"The Demand for Prescription Drugs: An Analysis of U.S. States"

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Abstract

This paper explains the variation observed in consumer spending on prescription drugs among US states. It concludes that expenditures on prescription drugs are primarily a function of public health issues and not the result of differences in access to medical care. Three variables: percentage of the population over sixty-five, the obesity rate and the percentage of the population that smokes account for much of the variation across states in per capita prescription drug use. This suggests that public health programs to reduce obesity levels and smoking rates may have a large effect on prescription drug use.

I. <u>Introduction</u>

The U.S. spends more than 90 billion dollars a year on prescription drugs alone, or more than one percent of the entire Gross Domestic Product. Between 1997 and 1999 prescription drug expenditures grew nearly 200 times faster than overall national health expenditures (chart 1). At the turn of the twentieth century, the average US citizen was spending $327.71 a year on prescription drugs (see Table 1). But per capita prescription drug use varies widely among the fifty US states. Some states have per capita prescription drug spending of more than $400 while other states spent half that much. Thus, it becomes crucial to account for the significant divergence in prescription drug use between the various states. An accurate understanding of the causes resulting in the aforementioned variation would permit prescription suppliers to employ a state-specific rather than national prescription drug program. Likewise it might permit implementation of public health strategies to reduce spending on prescription drugs. The new state-

specific drug program would ultimately lead to an increase in efficiency and a decrease in costs to both the suppliers and buyers in the prescription drug market while simultaneously providing better health care.

This paper explains the variation observed in consumer spending on prescription drugs among US states. It concludes that expenditures on prescription drugs are primarily a function of public health issues and not the result of differences in access to medical care. Three variables: percentage of the population over sixty-five, the obesity rate and the percentage of the population that smokes account for much of the variation across states in per capita prescription drug. This suggests that public health programs to reduce obesity levels and smoking rates may have a large effect on prescription drug use.

II. **Background**

Suraratdecha (1996) noted the need for a state specific prescription drug program after reaching the conclusion that, "all states should not be regarded as a single homogeneous group." The article also points to the percentage of the population that is over sixty-five in each state as a possible cause for the variation in prescription drug usage. If this proves to be the case, the impact of these findings on the prescription drug market would be extensive.

Armed with this knowledge, health care providers would be able to better estimate the needs of their customers in each state. It is an unfortunate truth that as we increase in age the likelihood of being affected by disease also increases. A pharmaceutical provider would be able to determine which diseases appear more frequently among the elderly and in response provide prescription medication more

efficiently, economically and rapidly. In addition to aging, obesity is a significant source of health problems. Obesity is associated with a variety of risk factors for cardiovascular disease such as hypertension, elevated cholesterol, and type two diabetes as well as increased risk of cancer, stroke, osteo-arthritis and other diseases (Must et al. 1999). Consequently, obesity may contribute to prescription drug use.

Mortimer (1997) considers the effects of managed care in comparison to self-paid insurance plans. She concluded that managed care sectors have a tendency to be more price elastic than self-paid sectors. In short, a small change in prescription prices for the managed care sector results in the substitution of generic drugs for name brand drugs. In other sectors consumers tended to be less sensitive to price changes and remained loyal to the brand name prescription drugs.

This could be one possible cause for the variation in prescription drug use noted above. If it turns out that managed health care sectors are more prevalent in certain areas of the country, say the South or Midwest, we would be able to postulate, for the time being, that this is a factor in the variation of drug use in these areas. If a large majority of the population uses managed health care in the South or Midwest they would be more inclined to use prescription drugs because of their low cost. This increased use could possibly result in yet another outcome, that being over diagnosis.

The possibility of over diagnosis is considered by Bonuck, Memmott and Aron (2001). This article maintains that a reduction in the price of prescriptions leads individuals, in particular the elderly, to over diagnose themselves. It instills a better safe than sorry attitude in the elderly in regard to drug usage. In addition, prescription drugs

might serve as a substitute for physician care. States with higher numbers of people per physician would then have higher prescription drug use.

Lundin (2000) concludes, "that physicians' habits and tastes acquired by patients are important." The knowledge of both the physician and the patient of what drugs are available play a large role in drug usage. For example if you live in the South a doctor may give you several prescriptions to combat the common flu, whereas a patient suffering from the same illness in the North might receive only one prescription from his physician that is capable of producing the same result.

Kolassa (1995) argues that if a physician was to alter his or her prescribing habits due to drug prices they might use older drugs because of their low cost, which may result in the same scenario as above. It would take more low cost alternatives to equal the results of the higher priced cutting edge drugs. In response, as income increases people are able to afford more qualified physicians. This results in a lower rate of prescription drug use due to the physician's knowledge of superior drugs. Per capita income is also effective in accounting for the use of discretionary prescription drugs such as Propecia or acne preventative drugs. As income rises people are able to allocate a larger portion of income to discretionary drugs or luxury drugs

III. Limitations

Initially one would think of a large number of possible causes for the variation. Unfortunately, due to the inability to attain, or accurately account for, certain potential causes the study was limited as to what was included in the analysis.   Some possible causes that did not make the final analysis included the public or societal acceptance of

certain prescription drugs. While the analysis was unable to numerically address this issue we must be mindful that it may be an influencing factor on the conclusions drawn herein. In the end, these types of issues would have to be considered using a sensitivity analysis. Another possible variable that did not make the final analysis was the substitutability of over the counter medications for prescription medications. An educated consumer may be aware of possible sicknesses he or she is inflicted with and, rather than seek a physician's help, take over the counter medications to combat the illness e.g. ibuprofen is available in over the counter two hundred mg tablets – the prescription dose is six hundred mg so some patients would just take three of the two hundred mg tablets and avoid a visit to the doctors. Again, this data was unavailable and impractical to generate but may have had some significance in explaining the variation. One final variable that may have some effect, but also was not included, was the extent of the physician's knowledge of the prescription drugs available in the market place. Similar to what Kolassa (1995) discussed, if a physician is unaware of new prescription drugs he or she will prescribe older medications that may require larger doses or multiple medications.

IV. <u>Data and Analysis</u>

Based on the discussion above, we regressed per capita prescription drug usage on per capita income, persons per physician, obesity rate, percentage of the population over 65, percentage of the population without insurance, percentage of the population that smokes and the percentage of the population that is enrolled in HMOs. Data was collected from Thomas (2001), *The Statistical Abstract of the U.S.*, and the Center for Disease Control's Behavioral Risk Factor Surveillance System. It was expected that as all

of the independent variables increased (except for persons per physician and persons without health insurance) an increase in per capita prescription drug use would be observed. It was believed that as the number of persons per physician and persons without health insurance increased the rate of prescription drug use would decrease.

The initial regression revealed that a two-step regression would be required in order to compensate for the correlation between several of the independent variables (Persons Per Physician and Income, Obesity Rate and Income and HMO membership with income and People Per Physician). The results from the initial regression can be viewed in table two. These correlations can easily be attributed to the following reasons: It was expected that as income goes up the number of persons per physician will go down as indicated by the inverse correlation. This is the result of physicians locating themselves around high-income densely populated urban regions. Obesity rates and income were found to be negatively correlated because as per capita income increases people can afford to purchase healthier foods and also have the ability to allot more time to exercise due to their increase in leisure time (Sobal and Stunkard, 1989). Since income and education are also closely related, it can also be assumed that higher income people are making healthier decisions as income increases, thereby reducing the rate of obesity in the state. The correlation between income and HMOs is likely the result of faster increases in medical care costs in high-income states.

The final analysis of the data, as Suraratdecha (1996) anticipated, revealed the fact that the percentage of the population over sixty-five was most closely correlated to the rate of prescription drug use in each state. Table 2 shows that a one percent increase in the population over 65 increases annual per capita spending on prescription drugs by

more than $17. This could be attributable to several factors, one of the most obvious being, the relationship between getting old and becoming ill. As a person ages, he or she becomes increasingly susceptible to illness. This is attributable to the fact that after a person passes the age of roughly twenty-five, the body begins to gradually die as cell growth begins to slow down. Without the body's ability to effectively fight off disease and the effects of aging, a person becomes increasingly reliant on drugs to compensate for the body's shortcomings. While the miracle of modern pharmaceuticals has undisputedly increased life expectancy, the natural consequence is the body's components now have to perform for a longer period of time then at any time in our evolutionary history. The body's various parts are not suited to the increased longevity and, as a result, there is a demand for new types of medications for problems caused by increased age.

The second independent variable that proved to be helpful in explaining the per capita expenditures on prescription drugs was the rate of obesity. Table 2 shows that a one percent increase in obesity increases annual per capita spending on prescription drugs by more than $7.60. This could be attributable to several factors. As a person becomes heavier the organs in his or her body become more taxed as carrying out their daily functions become increasingly difficult. For instance, the energy expelled by a normal heart in an average sized individual may increase dramatically as the body weight of that same individual nears obesity and the heart is required to circulate the blood thru an increasing number of blood vessels. It is this increased workload on the organs that makes them more prone to failure or reduced efficiency. The individual then becomes more dependent on prescription drugs to assist the organs in carrying out there daily

functions. Another explanation as to the increase in prescription drugs usage among obese individuals is their increased likelihood to contract diabetes. Along with the increases in prescription drug use as a direct result of diabetes, this disease, unfortunately, increases the bodies chance of contracting other ailments such as heart disease, kidney failure and vision irregularities. The secondary effects of the disease require additional expensive medicines to treat complications and can substantially increase expenditures on prescription drugs for a state having a large number of diabetics. Certain public policies were recently instituted such as tax deductions for spending on approved weight loss programs. These types of public policies may persuade members of the obese population to increase their attempts at losing weight. Currently obese individuals can deduct taxes on weight loss programs as far back as 1998.

The final independent variable that was helpful in explaining per capita prescription drug use was the percentage of the population that smokes. A one percent increase in smokers leads to more than a $4 increase in per capita prescription drug spending. It is a well-known fact that smoking is detrimental to your health. Studies have shown that smoking increases the body's risk of contracting diseases such as Cancer and Heart Disease. As with obesity, the secondary effects of smoking drastically increase the amount of per capita prescription drug spending, due in part to the high cost of medications to treat the secondary diseases resulting from smoking.

Neither people per physician, per capita income, the percentage of uninsured, or percent enrolled in an HMO had any significant impact on per capita prescription drug use. The number of people per physician was included under the assumption that as the rate of people per physician decreases physicians would be better able to monitor their

patients and as a result diagnose them more frequently. This increase in the diagnosis rate would ultimately lead to an increase in prescription outlays by each individual. It was expected that based on this increase a negative correlation would appear between the amounts of people per physician and drug expenditures in each state. This was not the case.

Per capita income was included because higher income might increase access to medical care and permit purchases of more expensive medications. Access to medical care does not seem to be an important determinant of prescription drug expenditures. For similar reasons, increases in the percentage of the population without health insurance were expected to decrease the rate of prescription drug use. People without health insurance must pay full price for their prescriptions and as a result will tend to purchase less.

The final variable that was used in hopes of explaining the variation in drug use was the percentage of the population that was enrolled in HMOs. Given that HMO's tend to have good prescription drug plans, it was assumed that as the percentage of the population covered by HMOs increases the rate of prescription drug use would increase. This would be the result of the availability of low cost prescriptions to HMO members. As before, this proved not to be the case.

V. <u>Conclusions</u>

The data indicate that expenditures on prescription drugs are primarily a function of public health issues and not the result of differences in the quality of medical care or access to physicians. While not every independent variable proved useful in explaining

the variation observed in the dependent variable, we are able to conclude that as the population ages their reliance on prescription drugs increase. This also holds true for the rate of obesity, in that as the mean body mass of the population increases the rate of prescriptions utilized by individuals also increases. The percentage of the population that smokes was also helpful in explaining the rate of prescription drug use. The recent introduction of certain public policies (tax deduction for weight loss programs and anti smoking campaigns) may result in a larger percentage of healthy individuals among the population thereby decreasing per capita spending on prescription drugs among US states. Other initiatives to improve public health may also have the effect of reducing expenditures on prescription drugs.

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Appendix

Chart 1

AVERAGE ANNUAL PERCENTAGE GROWTH FROM PREVIOUS YEAR
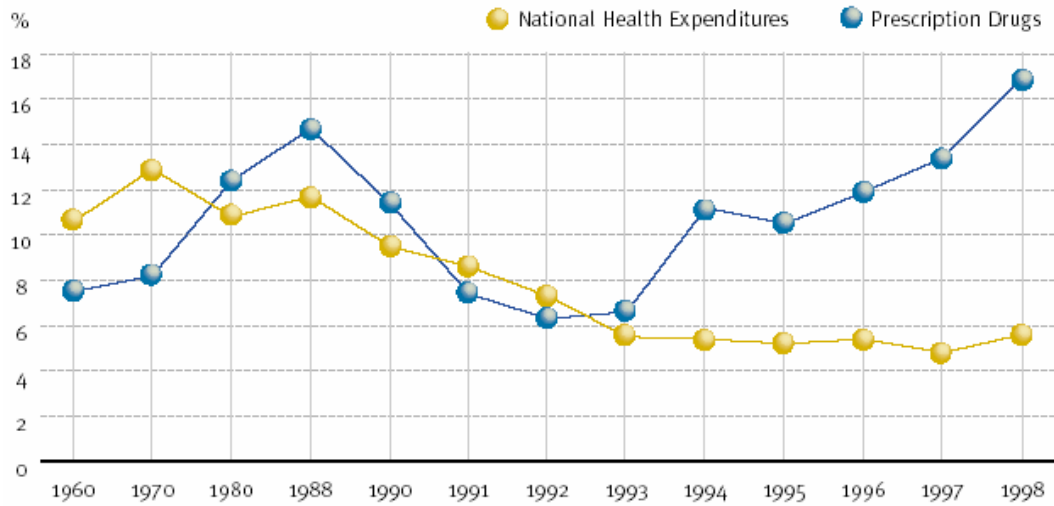
Source: Healthcare Financing Administration

Table 1
Simple Statistics

Variable	N	Mean	Std Dev	Minimum	Maximum
Pcdru	50	327.25	58.23	210.70	432.72
Inc	50	21304.00	4018.00	14694.00	32519.00
Ppphys	49	488.20	95.46	299.00	69500.00
Obsrt	50	20.05	2.39	14.20	25.00
Povr65	50	12.70	1.97	5.40	18.30
W/O ins	50	15.02	3.97	9.00	24.50
Smoke	50	23.27	2.99	14.20	30.80
HMO	49	24.44	14.07	1.20	52.90

Table 2

OLS and Two Step Regression Analysis

Dependent Variable: Per Capita Prescription Drug Use (in dollars)

Coefficients:	Per Cap Drug Use	Per Cap Drug use (Two Step)
Constant	-135.16	2.08
	(-.91)	(.02)
Income	.00309	.00143
	(1.21)	(.83)
PP Physician	-.09435	-.08025
	(-.90)	(-.83)
Obesity Rate	7.68**	7.68**
	(2.32)	(2.32)
Over 65	17.10***	17.10***
	(4.04)	(4.04)
Smoke	4.14*	4.14*
	(1.75)	(1.75)
W/O Insurance	-1.22	-1.22
	(-.69)	(-.69)
HMO	-.25	-.25
	(-.42)	(-.42)

R-Squared	.52	.52
Adj-R Squared	.44	.44
F-Value	6.32	6.32
N	49	49

t-statistics given in parentheses.
* = significant at the 0.1 level, ** = significant at the 0.05 level, *** = significant at the 0.01 level.