings suggest that models of consumer choice need to account for heuristic approaches when significant information gaps persist in consumer knowledge of price. Given that consumer information gaps in health care are pervasive, the use of heuristics may be relevant for other decisions besides pharmaceuticals such as the demand for physician care and other forms of medical treatment. This is an important direction for future research.

To the extent that consumers do not appear to be basing their drug treatment decisions on price, our results call into question the practice of defining relevant drug product markets according to whether drugs are competing with each other on price. Instead, the nature of insurance coverage may have a more important effect than price on how drug producers are able to compete for consumers.

From a regulatory perspective, our findings suggest that price regulation and the expansion of drug coverage will have asymmetric effects. While higher prices will shift cost onto the consumer with little effect on utilization, higher cost sharing will both increase the consumer's burden and reduce utilization. Therefore, price regulation and expansion of coverage will exert differential effects on the consumer. But in a world where consumers respond to out of pocket prices, these effects would be symmetric. That is, if the price of the drug is $100 and the consumer's cost share is 50%, he will respond in the same manner to a 10% price increase or a 10% increase in his cost share. But our results suggest that only the increase in cost share, not price, will reduce demand.

Our results suggest that the traditional model of consumer demand does not precisely fit the consumer demand patterns we observe. Nonetheless, we believe that neoclassical notions of constrained optimization and rational behavior remain relevant. Consumers attempt to make optimal prescribed medicine demand decisions, but are constrained by their incomplete information. At the same time, the evidence suggests that previous efforts to provide consumers of health care better information, including comparative price information, have met with little success (Sofaer and Gruman 2003). Until more effective ways are found to convey price information to aid consumers in their health care decisionmaking, reliance on heuristics may continue to guide consumer choice.

**TABLE 1. VARIABLE NAMES, DESCRIPTIONS, and MEANS**

| Variable Name | Description | Branded Drugs (n=30,419) | Generics (n=26,340) |
|---|---|---|---|
| lnbrdDRUG | natural log of numbers of brand name drug prescriptions filled annually | 1.53 | … |
| lngenDRUG | natural log of numbers of generic drug prescriptions filled annually | … | 1.13 |
| brdSLFSHR | share of brand name drug costs paid for out of pocket | 0.51 | … |
| genSLFSHR | share of generic drug costs paid for out of pocket | … | 0.60 |
| brdSLFPRICE | out of pocket price per brand name prescription filled | 22.56 | ... |
| genSLFPRICE | out of pocket price per generic prescription filled | … | 9.03 |
| FEMALE | binary variable (BV) = 1 if subject is female else = 0 | 0.62 | 0.62 |
| INCLT10K | BV = 1 if family income is less than $10,000 else =0 | 0.07 | 0.08 |
| INC2030K | BV = 1 if family income is $20,000-$30,000 else=0 | 0.12 | 0.13 |
| INC3050K | BV = 1 if family income is $30,000-$50,000 else=0 | 0.24 | 0.24 |
| INC50KUP | BV = 1 if family income is $50,000 or more else = 0 | 0.46 | 0.43 |
| AGE2534 | BV = 1 if subject is between 25-34 years of age else =0 | 0.22 | 0.24 |
| AGE3544 | BV = 1 if subject is between 35-44 years of age else =0 | 0.28 | 0.29 |
| AGE5564 | BV = 1 if subject is between 55-64 years of age else=0 | 0.22 | 0.20 |
| HISPANIC | BV = 1 if subject is Hispanic else=0 | 0.15 | 0.17 |
| AFRICAM | BV = 1 if subject is African American else=0 | 0.12 | 0.12 |
| OTHRACE | BV = 1 if subject is other non-Caucasian race else=0 | 0.03 | 0.03 |
| NOHS | BV = 1 if subject has less than high school education else=0 | 0.08 | 0.09 |
| SOMEHS | BV = 1 if subject attended but did not graduate from high school else=0 | 0.12 | 0.14 |
| SOMECOLL | BV = 1 if subjected attended but did not graduate from college else=0 | 0.22 | 0.22 |
| COLLGRAD | BV = 1 if subject is college graduate else=0 | 0.14 | 0.13 |
| GRADSCHL | BV = 1 if subject attended graduate school else=0 | 0.10 | 0.09 |
| MARRIED | BV = 1 if subject is married else=0 | 0.74 | 0.72 |
| HEALTHFAIR | BV = 1 if subject's health is fair else=0 | 0.17 | 0.18 |
| HEALTHGOOD | BV = 1 if subject's health is good else=0 | 0.35 | 0.35 |
| HEALTVGOOD | BV = 1 if subject's health is very good else=0 | 0.31 | 0.30 |
| HEALTHEXC | BV = 1 if subject's health is excellent else=0 | 0.09 | 0.08 |
| NUMCHRON | number of chronic conditions subject has | 0.86 | 0.86 |
| MIDWEST | BV = 1 if subject is from Midwest Census Region else=0 | 0.23 | 0.23 |
| SOUTH | BV = 1 if subject is from South Census Region else=0 | 0.39 | 0.37 |
| WEST | BV = 1 if subject is from West Census Region else=0 | 0.20 | 0.23 |
| MSA | BV = 1 if subject lives in Metropolitan Statistical Area else=0 | 0.78 | 0.77 |
| YR1997 | BV = 1 if observation is from 1997 else=0 | 0.26 | 0.26 |
| YR1998 | BV = 1 if observation is from 1998 else=0 | 0.18 | 0.18 |
| YR1999 | BV = 1 if observation is from 1999 else=0 | 0.18 | 0.19 |
| YR2000 | BV = 1 if observation is from 2000 else=0 | 0.19 | 0.19 |

**TABLE 2. DEMAND ESTIMATES -- ALL BRAND NAME DRUGS (n=30,419; Adj R-SQ = 0.29)**

**Dependent variable: lnbrdDRUG**

| Variable | Parameter Estimate | t Value | Pr > \|t\| |
|---|---|---|---|
| INTERCEPT | 2.02*** | 51.31 | <.0001 |
| brdSLFSHR | -0.36*** | 21.70 | <.0001 |
| brdSLFPRICE | 0.0008*** | 6.09 | <.0001 |
| FEMALE | 0.29*** | 25.29 | <.0001 |
| INCLT10K | 0.07*** | 2.71 | 0.0066 |
| INC2030K | 0.01 | 0.60 | 0.5496 |
| INC3050K | 0.034 | 1.70 | 0.0885 |
| INC50KUP | 0.02 | 1.12 | 0.2613 |
| AGE2534 | -0.43*** | 26.06 | <.0001 |
| AGE3544 | -0.28*** | 18.87 | <.0001 |
| age5564 | 0.16*** | 9.98 | <.0001 |
| HISPANIC | -0.23*** | 13.20 | <.0001 |
| AFRICAM | -0.24*** | 13.05 | <.0001 |
| OTHRACE | -0.29*** | 7.97 | <.0001 |
| NOHS | -0.12*** | 4.90 | <.0001 |
| SOMEHS | -0.06*** | 2.90 | 0.0037 |
| SOMECOLL | 0.06*** | 3.70 | 0.0002 |
| COLLGRAD | 0.09*** | 5.10 | <.0001 |
| GRADSCHL | 0.13*** | 6.08 | <.0001 |
| MARRIED | -0.04** | 2.58 | 0.0100 |
| HEALTHFAIR | -0.39*** | 15.43 | <.0001 |
| HEALTHGOOD | -0.69*** | 28.36 | <.0001 |
| HEALTHVGOOD | -0.88*** | 34.28 | <.0001 |
| HEALTHEXC | -1.03*** | 33.60 | <.0001 |
| NUMCHRON | 0.32*** | 49.74 | <.0001 |
| MIDWEST | 0.12*** | 6.78 | <.0001 |
| SOUTH | 0.16*** | 9.88 | <.0001 |
| WEST | -0.09*** | 4.85 | <.0001 |
| MSA | -0.01 | 0.54 | 0.5923 |
| YR1997 | -0.03 | 1.51 | 0.1301 |
| YR1998 | 0.02 | 1.21 | 0.2262 |
| YR1999 | 0.05*** | 2.88 | 0.0040 |
| YR2000 | 0.05*** | 2.80 | 0.0051 |

*** Statistically significant at the 1% level, two-tailed test.
** Statistically significant at the 5% level, two-tailed test.

**TABLE 3. DEMAND ESTIMATES -- ALL GENERIC DRUGS (n=26,340; Adj R-SQ = 0.28)**

**Dependent variable: lngenDRUG**

| Variable | Parameter Estimate | t Value | Pr > \|t\| |
|---|---|---|---|
| INTERCEPT | 2.06*** | 54.85 | <.0001 |
| genSLFSHR | -0.42*** | -25.77 | <.0001 |
| genSLFPRICE | 0.01*** | 12.17 | <.0001 |
| FEMALE | 0.11*** | 9.80 | <.0001 |
| INCLT10K | 0.020 | 0.77 | 0.4390 |
| INC2030K | -0.07*** | 3.23 | 0.0012 |
| INC3050K | -0.09*** | 4.31 | <.0001 |
| INC50KUP | -0.10*** | 5.02 | <.0001 |
| AGE2534 | -0.27*** | 16.98 | <.0001 |
| AGE3544 | -0.17*** | 11.27 | <.0001 |
| AGE5564 | 0.13*** | 7.74 | <.0001 |
| HISPANIC | -0.16*** | 9.62 | <.0001 |
| AFRICAM | -0.10*** | 5.51 | <.0001 |
| OTHRACE | -0.10*** | 2.96 | 0.0030 |
| NOHS | -0.05** | 2.00 | 0.0459 |
| SOMEHS | -0.003 | 0.15 | 0.8817 |
| SOMECOLL | -0.03 | 1.65 | 0.0984 |
| COLLGRAD | -0.01 | 0.62 | 0.5352 |
| GRADSCHL | 0.01 | 0.48 | 0.6290 |
| MARRIED | -0.03** | 2.35 | 0.0188 |
| HEALTHFAIR | -0.50*** | 21.09 | <.0001 |
| HEALTHGOOD | -0.85*** | 37.06 | <.0001 |
| HEALTHVGOOD | -1.02*** | 42.24 | <.0001 |
| HEALTHEXC | -1.10*** | 37.06 | <.0001 |
| NUMCHRON | 0.22*** | 35.95 | <.0001 |
| MIDWEST | 0.08*** | 4.44 | <.0001 |
| SOUTH | 0.08*** | 4.92 | <.0001 |
| WEST | -0.01 | 0.32 | 0.7502 |
| MSA | -0.03** | 2.45 | 0.0145 |
| YR1997 | 0.02 | 1.12 | 0.2634 |
| YR1998 | 0.03 | 1.42 | 0.1554 |
| YR1999 | -0.005 | 0.27 | 0.7883 |
| YR2000 | 0.02 | 1.26 | 0.2091 |

*** Statistically significant at the 1% level, two-tailed test.
** Statistically significant at the 5% level, two-tailed test.

**TABLE 4. DEMAND ESTIMATES USING MARKET-LEVEL MEASURES FOR PAITENT COST SHARE AND OUT OF POCKET PRICES**

| Market measure | Branded drugs | Generic drugs |
|---|---|---|
| Cost share | -0.14** | -0.28*** |
| Out of pocket price | -0.00008 | 0.002 |

*** Statistically significant at the 1% level, two-tailed test.
** Statistically significant at the 5% level, two-tailed test.

**TABLE 5. EFFECTS OF COST SHARE AND PRICE ON DEMAND FOR TWELVE CONDITIONS**

**BRAND NAME DRUGS**

| Condition | Sample size | Cost share effect | Price effect |
|---|---|---|---|
| Asthma | 1,241 | -0.52*** | 0.007 |
| Diabetes | 1,964 | -0.24*** | 0.0007 |
| Anxiety disorders | 1,019 | -0.54*** | 0.007 |
| Chronic obstructive pulmonary disease | 1,230 | -0.11 | -0.00007 |
| Hypertension | 5,176 | -0.08* | -0.001 |
| Lipid disorders | 1,715 | -0.30*** | 0.0004 |
| Headache | 1,098 | -0.20*** | 0.0002 |
| Back problems | 1,236 | -0.15* | 0.001 |
| Sprains and strains | 607 | -0.11 | 0.0005 |
| Upper respiratory infection | 3,166 | -0.11*** | 0.00008 |
| Intestinal infection | 687 | -0.06 | 0.001 |
| Urinary tract infection | 834 | -0.10* | 0.007 |

**GENERIC DRUGS**

| Condition | Sample size | Cost share effect | Price effect |
|---|---|---|---|
| Asthma | 952 | -0.18* | 0.005 |
| Diabetes | 841 | -0.21** | 0.002 |
| Anxiety disorders | 804 | -0.50*** | 0.009** |
| Chronic obstructive pulmonary disease | 1,289 | -0.24*** | 0.006 |
| Hypertension | 2,956 | -0.16*** | -0.001 |
| Lipid disorders | 286 | -0.27* | 0.002 |
| Headache | 949 | -0.34*** | 0.006** |
| Back problems | 1,568 | -0.22*** | 0.004 |
| Sprains and strains | 806 | -0.19*** | 0.004 |
| Upper respiratory infection | 3,348 | -0.08*** | 0.0007 |
| Intestinal infection | 824 | -0.11** | 0.0003 |
| Urinary tract infection | 870 | -0.05 | 0.003 |

*** Statistically significant at the 1% level, two-tailed test.
* Statistically significant at the 10% level, two-tailed test.

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