Health Economics

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Week – 09

Lecture 42- Monetary Valuation of Health

Welcome friends once again to our NPTEL MOOC module on health economics. So, what have you inferred from our previous week's lectures? It was on the theory and principles of economic evaluation. In this one, we will be identifying directions for monetary as well as non-monetary measures of health.

Once again, I am just recapping what we did in the earlier week. We learned about the theories of economic evaluations. We also discussed the principles of economic evaluations. There are five approaches we discussed. Those were cost-benefit analysis, CBA; cost-effectiveness analysis, CEA; cost-utility analysis, CUA; cost-consequence analysis, CCA; and cost minimization analysis, CMA. If you remember, the last two, we said, are less used (especially CCA and CMA), but we discussed them in detail for your reference as there might be specific situations where you might be interested in applying. We have also given nomenclatures (in detail) of the methods from the previous week. Within each of these, we emphasize their definition, objectives, features, use of the principles with relevant examples, advantages and disadvantages, and limitations.

In this lecture, we are emphasizing the specific aspects of evaluation. We learned in the initial lectures of the course that in health economics, outputs are defined in two types- i) the amount of healthcare provided or ii) health itself. In this one, we will focus on how these outputs or their types are measured and used in economic evaluation. As you know very well, these are largely subjective by nature. Defining an output in production function for healthcare as a concept is very challenging. You need to derive the specific type of measurement. Then, you can determine whether these measurements follow a continuous or a discrete choice. Further, we will also discuss how the measured output is valued in monetary terms and not just counted.

Unlike other areas of economics where measuring and valuing the output used to be pretty straightforward and possess no conceptual difficulty. In the healthcare industry, there are challenges. For example, in an industry (such as pharmaceutical), the output is measured in physical terms such as 'quantity of goods produced' and valued based on the market value of goods.

Output measurement and valuation in the healthcare industry are indeed difficult. Questions arise - Is it the number of healthcare treatments or the improvement in health that matters? Further, if it is the health improvement, how can it be measured and valued?

So, we will learn how economics measures and values healthcare output or benefit. Broadly, these are divided into two parts. One is called monetary valuation, and another is called non-monetary valuation of outputs.

Let us start with a discussion of the monetary valuation of healthcare output. You just recall what we did in the CBA (cost-benefit analysis) method. We emphasized the concept called willingness-to-pay (WTP) or, sometimes, willingness-to-accept (WTA). This is a means of capturing benefits and costs in monetary terms. This provides the basis for measuring changes in the welfare or benefit for changes in cost due to resource allocation.

Hence, we introduce you to the approaches that use the theoretical concept of WTP (willingness to pay or accept) in practice to measure their benefit. There are two approaches that we usually follow, or authors follow, that are called the revealed preference or stated preference approach. These approaches adopt monetary valuation in healthcare benefits or output.

So, we will explain one by one, starting with the RP (i.e., revealed preference) approach. This refers to the monetary valuation of goods and services based on inferences drawn. So, the first aspect is the inferences drawn from the real-world choices. So, what is happening around is more important. Hence, while evaluating for certain access of services, a person must have done certain possible calculations in his or her mind. Based on those real choices and real-world options availability, the opportunity cost is usually derived in the people's minds.

Hence, people make choices based on their preferences by comparing the alternatives with their opportunity cost (which I just said). The choices they make, therefore, reveal their preferences. What they mentioned is called a revealed preference because they had already made certain calculations.

We are just citing one example for a case where someone is not willing to purchase a treatment costing 20 rupees per unit. However, if the person knows that somewhere, 10 or other options are also available, the person might be willing to take that treatment at half the cost. Hence, we can infer that the value the individual places for the treatment lies between the range of 10 to 20. So, varying prices within this range may help to estimate their maximum willingness to pay. So, the availability and the willingness can also be calculated based on certain revealed preferences and estimations.

The above example reveals the individual choice; however, we are more concerned with estimating the value of some good for everyone who consumes it. In the above example, the average willingness-to-pay can be inferred from the market demand curve using the same reasoning as for individual consumer's demand curve.

There are some challenges that lies in estimating the options availability using revealed preference. One challenge with the RP is that, in the healthcare industry, prices are not charged directly or do not reflect the value. So, the prices we just quoted in the example may not be directly observed, and they are free at the point of consumption or highly subsidized

in many cases. These pose difficulties for estimating the demand curve because there are different schemes available, and it is one of the important aspects of public policies. However, if someone is interested in health improvement instead of health services, we cannot use RP, as health improvement cannot be traded and has no market.

Then, in that case, what are the solutions? Currently, two options can be used: the 'user cost method' or the 'indirect market method'. In the user cost method, you need to consider the additional costs, such as travel time, the time required for consultation, etc., associated with obtaining that particular service. Even if the service is free, the other costs are directly borne by the individual or the person. There are indirect costs or a market method as well. This infers benefits from the market and assesses the related outcomes. For example, the income of the people who work in high-risk jobs, compared to those working in low-risk jobs, can infer their income change. So, that is all about the revealed preference.

We are now discussing another approach to estimating WTP, i.e., the SP (the stated preference). Stated preference valuations are derived from surveys or experiments. These surveys or experiments are often loosely termed as willingness-to-pay studies. Here, researchers might ask people to give values directly or infer them indirectly by offering hypothetical choices. So, choices can be hypothetical because we are expecting their preferences. The assumption is that the valuation that people state reflects their choices, and the choices that people make in the survey are the same they will make in the market. So, whatever they reflected in the survey should be the same as reflected in the market demand curve.

The foundational basis for this approach to be validated is unlike the revealed preference i.e., based on economic reasoning or the estimations of preliminary observation. The main theoretical basis of the stated preference is largely psychological. Although controversial in nature, most economists accept the use of the stated preference technique as long as it is consistent with the aim of the economic analysis. So, this is accepted by most of the studies.

The valuation techniques used for the stated preference are broadly categorized as- 'survey method', 'simulated market method', 'contingent valuation method' and the 'DCE method' (or discrete choice experiment). The surveys are basically referendums on different issues that needs to be addressed. Now, we are referring to the 'simulated market' (you can also follow Bhatia and Fox-Rushby's (2003) paper to study it in detail): In this study, the goods are provided under experimental conditions using some simulated techniques. The next are contingent valuation method and discrete choice experiments. The contingent valuation is a widely recognized technique. It refers to the valuation of goods and services, where the measurement of the value is contingent on the descriptions of the hypothetical market given to the respondent. So, the complete understanding or description of the hypothetical market is more important. The discrete choice experiment is considered a very recent addition to the valuation techniques and part of the stated preference. So, as I told you, the last two, CVM and DCEs, are the most used or recognized techniques. We will understand these in the health market (in detail).

Contingent valuation, once again. As I told you, the contingent valuation method stresses on the details about the hypothetical market. There are several features required for conducting a good CVM, they are- ensuring credibility, ensuring respondent understand, and creating a representative sample. We will discuss it one by one. The most important issue while applying contingent valuation is ensuring credibility, i.e., the value reflected should actually cater to the real choices. Second, the respondents must understand the market scenario presented to them and find it plausible and meaningful. Without this, it might be difficult for the respondent to answer and may not give a serious response. For this, the essential requirement are that the details about the descriptions should be sufficient enough to understand, it should be plausible and meaningful. Describe the nature of the good or service, how they can be obtained, and who will pay for it. And last requirement is related to ensuring the credibility of the figures that the person reflects.

However, the information provided must be as minimal as possible. Overburdening or irrelevant distractions through so many details might cause people to reflect on non-credible information, and therefore the survey information might not be appropriate enough for real-world situations.

The last one (as part of the CVM) is a 'representative sample'. The sample we are deriving must be representative enough of the larger population. Ensure that the sample used represents everyone who might be affected. So, we have to take such coverage of the sample that it can be replicated in different situations.

The approaches, especially in healthcare, are challenging (as I already told you). Although there are no universally accepted approaches to CVM studies, Gafni (in 1991) has published a very strongly argued set of guidelines which mainly include the following- willingness in terms of insurance premium, realistic scenario, effects in probability terms, the representative sample.

Willingness in terms of insurance refers to how much premium one is paying. People cannot plan to consume healthcare; hence, willingness-to-pay should be expressed as an insurance that they would prefer to pay for the service they need. The realistic scenario means it has to cater to real-world choices. The scenario should state the probability that they will need it. The probability should be very high. Effects in probability terms, say that the effects should be explained in probability terms (the probability of success or failure). Then, the representative sample- This requires the WTP of all the members of the population of interest to make the survey representative enough.

Several challenges are attached to the CVM (contingent valuation method) studies in healthcare. First is the challenge arising due to some artificial nature of choices. In real life, consumer choices consider the trade-off between benefits and costs. However, in experiments or surveys, the environment is not an actual market but largely hypothetical, potentially influencing respondents' choice based on utility derived from the interactions with the researchers.

Then, the second challenge due to the issue of strategic responding, where people may be quite prepared enough to get the best benefit out of it when they know that experiments are being conducted for future policy conclusions. And, if any policies are targeted, they reflect differently, i.e., they give strategic responses. Rational consumers may strategically respond in surveys, anticipating future receipt or payment obligations or the potential provision of goods or services for free. So, they act accordingly. You might have seen it in different poverty alleviation programs. Some views are taken, and they (the respondents) respond as if they are part of the model (very clearly).

The third challenge is the realism of the market scenario. This is the problem where ensuring the realism of the market scenario is very critical and has many issues.

Hence, what are the ways of asking questions related to willingness-to-pay? There are four approaches in which researchers ask respondents to respond to their willingness-to-pay, they are- i) open-ended responses, ii) closed-ended, iii) payment scale, and iv) iterative bidding. Open-ended is basically the one where you give the choice to write the views without any caption or without any limit. It is very simple, but some concerns are also involved, like- i) responses may deviate from the typical market behaviour, and ii) they may yield random and unrealistic responses because open choices are given.

In the closed-ended responses, we need to specify options within the limit of the responses, like the categorical values we give within choices. Here, respondents choose to accept or reject a single value ('yes or no' kind, or 'one or zero' kind, or in a dummy format). Different values are presented randomly to different people in a sample, and WTP values are estimated based on the average responses. The merit of this method is that it is easily relatable to the market, where we get fixed prices for goods, and fixed components can be expected. There are also concerns attached to it. This provides only a single choice to an individual, i.e., there is a limit to the choice).

The payment scale presents a scale of choices to the respondents; out of these ranges, he can choose his optimal WTP range. This also gives a certain extent of open-endedness. The potential concern in this method is the potential cueing of what WTP values are considered sensible to the researchers.

Iterative bidding is another approach of estimating WTP, where respondents in an interview engage in a bidding process. The respondents are initially given a price, and the price is adjusted based on their WTP. Hence, the best choice is derived from the bidding. The merit of this method is that it is closer to market operations by allowing haggling. There are concerns attached to it as well, like- i) it is restricted to interview settings, and ii) continues until the respondents become undecided.

One of the examples of WTP using the contingent valuation method is mentioned in the book of Morris et al. (2012). The example is taken from the works of Jarahi and others (2011). Jarahi et al. (2011) examined patients' willingness to pay for child safety seats in Iran. Iran has one of the highest rates of road traffic crash death in the world, and road

traffic injuries are the leading cause of life years lost. The use of safety seats is not mandatory. The authors derived this case, where they tried CVM to understand willingness-to-pay.

Hence, the author interviewed 590 car owners who were parents of children under five years old in a preschool setting. So, the experiment unit is in a preschool setting; the persons are the ones who have children under five years (in total) and they own a car. Parents were shown pictures of the main types of safety seats, with evidence of their efficacy in reducing deaths and information on the incidence of child car passenger deaths in Iran. Using a payment scale format, parents choose the amount of money they would pay during the survey for the safety seats from seven options. The questions were asked, such as whether safety seats are required and how much they are willing to pay. All WTP amounts were measured in 2009 US dollars ($) since this paper was published in 2011.

Out of these seven options which one is best preferred? The results suggested that interventions providing free or subsidized car safety seats should be considered, given that the willingness to pay was lower than the actual price of safety seats in Iran. So, the choices given as a willingness to pay are lower than the actual price for the safety seats. Hence, the idea is that there must have been a free provision to control the number of incidences since the years of life lost is huge in Iran. That is a very interesting finding. You can also experiment on your own in different settings in your field. However, make sure that the sample you choose is representative enough and that the experiment you do is understandable to the participants. In the above example, the experiment is representative because this can be applied in pan Iran or even to the world. Wherever the incidences are high, they will follow this.

Another method of estimating WTP is the discrete choice experiment (DCE). So, we have already discussed the contingent valuation method. We are now discussing the DCE. DCE are part of health economists' stated preference (SP) technique. The DCE method is grounded in Lancaster's 1971 theory and views goods and services as a bundle of attributes. (Note: When writing a thesis based on empirical or experimental research, one should always refer to the original theory). That is, the Lancaster theory is on viewing goods and services as bundles of attributes. So, goods and services are part of a bundle of attributes. People's preferences for these attributes determine the overall preferences for a good.

There are stages involved in DCE. These are largely emphasized in Ryan and Farrar's (2000) work. They have described 5 stages of conducting DCE , which are as follows- i) to identify the attributes, ii) to assign the level to the attributes, iii) to choose the scenario for the inclusion (of those attributes and of the persons to be experimented), iv) to establish the preferences through the DCE. And finally, v) the analysis using regression (sometimes you do conditional logistic regression because some conditions are given). We will discuss it in detail.

So, understanding how DC is commonly used. This involves presenting individuals with choices of scenarios described by their attributes and levels. For each choice, respondents

are asked to prefer a scenario. Then, respondents are asked to make a number of such choices, and respondents are modelled using regression analysis. Finally, the regression analysis helps identify the specific determinants and factors that largely impact the valuation. And we can determine the trade-offs between the attributes and the overall utility score for each combination of attributes. And, if costs are also included as an attribute, then DCEs enable the estimation of willingness-to-pay for a good with specific attributes.

Applications of DCEs are presented here in detail. We are discussing in two contexts. One is from the context of the consumer or the patient, and another is from the healthcare provider or the doctors or the supply side perspective. DCE measures the patient's preferences in various interventions. For example- smoking cessation, pregnancy management, colorectal cancer screening etc. The examples application of DCE for the healthcare provider are divided into two perspectives. First, from physicians' perspective- preferences for oral versus intravenous drugs in cancer treatment. Second, from the antenatal clinic worker's perspective- preferences for different malaria prevention strategies, especially in pregnancy can be checked.

Now, let us use an example to understand the DCE application in health issues in particular. Here, we will clarify all five stages that we just mentioned. So, here is an example of the DCE that assesses a patient's preference for early rehabilitation management after a stroke. We are referring to the Laver et al. (2011) paper. They studied stroke patients' preferences for different rehabilitation models in Australia in 2009 and 2010. Laver et al., from their literature review, identified the attributes of stroke rehabilitation that were important to patients and capable of being influenced by policymakers.

Patients confirmed these identified attributes in qualitative interviews. Laver et al. then developed the attributes into four categories with three levels each (i.e., four attributes are there, but each case has three levels). The fifth attribute, i.e., the cost, was also included to allow estimation of willingness-to-pay to be assigned to each level of each attribute presented. Here, we can use the five steps suggested by Ryan and Farrar to understand the DCE (in detail).

Step 1 & Step 2:- Identification and Levelling of attributes

5 Attributes and 3 Levels of each:

1.Mode of therapy (group, individual, computer)

2.Dose of therapy (30 min, 3 hours, 6 hours per day)

3.Team providing therapy (community doctor and physiotherapist, same specialist team, different teams for each phase)

4.Amount of recovery (70%, 80%, 90%)

5.Cost of therapy (no cost, Aus$50/week, Aus$100/week)

Starting with step 1 and step 2. These steps are all about the identification and levelling of the attributes. There are five attributes and three levels each (as mentioned in the work by Laver et al., which are also emphasized in Morris). Those five attributes are i) mode of therapy, ii) dose of therapy, iii) team providing therapy, iv) amount of recovery and v) cost of therapy.

The levels for each are like for 'mode of therapy'- it is a group level, individual level or it is computer level. Then, 'dose' is given as 30 minutes, 3 hours and 6 hours per day, Then, for 'team providing therapy', the levels are- whether it is community doctor and physiotherapist, same specialist team, or different teams for each phase. 'Amount of recovery' is given as 70 percent, 80 percent and 90 percent (three levels). 'Cost of therapy', the fifth attribute to measure the willingness-to-pay is- either no cost level, or at least 50 Australian dollars per week, or 100 Australian dollars per week, is evaluated.

Step 3 & 4:- Choosing scenarios for inclusion & establishing preferences through discrete choices

Three levels for five attributes resulted in- 243 possible scenarios, which were reduced to 18 choice sets between 2 scenarios.

- These 2 scenarios were divided into 3 different versions → each containing 6 binary choices
- 50 patients in the full study → Each patient made choices between two scenarios in each set

❖ The resulting choice set for each scenario is as follows-

Step 3 and 4 choose scenarios for inclusion and establish preferences through discrete choices. 3 levels for 5 attributes resulted in 243 possible scenarios, which were reduced to 18 choice sets between two scenarios. These two scenarios are divided into three different versions, each containing six binary choices. A total of 50 patients are used in the full study. Each patient made choices between two scenarios in each set.

The resulting choice set for each scenario is as follows-

Programme 1:	**Programme 2:**
Individual therapy	Group therapy
30 minutes per day	6 hours per day
Aus$100 per week	No cost
Same specialist team	Community-based doctor and physiotherapist visiting
80% recovery	90% recovery

For program 1 and program 2. You can see- individual therapy (for program 1) and the group therapy (the program 2). For individual therapy, 30 minutes per day is preferred, the cost is 100 Australian dollars per week and the same specialist team is engaged and this results in 80 percent recovery out of those in these levels are represented as result here for program 1. For program 2, group therapy 6 hours per day, no cost is preferred, and community-based doctors and physiotherapists visit. Here, in total, we have a 90 percent recovery.

The final step is to understand the regression analysis through the responses. Analysis are made through conditional logistic regression, analyzing patient choices. The dependent variable was binary choice between program 1 and program 2 (or out of program 1 and 2). The independent variables are largely attributes and levels for each program that has already been mentioned.

Hence, the result and conclusion of these particular examples are that patients are divided into two programs, and results are derived. Finally, the results mentioned that- patients prioritize 90 percent of recovery and individual therapy. Computer therapy, longer daily sessions, and higher costs were less preferred. Willingness-to-pay-related figures offered a quantitative understanding of the patient's preference for various attribution attributes.

Note: The provided information is a concise summary of the key findings. For further details of this, you can read the full study by Laver et al. (2011), which we have already mentioned in our reference. That paper was published in 2011. I strongly recommend you for a better understanding of the applications. So, that is all.

I am just giving you the summary and conclusion of this lecture. It is indeed difficult to value healthcare output, since it is complex and largely provided by public institutions as part of public policy. Evaluation as an individual, to assess their willingness-to-pay is very tough. There are two ways in which it is usually valued. One is monetary and non-monetary. Within monetary, for valuation of healthcare services, we discussed two methods. One is called the revealed preference approach, and another is the stated preference approach. While revealed preference is based on economic logic. On the other hand, stated preference has hypothetical or psychological foundations. However, due to the unavailability of the health market, stated preference (SP) is preferred over revealed preference (RP). You can just check one second from previous lectures what do we by the unavailability of market. We mentioned in RP case and its limitations. Further in SP case, there are various valuation techniques under stated preference. Out of those methods, we emphasize- contingent valuation method (CVM) and discrete choice experiment (DCE).

So, that is all. What is following in the next lecture? It is all about the specific concerns related to health improvement and we will also emphasize on the non- monetary valuation of healthcare outputs which will include measurement of health improvement in terms of QALY (quality adjusted life years) and DALY (daily adjusted life years). We have also use these two in other units as well. But, the evaluation pattern etc., we will emphasize in our next lecture. We will explore the concept of non-monetary valuations further.

So that is all. I hope you are geared enough for the next lecture and maybe ready for the questions because we are going to set a number of questions using these evaluation techniques. And we will also give you some important cases where the best method can be utilized. So, you need to identify appropriate cases.

These references will be useful enough for you to understand further. With this, I think, I should stop, and I hope you will raise questions. Thank you.