Health Economics

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Week – 02

Lecture 07- Demand for Health care

Welcome again, friends, to this NPTEL MOOC module on Health Economics. This module is considered to be unique in the sense that we are covering the latest nuances of economics with the concept of health, health as a commodity, and the way in which the health conditioning of a person derives the commodities differently. The demand for health is not just a function of the kind of commodities we are seeing; rather, it is, in fact, a function of commodities with the level of healthcare. Hence, the demand for healthcare is the title of this course and we will discuss all functional forms with elasticities, etc.

What we have done in the previous lecture, if you remember very well, we dealt with the utility function or the level of utility with trade-off between health and consumption of other goods, etc., as well as the production function for health and lifestyle choices and health. Emphasis was given on health state dependence as well. In this chapter, we will be emphasizing the demand curve for healthcare, whether it should be elastic or inelastic. Usually, we get two types of structure depending upon the commodity we consume.

Does the healthcare demand curve follow the law of demand, or is it being violated? We will also be emphasizing. To validate our products, which derive certain values for society and hence define the elasticities, we will be citing some examples through the randomized experiments conducted in different places. Specifically, we will highlight the RAND health insurance experiment conducted between 1974 and 1982. We will also cite the example of the Oregon Medicaid Study 2012. Food for thought is that you are willing to pay all your wealth for your health or your money matters.

In conventional economics theory, we usually emphasize money as the medium of exchange, though it really carries the asset's value. But here we are, not carrying with the same voice again, with the same belief. Money does not always matter. It carries with certain compromisation. The health you carry is denominated with money with a higher value, but what state of health you are carrying really compromises your wealth.

Wealth is not everything. Are you willing to pay all your wealth for the sake of health? This is not the case. At least some fraction should be afforded for healthcare in order to define your commodities, which is going to be valuable and cherishing throughout your life. Now, the first question is put up before you is “Is demand for healthcare downward sloping?” How do we define quantity that is Q, and how do you define price P? If you remember our typical example, the demand function is downward-sloping.

We usually considered here like this P and Q demand function we take and function where we are saying Q is a function of price. So, hence we define our demand curve to be downward sloping. Whether we take P as a function of Q or Q as a function of P in both cases, the inverse relationship follows. And this is typically in the case of commodities without defining healthcare in this case. It is a conventional example of demand function.

Yes, again demand function varies from product to product like in the case of inelastic products, maybe very necessary products, even maybe only just like the standard example you usually take perfect elastic case is called the insulin drugs for the diabetic patient that is considered to be vertical. This kind of aspect you might have studied in your economic theory. Now, I am going to emphasize or derive, or measure elastic demand when health as a product is considered. How are interpretations made when health is taken into consideration? A quick visit to the doctor's office is not equivalent to an overnight stay at the hospital. So, counting both as one unit of healthcare is not appropriate.

The doctor's office is different than that of stay at the hospital. We will be emphasizing that. Researchers handle this difficulty by measuring separate demand curves for different kinds of care. Measuring price, how price is measured, whether it is paid by third party such as private health insurers or government or whether it is from your pocket or through your premiums or there are co-payments like insurance which have already mentioned, co-payment or sharing basis etc. or it is completely free, the third party like when we are referring to as free medical care cases. So, in that case prices are obviously going to be different for the products we are referring to.

In this figure, we have two straight lines: downward and vertical. Downward, we are referring to elastic demand and the vertical one to the inelastic, which is called the perfect inelastic demand curve. Inelastic demand for goods means you cannot compromise with the quantity of goods. You will pay any price for it irrespective of the price of the commodity that the interpretation is that you are supposed to have that reserve quantity in your basket of commodity.

For severe health hazards, you would not think twice about money, you are supposed to get that amount of healthcare products in your treatment. In that case it has to be perfectly inelastic or inelastic. Whereas elastic demand signifies the concept that people do alter their quantity demanded subject to the change in the price. If the price of Band-Aid for example, again another healthcare product in this case, Band-Aid this might be a small injury or might require only Band-Aids that will solve your injury. The demand is different when price increases to multiple, your demand will drastically fall.

Therefore, that is considered to be elastic because the responsiveness in terms of quantity is very huge as compared to price. We are taking some real life examples and referred in one of the authors papers, Keeler et al. 1988 work. Their co-payments were referred, co-payment basically who is bearing the cost. You might have read the latest references in Indian context as well.

Co-payments are considered to be very high. One of the measures of those co-payments is through out of pocket expenditure on healthcare. It is considered to be two-third, people are burning huge amount from their pocket. At this moment for your easy

understanding, we have taken one co-payment or the payment the consumer is bearing is 25 percent in one case, another is called 95 percent. For two type of products, we have cited dental care and outpatient care and what really happens when co-payments are different, the incidence of consultations for each of the care varies based on your percentage expenditure.

When it is one-fourth of the expenditure, the number of visits for the dental care is higher than that of higher expenditure when we are bearing. It is 1.06 and where it is only 0.88. The average number of consultations is calculated here as author derived.

Whereas in outpatient care, the consultations is expected to be relatively higher, but still when the co-payments are higher, this declines. We are supposed to identify the elastic or inelastic nature of spending or demand in both the cases. Remember what was the microeconomic theory tells you or the standard example of measuring price elasticity of demand. We are not referring to the other type of elasticity of demand like an income elasticity of demand or cross-price elasticity of demand. We are only sticking to the price elasticity of demand in this context.

If you remember, you might have not read microeconomics theory before this. I am just clarifying that we usually check with the symbol price elasticity demand, or EP, EP etc. you can take or sometimes in different book you will find this as the symbol. Basically, that is called percentage change, delta stands for change in quantity demanded with respect to of a commodity X with respect to percentage change in price. So, that is precisely delta Q by Q divided into 100, delta P by P into 100. This is here 100, 100 cancels out and this is precisely delta Q by Q into P by delta P.

And one thing to remember from your microeconomic theory that the relationship is considered to be negative. Here it is just a quantification. What is the magnitude of change in the percentage in both cases, but by default you are supposed to carry the minus sign because price is compared to the demand for the product in general considered to be negative. So, the equation is mentioned, but in healthcare products the nature of spending is considered to be different.

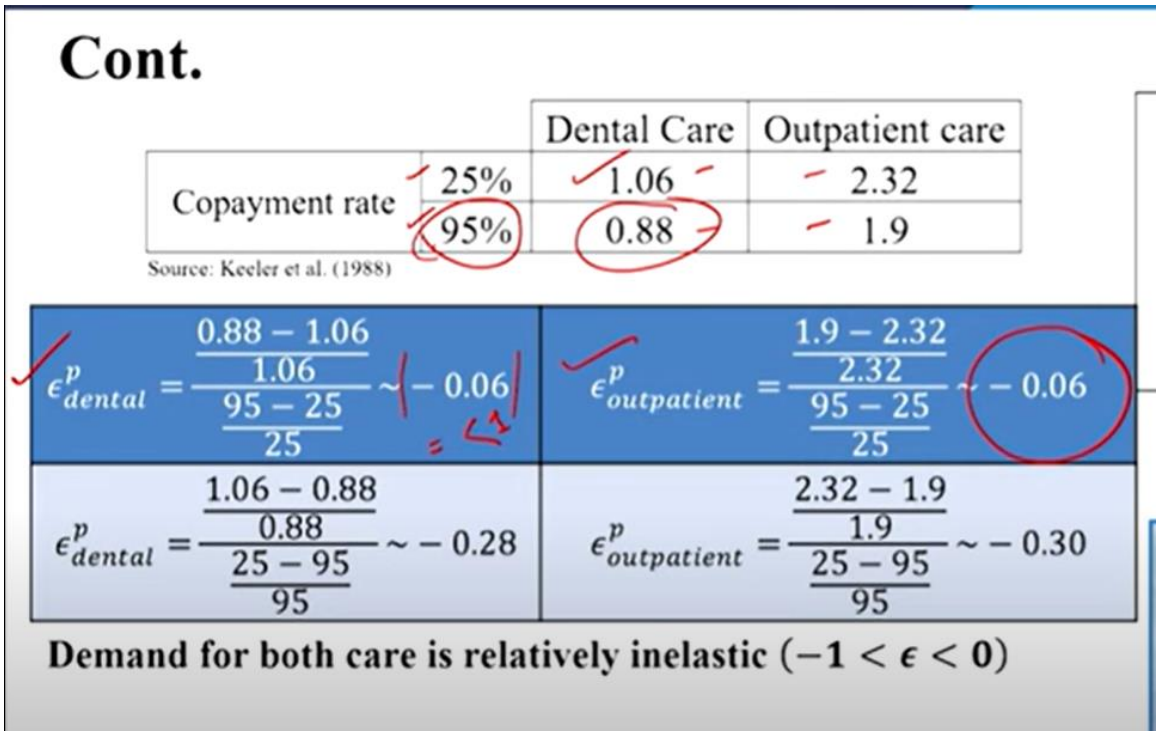
$$\epsilon_d^p = e_d^p = E_d^p = \frac{(\%\Delta Q.D_x)}{(\%\Delta P_x)} = \frac{\frac{\Delta Q}{Q} * 100}{\frac{\Delta P}{P} * 100} = (-)\left(\frac{\Delta Q}{Q}\right)\left(\frac{P}{\Delta P}\right)$$

The responsiveness in different products are different, hence we are calculating. In the co-payment case when 25 percent and 95 percent cases are observed, the rate of payments are different and the number of cases or consultations are mentioned in this example. We can calculate the elasticity of demand for dental care.

In the first case, your starting point is number of cases that the Q, Q is this first 0.88 minus Delta Q. So, minus 1.06 divided by 1.06 whole divided by this 95, this is considered to be a

rate 95 minus order or a proxy of price to 95 minus 25 divided by 25. So, this boils down to minus 0.06. The modulus value of it gives you the right value that is basically less than 1.

The less than 1 and in another case that is for out-patient case, let us check this is also 0.06. But if you start with the reverse, we started with the higher prices, we started with when your rate of contract or the payment increases what really happens, we started with new to the Q1 to this, this is basically Q1 minus Q0 divided by Q0. Here on the denominator, we have taken P1 minus P0 divided by P0. But when you simply change the direction that means Q0 minus Q1 divided by Q1 and vice versa and accordingly for the prices, why is it so? The rate of spending for the healthcare might increases might decreases.



Hence, the starting point gets changed. In this case, this is the value and in another example, it is the value in all the cases, the absolute amount has to be compared and in all the cases, we derived that it is relatively inelastic. However, while comparing dental care and outpatient care, we have also presented. You can see dental care and outpatient care, the relative elastic demand are also different. Here you just have a check in the graph we have already mentioned for this one is dental care, this one is outpatient care, this is DC dental care is relatively more elastic as compared to the outpatient care.

Even our findings also derived comparing these two, you will find that this is relatively inelastic. Dental care is more inelastic than that of outpatient care. Let us understand the choice of starting point also mark a big difference in terms of elasticity of demand. Similarly, some other methods we used to refer in microeconomics theory called Arc elasticity of demand. In short, we mentioned ARC in capital.

ARC stands for a bending portion, the arc portion of a curve. It is considered to be like this. When this arc is measured, when you have a demand curve which is nonlinear. In case of linearity of your demand patterns, what do you mean by linearity again? When your reflections or the responsiveness of P and Q considered to be almost tending to be same in the long run, but in the short run that is considered to be linear, project demand curve to be linear where the previous method, price method, method we have just mentioned, percentage method is useful. Whereas ARC is used when your demand curve is considered to be very volatile, it is nonlinear.

Out of that you may project two points, that is two points of change. You want to measure what really happens from event 1 to event 2, your event 1 at place A and event 2 at place B. What really happens in terms of spending patterns? So, do not you think that you have got an ARC. This is actually called an ARC, bending portion of a cycle is called ARC. So, in that case we used to take the starting point.

What is the starting point? In a typical elastic demand function

$$\frac{dQ}{dP}\left(\frac{P}{Q}\right)$$

This P & Q, we used to take the starting point that is P_0 and Q_0. In this case, in the ARC_1 since many changes are there in a nonlinear setup, we are in order to address the changes, neutralize the changes, we are supposed to take (P_0 +P_1) divided by 2 and (Q_0 +Q_1) divided by 2. This is divided by 2, this is divided by 2, so 2 cancels out. So, the formula is delta Q, this is basically Q_1 minus Q_0 divided by P_1 minus P_0 into P_0 or P_0 plus P_1 whole divided by Q_0 plus Q_1, thus basically the formula. And this is what is mentioned in this example.

$$\left(\frac{Q_1-Q_0}{P_1-P_0}\right)\frac{P_0+P_1}{Q_0+Q_1}$$

ARC elasticity method can also help you to derive the results. I think I have already made it, in the PPT we will do it, we can find out the eraser and we will show you what really happens. So here I will check the highlighter pen again. So, in this example, we have also applied the ARC method just to know whether there happens to be any nonlinear changes, still we applied the ARC method. Through the ARC method also we have found the elasticity of demand is inelastic in both the cases.

However, again in the outpatient case as compared to one is relatively more elastic than that of the dental one. Dental is considered to be more inelastic. Product wise we have different approaches or different inelasticity of demand. Hence, products should be marketed accordingly so far as marketing of healthcare products is concerned. So, average also matters so far as calculations of elasticity demand for healthcare is concerned.

We will also cross check with this whether it is downward sloping or vertical. If it is perfectly inelastic, then it will be vertical. We will be citing here some of the examples from another health insurance experiment of the RAND Corporation, Institute of the

Rand Corporation and a team of researchers at the RAND Corporation led by the health economist Joseph Newhouse in 1971. Try to answer this question through one of the experiment, one of the largest social experiment in the history of science, that is called health insurance experiment. What they try to know that if people care about their health above all, they must be ready to give any price for their healthcare.

This means that they have rather a vertical demand curve as well for healthcare. So, it depends upon the type of product, any price if they are ready to pay for it, that means it is precisely considered to be perfectly inelastic. So, one experiment is called RAND HIE finding or experiment. Healthcare elasticity is not zero.

That is an interesting aspect. There is not much of a surprise regarding Rand HIE findings. Healthcare elasticity is not zero and the law of demand still holds as you have seen in our previous examples. We will discuss the details of RAND HIE in a while in our next couple of slides. So, objective here is how does cost sharing or membership in an HMO affect the use of health services compared to free care. So then how does the cost sharing affect appropriateness and quality of care receive? What are the consequences of health? So, the medical aspects etc. will be also cross checked with cost sharing patterns.

I will just tell you. We will concentrate from now on a part of our subjective highlighted in that is in red. With that example, we have cited six counties or the downtown of USA. They are Dayton, Ohio, Seattle, Washington, Fitchburg, Leominster and Franklin. So, the time period as referred to in their calculation is 1974 to 1982. 2750 families and 7700 individuals are considered with the age group of under 65.

Participants were randomly assigned to one of five types of health insurance plans created specifically for the experiment. Since we have said this is a randomized experiment from the RAND Corporation. We will just check what is the design they have followed. Basically, all the participants, which is of 2700 families in total the participants were 7700 individuals.

So they have divided into two firsts. Those are based on cooperatives. Then another one is free for service plans. And then free for service plan that does not mean 100 percent free. One category may be free care, 100 percent free care.

Another is cost sharing plans. We will compare each one since it is control as compared to treatment group. We will check how they are creating the difference in terms of health spending. You just see what happened. This experiment is called Rand Health Insurance Experiment of 1974-82. This is a randomly divided household into two groups, free care and cost sharing basis broadly.

These are mentioned here. So just to check what is the difference. In cost sharing basis, again we have already cited earlier, you will pay 25 percent, 50 percent and 95 percent. And the fourth category is the control group is basically the free care type.

We will discuss all sort of things. In addition to that we have already said cooperative models were also mentioned, but at this moment in the example we will discuss this four

categories, free, 25 percent type, 50 percent type and 95 percent type to find out the number of episode, the average number of annual episode by different conditions. Here, we are referring to their experiment and outcome, evidence from outpatient care particularly. As patient cost sharing increases, you can see here the cost sharing 0 percent, 25 percent, 50 percent and 95 percent as per the findings of keeler et al. work.

When the cost sharing increases, it is quite obvious that the number of episodes, annual episodes or the consultation is considered to be less. And again, it varies from acute disease to chronic disease. So as patient cost sharing increases, the number of episodes for outpatient care decreases sharply. People assigned to the 95 percent group had 36 percent fewer episodes of outpatient care than those in the free plan.

We can compare each category what the difference is. Both conditions had downward sloping demand. Chronic conditions especially like for example, diabetes, high blood pressure, acute or cold or broken leg etc. But chronic are in prolonged type and which requires consistent consultations. So accordingly, the episodes vary. When price increases, the number of demand or the consultation decreases.

Evidence of inpatient care. Here we have also given another finding by Newhouse of 1993 and in Keeler et al. they have also discussed inpatient care. In the previous one we discussed outpatient care. So here it is inpatient care, but Newhouse etc. discussed emergency care. So accordingly in our research plan you have to categorize different products and based on that again you find in different cost sharing case this falls. And as patient cost share increases the number of episodes of inpatient care decreases sharply. Even for emergent or urgent emergency conditions, the care those on the highest co-payment plan were less likely to buy care. A downward sloping demand curve for both inpatient as well as emergency care. So, pediatric care is also referred from the work of Newhouse 1993 and dental care utilization is discussed.

The families on the free plan were significantly more likely to start immunizations and other preventive care with the age group. Here we have also emphasized the age group wise categories. You can imagine to what extent consultations are possible, to what extent the research is possible. Here we compare by expenditure, their standard of living as well, their plan free as compared to payment 95 percent plan with different income group wise, standard of living wise. We observed that a similar trend of downward sloping curve is observed in dental care as well.

You can cross check and elasticity of demand can also be calculated based on these examples. Please try calculating these numbers for your confidence. We may also ask you some questions in the assignment and also in the final exam. And final exam questions might be MCQ based or MSQ based or maybe a numerical number, only number, fill up the blank, you have to estimate and find out the exact number of elastic demands. So, we also define the fractional point to what digit, round of digit or the number we will mention, give you the instruction correctly.

Please follow the instructions very rightly before preparation. So, we have discussed results of different healthcare uses and their elasticities. You can also find out the elasticity and price elasticity through percentage method and through ARC method to

identify whether they are elastic or their magnitude as well. So, another one is Oregon Medicaid study of 2012, you can also follow. In that case, the Oregon study compared two groups of low-income adult Oregonians, a people who own a 2008 lottery to receive the opportunity to apply for public health, insurance coverage through Medicaid and lottery. The second category is the lottery entrants who did not win or were not given the chance to apply for Medicaid.

Those comparisons can be made and in effect this lottery randomly assigned insurance coverage to a subset of the winner who has got the lottery. Hence, the lottery winner tended to face lower out-of-pocket expenditure for healthcare. So accordingly, we can find out the differences. This is what is presented. Like we have more funds, let us expand our Oregon health plan for only adults, low-income people.

Like even previous one example, there are number of policy conclusions possible through these experiments like which kind of products should be subsidized by government since we have seen that number of episode decline since our income quintiles are very different in the country and they may not able to afford. And this also calls for public facilities for healthcare. This also gives a clear direction as to why the government should intervene. And the number of conclusions is written in different papers as well. So, please when we are giving certain assignment, if it is descriptive, write it in different perspective from your word, it is really considered to be appreciative.

Similarly in Oregon Medicaid study, you can compare these two conditions. So, here the general group is treatment group, here treatment group is the Medicaid plan through the lottery. Let us use random selection using lottery. We have a waiting list of 90,000 applications out of that 30,000 were drawn. So here around 35,169 individuals who own the Oregon Medicaid lottery and out of them those have signed for the healthcare access and those who do not bother for this around 40 percent, so the remaining 60 percent are considered. So, accordingly once those who have signed off, again there might be some eligibility conditions.

After deducting the ineligible applicants, so only how many are left? It is in section 405 and based on that the study is applied. So, some findings based on Finklestein et al of 2012 work, here the percentage of visit and number of visit figures are given through outpatient care, inpatient care and emergency care which we have already mentioned the Rand Corporation findings also. Here the comparison is between lottery winners as compared to losers. Outpatient, inpatient and emergency care show downward slope of demand for Medicare and Medicaid increase with the use of healthcare services. So, now we can compare Rand, the health insurance experiment as compared to Oregon medical study.

RAND and Oregon experiment are different, they were performed in different population with different research questions and circumstances. Oregon study focuses on low-income population unlike Rand study that is also important. So, whereas RAND study is national representative that is another important direction and RAND study used a direct randomization of health insurance coverage while the Oregon medical experiment relied on a randomized scheme that was only indirectly related to insurance

coverage. And the Rand participants had multiple co-payment options whereas here we have only specific choice between have and those who have not received. Students had multiple co-payment rates thus varying marginal cost while in Oregon study once selected had no marginal cost.

Similarly, other differences you can note, I am not going to read between the lines, I think it will be useful for your understanding. Based on all sort of evidences, the elasticities are also calculated based on by Newhouse 1993 paper and in Guattane et al. 2008 study, you will find interesting aspect. Broadly speaking, we have compared elastic and inelastic demand. You will see inpatient, dental care, outpatient care, all care cases even are largely coming under inelastic demand.

Similarly, some necessary products like coffee, tea, salt etc. is also part of inelastic demand structure. Then movie, it does not as observed watching a movie, irrespective of change in the price level people considered purchasing this and that too not responsive is not so huge, it is inelastic. Whereas restaurant, meal etc., it is a reflection of the contract, the price rate and similarly tomatoes, there are many other products usually comfort and luxury type of goods are considered to be elastic. So, you can also cross check with your real life data and it is going to be very interesting. So, what to be concluded? So whether demand curve for healthcare is elastic or inelastic, healthcare demand is not perfectly elastic for sure.

In large number of cases, both RAND HIE and Oregon's experiment confirms that healthcare demand follows the law of demand, the emergence care and inpatient care are relatively more elastic. So, we have these readings to follow. J Bhattacharya's book on health economics is considered to be a standard book for you and chapter 2 we have referred here, please have a read for further clarification. Finkelstein who have also referred in the previous lecture, 2020 study is relevant, page number is also mentioned.

Newhouse, we have also referred, Newhouse of 1993. So, it is all for your ready reference. Then what we are going to study in our successive lectures, especially in the next lecture, we will continue again this demand chapter, demand of healthcare. We will start specifically on Grossman's model of demand for health.

With this, it is time to close. I hope you have raised number of interesting aspects. We will be happy to receive your comments. Thank you. Thank you.