

Testable Predictions from Theory

Based on the discussion thus far, we can list several testable predictions regarding demand for health care; quantity demanded increases

1. As price falls
2. With increase in illness level
3. With generosity of insurance coverage
4. As cost of time decreases
5. As the time devoted to obtaining care decreases
6. With age of Adults
7. As price of substitute care increases
8. As price of complementary medical good or services falls
9. As own income increases

Do you think that the demand for children follows the above relationship?

Studies of Demand Curve for Health Products and Services

Early empirical studies of demand for health care products and services ranging from hospital days, physician care had substantial variation in their estimates of price elasticity of demand. This variation is typically due to the researchers inability to control the environment of the observations, or the lack of knowledge of all information needed to obtain true estimates.

The Rand Health Insurance Study (HIS)

The Rand HIS was one a randomized, controlled trial of health insurance to learn more about how insurance affected demand for health care funded by the US federal government. Because it was a controlled experiment, its veracity with regards to its finding has stood. However, that is not to say individuals has not evolved since the 1970s when the experiment was conducted.

Observations:

1. There were 5809 enrollees from the
 - a. Urban cities of Dayton, Ohio; Seattle Washington; Charleston, South Carolina; and Fitchburg, Massachusetts, and
 - b. Two rural towns, one in South Carolina, and the other in Massachusetts.
2. Only non-institutionalized individuals less than 65 were eligible.

Length of Experiment:

Choice of 3 or 5 years.

Controls:

1. Forsake the use of own insurance and receive in turn allocated insurance of the HIS for the duration of the experiment.
2. The type of insurance was allocated randomly.
 - a. Full Coverage
 - b. 25% Copayment for all services

- c. 50% Copayment for all services
 - d. 50% Copayment for dental and mental services, and 25% for all other services
 - e. An individual deductible for ambulatory care only of \$150 per person in the family (\$450 total per family). This was essentially to test whether inpatient and outpatient care are complementary or substitutes. Individuals with this plan had full coverage for hospital care.
 - f. No coverage until a catastrophic cap was reached from 5%, 10% or 15% of family income, subject to a overall maximum of \$1000. This plan also has a 5% copayment rate, principally to encourage individuals to file claims so as to observe the typical types of health care individuals would pay for out of pocket.
 - g. Some individuals were separately enrolled in a Health Maintenance Organization (HMO)
3. No family at any time was subject to excessive risk such that out of pocket expenditures amounted to more than 5%, 10% or 15% of family income up to a maximum of \$1000. That is the maximum quantum each individual is at risk of spending never exceeds \$1000. And should this cap be reached, all health expenditures were paid for, for the rest of the year, i.e. full coverage
 4. Further, there is a participation incentive of the maximum out of pocket liability which not only ensured no one is made worse off, and which reduces attrition of sample.

Some Findings:

General:

1. Demand for hospital care is least price responsive or least elastic, especially at high coinsurance rates
2. Preventive Care such as check ups are the most price responsive, or most elastic at about -0.43 in the higher coinsurance ranges.
3. Chronic Outpatient Care falls between 1 and 2 in terms of responsiveness.
4. For all medical services, price elasticity was estimated at -0.17 near complete coverage, -0.22 for higher coinsurance rates.
5. The rate of responsiveness to price was relatively small in general, as accord with expectations.
6. Converted to 2000 spending levels, without accounting for technological changes, using the medical consumer price index (CPI) the uninsured person spends about \$1330 per year, while the full insured spends \$2315 per year, about 75% more per year than the uninsured, highlighting moral hazard problem?
7. Results from this experiment were very similar to results from “natural experiments”. What is a “natural experiment”? This highlights that it may be more cost effective to use “natural experiment”, but to wait for some exogenous intervention may be costly in itself.

Some Specifics:

Are Hospital and Outpatient Care Substitutes or Complements?

The individuals with a deductible for ambulatory service were used to answer this question. What is the idea behind it? Consider the following, what happens when the price of a substitute or complementary good changes? What happens to the demand? Well, what happens to the price of hospital care for individuals with deductible vis-à-vis individuals without the deductible, i.e. full coverage inclusive of hospital care? If hospital care and outpatient care are complements, the deductible would reduce the demand for outpatient care, but raise the demand for hospital care. This is exactly what was found.

Is there Moral Hazard in Dental Care?

Previous research suggested that elasticity of demand to dental care was quite high, and this seemed to be true even in the HIS where elasticity was low under high coverage, and high under low coverage. However, the problem with the estimates is that dental visits are in a sense “storable” out longevity of treatment perhaps, or the longevity of the fear provoked! Essentially, there was substantial variation in usage over the experiment period, to the extent that in later period of the experiment, there was no significant variation in dental health consumption between the various coverage groups with the exception of full coverage, which then implies some coinsurance is necessary to mediate problems with moral hazard.

The following few medical services were examined because most insurance programs hadn't covered for them or were typically options not enrolled in.

Prescription Drugs

It was found that demand for prescription drugs was elastic with full insurance individuals to the extent that individuals in the HIS with full coverage consumed 76% more drugs than those with the 95% coinsurance plan.

Mental Health Service

A priori would you expect demand for mental health services to be price elastic? Essentially, we can think of various substitutes to professional medical health care, which intuitively would mean that mental health services would see greater price elasticity. Simple comparisons done on the data obtained from the HIS showed that price elasticity was similar to other services. However, there is has been criticism leveled on the result due to the structure of the HIS experiment. It was argued that individuals who purchase mental health care are typically heavy health care users, such that the cap would always be reached by them, and they would effectively move into the full coverage range! A reexamination of the data looking at the data across all illness events which allows the researcher to see how an individual behaves before and after the cap was reached revealed that those with full coverage consumed 4 times the medical care compared to those without health insurance. Further, the greatest change in elasticity occurred between 50% coverage to no coverage. In fact, demand for medical services was twice as large between 50% and 95% coinsurance.

Deductibles

Although not explicitly examined by the structure of the HIS program, the data permitted simulation of spending patterns with varying amounts of deductibles. What was found was that the initial effect of a small deductible is the largest, with marginal increments yielding smaller changes among various medical services, until the deductible exceeded \$500. What is causing this? Do you think information on how income was coded in the data might explain this curious pattern? Examine Table 5.6 of your text and calculate the marginal fall in expenditure for each category of medical treatment as deductibles vary.

Income Effect

To examine how income effect, you could include income as a regressand, that is a right hand side variable in a formulation between medical service demand and income. In our previous discussion, we had used this formulation,

$$m = M(y, p, l) = \beta_0 + \beta_1 p + \beta_2 y + \beta_3 l$$

and to examine the effect that insurance has on demand, the following formulation could be used,

$$m = \beta_0 + \beta_1(p - Y) + \beta_2(y - R) + \beta_3 l + \beta_4(d - R_d)$$

Do you think income effect when estimated should be large or small? If we think about the medical service and goods as a necessity, which it is, we should not see much income effect, just as we did not see a large elasticity of demand as shown in your text in tables 5.2 and 5.3.

The HIS experiment is what we call a panel data, and follows a set of individuals over time. In this case here, it is a short period of time. The analysis done on the HIS data had medical technology at a relatively stable level since it is a short snapshot in time, so that you can think of it as a constant and given. However, as our income rises, or as an economy becomes wealthier, demand for better technology rises, and we cannot think of medical technology as a constant. We could then examine how medical demand evolves over time to see how responsive demand is to changes in income using what is typically referred to as time series data. Using this approach it has been found that income elasticity in some instances is greater than 1.

But what are they really measuring? Is the approach actually correct? What might be some difficulties in this approach? Without a direct reference to a paper, let's think about what are the possible pitfalls, and think about how those problems can or cannot be controlled. When we are measuring how responsive medical service and product demand is to income in time series, we implicitly allow for changes in technology. There are several issues we have to consider:

1. How are price of older but not obsolete treatment affected? By treating treatments generally, we ignore substitution between treatment methods for the illness. Are we then really estimating the income effect.
2. How is price calculated for general treatment for an illness or illness group? If weighted for different alternative treatment, what weight to use?

3. How to control for changes in the method of information dissemination, i.e. that consumers are smarter than older generations. As a society becomes wealthier, are we still the same type of individuals as our predecessors? But of course we can control for this but accounting for the average educational attainment in each cohort.
4. Is growth in technology driving our demand or income? What if it is both our income growth and technology that is driving our demand, how can we separate the effects? Well we can if we assume technology does not affect income or the other way around. But yet if you think about it, it is our growth income that has permitted increased research, and increase in technology. And it is the overall growth in the economies capacity and technology that has permitted income growth. So what is causing what, the fundamental problem of causality?
5. Is it conceivable that the income of the last period is driving changes in prices this period, so that if we do not account for this pattern of causality, the result is also biased.

A reduced form analysis such as the one below,

$$m_t = \beta_0 + \beta_1 p_t + \beta_2 y_t + e_t$$

just will not do the trick. If the analysis has not controlled for this factors, we have to be cognizant of the various arguments that would cast doubt in the result's veracity. That is not to say we should reject it. Given the prerequisites for the course, it would be an excessive burden to discuss the technical issues, but you should realize that the arguments for and against the results can be derived intuitively.

Demand for Quality: Choice of Provider Specialization

Like any other profession you patronize, such as a contractor, a teacher, a lawyer, or an accountant, you would prefer one which has had better training. So you would expect individuals would always prefer a better qualified doctor. A typical comparison would be to examine the differential in prices paid towards a general practitioner or a specialist. In the HIS data, it was found that patients were willing to pay up to 10% to 20% higher for their services.

The question then is whether the result is believable. Consider the following arguments;

1. Are we really comparing apples with apples or apples with oranges? Is the demand for a specialist the same as that for a general practitioner? If they are not even the same demand, what are we measuring then? Are you going to let a general practitioner operate on you or a specialist?
2. It is claimed that a more direct test is to examine how different insurance plans affect the choice between general practitioners, and specialist. It was found that the choice was independent of insurance plan. Which if the technique is not flawed, provides some proof that consultation with a specialist is on a needs basis, and the comparison with general practitioners is incorrect.
3. Essentially, changes in quality should be compared within each sub-field. That is a general practitioner with another. Problem then is how should we tell them

apart? No doctor ever publicize their cure rate, or the time between diagnosis and full recuperation, or the number of times they diagnose correctly or incorrectly?

Other Studies of Demand for Medical Care

Natural Experiments occur when there is a change in structure or regime within the economy that allows researchers to examine how individuals change their behavior, without themselves structuring an actual experiment.

Stanford University Insurance Plan Change

Stanford University in a bid to reduce the cost of its health insurance coverage changed the full coverage insurance plan to a copayment of 25%. Researchers were then able to examine behavior of individuals before and after the switch to see if there is any real difference in behavior. Of all the finding, the one that says the most is that annual physical examinations fell. But when using these natural experiments, we must always be cognizant of the fact that something else might be causing a change in behavior, such as lower (or higher) than normal incidence of communicable diseases, or any other conceivable outside force that may drive the results. What are they actually doing? Let us imagine ourselves having the same data set as above, then what we are estimating is the following:

$$pe_{i,t} = \alpha + \beta I(\text{After } \Delta \text{ in Insurance Plan}) + \gamma_{i,t}$$

where y is income of individual, pe is the physical examination, and $I(\cdot)$ is the indicator variable for when the time period is after the regime switch. Then the effect is just β .

Canadian Insurance Plan Study

An association of pharmacists in Windsor, Ontario offered a drug plan providing full coverage for each prescription above \$0.35 deductible in 1958. The study examined how consumption varied between the individuals who purchased the insurance plan and everyone else in the city. What was found was that the individuals who purchased the insurance plan were on average consuming twice as much as those uninsured. The problem with this is that the plan was not offered randomly, but that individuals were allowed to choose whether to buy into the plan. You then have a selection of individuals who wanted to buy more prescription drug enrolling, thereby blowing up the estimates, or rather, biasing the estimated effect of insurance upwards!

What has Socioeconomic Status got to do with Child Health?

Currie, Janet and Mark Stabile, "Socioeconomic Status and Health: Why is the Relationship Stronger for Older Children?" 2003, NBER Working Paper #9098, *American Economic Review*, 93(5), 1813-1823, 2003.

Before we get into the specifics of the article, let's consider some common structures that data comes in. Essentially survey data such as the census are snapshots in time of observations, which in studying demand for health thus far, we have been observing individual choices in medical care services and products. These types of data are typically referred to as cross sectional data. The problem with using these kinds of data is that it is

often difficult to tell how changes in social perimeters, or issue affected the behavior since it is only a snapshot in time. Of course you might think, why not collect a set of cross sectional data, in that case can't we see how people at different periods of time change their choices. This method of merging data gives rise to what is commonly referred to as pooled cross sectional data. As long as we do so across short periods of time, such a method would typically suffice. However, when the data is pooled across several years, we still face the problem that because the individuals sampled in each period are different individuals, the large time span may not be able to give us the true picture we seek. The best way out is still to track a set of people through those changes in perimeters in social choice to see how people behave. These kinds of data are called Panel data, and each observation in each period is the same individual.

Now we are ready to discuss this paper. It has been found that socioeconomic status and health are positively correlated. However we should remain skeptical of the results since causality may run both ways in a sense that is poor health leading to lower socioeconomic status (SES) or is it the other way around. This paper builds on previous work by Anne Case that examines the origins of this relationship through examining a child's health and SES since a child's health has little to do with his SES. They found that the relationship did exist in children, and that it was stronger the older the child. This has implications the child's future, both in terms of health and human capital accumulation. However, because the paper relied on cross sectional data, it was not able to discern between two mechanisms that led to the poorer health among lower SES children. First, it could be possible that both high and low SES children have the same amount of health or illness shocks, but due to their SES are unable to respond to them. The second could be that low SES children are in fact more susceptible to health shock altogether, such as due to poor nutrition. The implications of findings pertaining to the reason for the difference is on social policy. If the first is true, then what the social planner ought to do is to provide more ready care to low SES children. On the other hand, the latter would imply that the society should ensure a reduction of arrival of these health shocks.

They use the Canadian National Longitudinal Survey of Children and Youths. The panel began in 1994, and the same children were re-interviewed in 1996 and 1998. Their findings were:

1. Using cross sections of the panel data, they noted that as SES increases so does health.
2. Little longevity in health shocks for both high and low SES children.
3. In the short run, low SES children suffer greater health losses.
4. Low SES children were more susceptible to health shocks

Methodology:

1. Pooled all 3 years as a pooled cross section and performed a order probit on health indicator that was on a scale of 1 to 5 from excellent to poor. This gave rise to the first finding. The relationship examined took the following form;

$$health_{it} = \left\{ \begin{array}{l} \alpha + \delta \ln(income)_{it} + \gamma momeducation_{it} \\ + \beta age_{it} + \tau_i + \theta birthyear_{it} + \lambda X_{it} + e_{it} \end{array} \right\}$$

2. To exploit the panel nature of the data, they performed the following;

$$health98_i = \left\{ \begin{array}{l} a + bshock94_i + c \ln(income)_i + d \ln(income)_i \times shock94_i \\ + emomeduction_i + \lambda X_{it} + e_{it} \end{array} \right\}$$

Read also;

Aizer, A., Lleras Muney, A., and Mark Stabile. "Access to Care, Provider Choice and the Infant Health Gradient", *American Economic Review, Papers and Proceedings*, 95(2), 248-252, 2005