

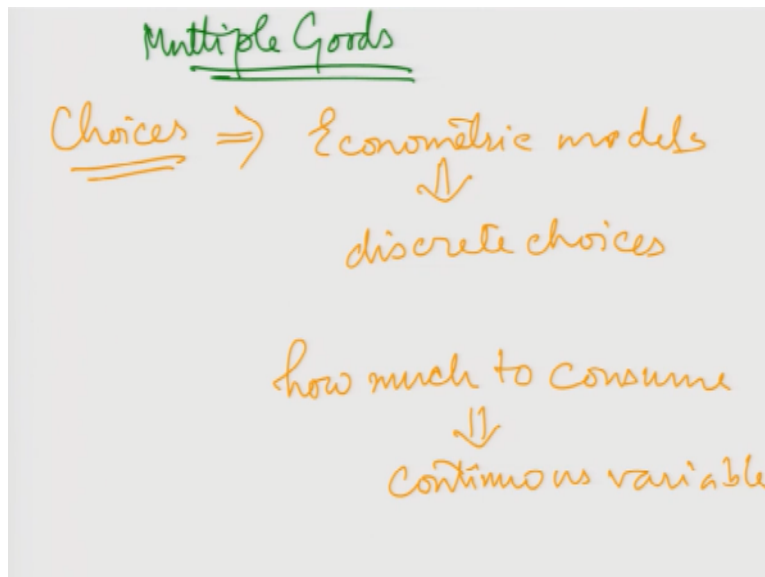
**Economics of Health and Healthcare**  
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**Lecture -20**  
**Measurements Based on Choices**

If the demand is different in terms of health status, then that health status can be determined by several choices. We learned I want to go to a hospital go to a clinic or go to a traditional practitioner I want to do it by myself in my home asking for my work from my mom dad or somebody else. These are the choices what kind of you know treatment I will take where I will we have already talked about where you know or which kind of department I am visiting.

For how long I am visiting of how many times I need to visit so all this comes into the picture.

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So, these choices when modelled then often our health our econometric models deal with discrete choices. Yes, when we talk about the choices but how much to consume when we ask this question how much to consume its basically a continuous variable where to consume going to consume why to consume can be discrete. But how much to consume that becomes a continuous variable.

And these choices very much defined are defined in terms of the say the access to the health care if there is excess they will have you know the choice is different. If they do not have access the choices are different. So, which are the variables you are really taking into account you need to know in terms of a developing country you need to always keep in mind that okay fine here they have excess or here they the exist this particular variables exists.

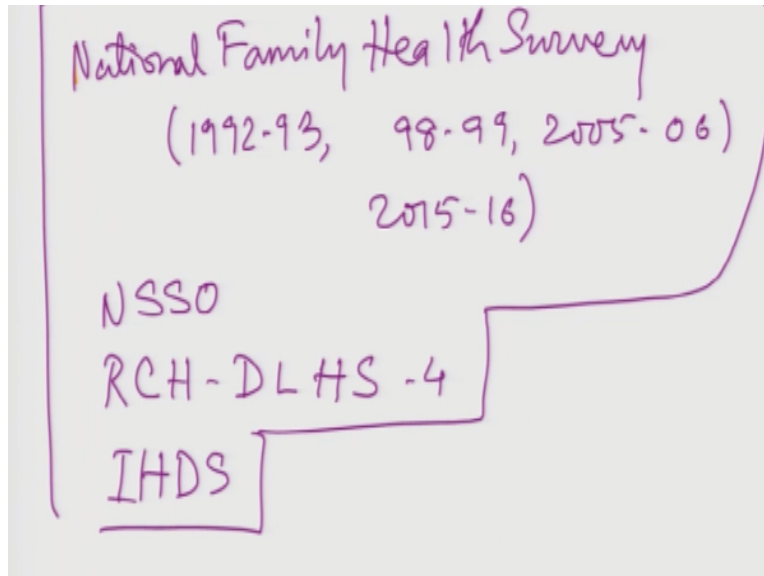
Then we can really figure that out and if we are looking at these choices or access they are basically, and they are useful indicator in terms of demand side and then you know the demand side interventions are basically say how much user fee they are paying. And whether they like that like to visit those facilities or not that is the demand side. What is the willingness to pay or how much they are paying?

But in terms of the supply side what is in terms when we look in terms of the providers you know the choices of the providers the consult consultations the providers are giving. What kind of providers they are visiting or how many times they are going back to the provider? all are supply side. Because how many times they need to go to the provider even is this is determined by the patient.

But it is not supposed to be determined by the patients it is referred or recommended by the doctors by the providers. Therefore, this is prayer basically this supply side indicators. But while we are modeling them they really you know they really should not so overcome each other the same time we can collect these data from household service. The data collection you know as we do not have many secondary data.

That data collection data availability of data has been a problem in countries like India.

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Even though we have service like national family health survey you know which started in 1992 93 and then continued 98 99 2005 6 and next one is 2015 2016 but yet to come out most likely this year end. So, these are the 4 NSSO national sample statistics organization we have RCHD reproductive child health district level health survey which is the 4th round we have availability. But this is suppose I do not know that may not be continuing.

Because national family health service is now giving us the district level data. So, this household level data gives us an idea about both even IHDS data Indian human development survey ISDS data it is done by say a year and university of Maryland probably yeah and then this health service gives us a clear idea that about some proxy about the health seeking behavior how let us take an example.

They go to these individuals and ask them how many times did you go for ANC antenatal checkup before birth the women are supposed to go for a checkup. Post-natal checkup after delivery the women are supposed to go for a checkup. So, did you go for that if not how many times it is supposed to be a minimum 3 times where they went for. Did you take your child for immunization?

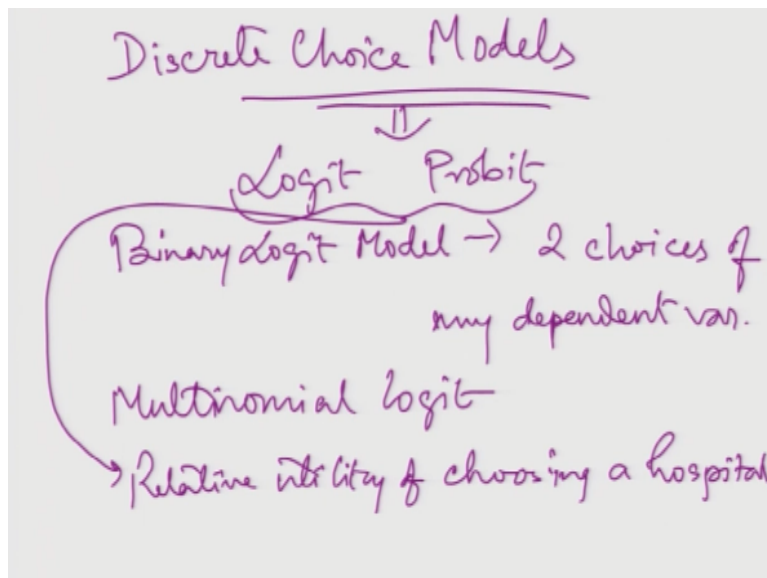
What kind of how many immunizations do you have for each particular you know measles, pulse polio and all these things so and we have an idea through these questions that what is their health

seeking behavior that is a demand for health care. So, as we do not have that and then you can design your own question your own survey to collect data from the general community. Having said that so when we have you know straight forward price or expenditure.

And its impact on the health care demand or we if we are regressing between them we have said that we are doing an ordinary least square method. But at the same time if we have or we can do a natural logarithm you know and then do an OLS. But all of expenditure and if we are we are having a discrete choice model when we have say what is a decision that when I am sick I will go to a doctor or I will not go to a doctor I will take home remedies.

What is the decision if it is like something like that then that that is known as discrete choice models.

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So, I have a very discrete choice choices yes and there are 2 very prominent one is logit and one is probit there is also one another one trobit. But logit and probit so basically in demography or know in the health economics we mostly do and logit and probit analysis and if they say in case of a choices like say it is a dichotomous choice right. Whether I go to variables so binary logistic regression what we do binary logic.

If there is or dichotomous model so that means whether I go for a health checkup or I do not go

there no 2 choices are 2 categories of my dependent variable. If there is more than 2 then we have multinomial logic if we have more than 2 categories of my dependent variable, we have multinomial logic and we also need to take you know when we are sitting on a regression equation.

We must take the background variables or the confounding factors you know which has a control over these in the relationship between the my dependent variable which is related to health of course and my independent variable. So, having said that or my decision making that whether I go for a clinic or not and those basic background variables can be my social economic variables. The education, the income, my gender, marital status, caste all these things.

Yeah, my occupation and everything so this logit and you know probit does there are basic they basically estimate the relative indices you know relative utility of choosing a particular decision. So, both logit and probit they estimate a relative utility of choosing a hospital or not. That you know that is one category of my dependent variable yeah over the self-remedies. Yeah so, I can explain that this is the probability of going to a hospital.

If it is, you know with the reference of not going to a hospital I mean this self-remedies so and over and this can be explained for each of the explanatory variable separately naturally right and these relative utility of choosing its actually an index which is estimated from - infinity to + infinity. So, this index value this induces value for each and every expected variable or independent variable.

This range between does this range between the - infinity to + infinity which can be converted to a frame of 0 to 1 considering a cumulative probability function. Yeah cumulative probability function so this - infinity to + infinity I can convert it into 0 and 1 and then you know estimate the probability of visiting a clinic over not visiting a clinic and then this logit model if you know I want to explain it.

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$$y = a + bx$$

$$\text{logit} \Rightarrow \ln \left[ \frac{\text{Pr}(x)}{1 - \text{Pr}(x)} \right]$$

$$\text{odds} \rightarrow e^{a+bx}$$

$$\text{odds ratio} \Rightarrow \frac{\text{odds}(x+1)}{\text{odds}(x)}$$

Contingency Matrix :

a	b
c	d

$$\text{odds ratio} = \frac{a/b}{c/d} = \frac{ad}{bc}$$

Then if the regression  $y = a + bx$   $y$  being the dependent variable  $x$  being the independent variable  $b$  being the slope  $a$  being the intercept. If  $y = a + bx$  then logit model basically you know represent it like log of probability of  $ax/1 - \text{probability of } x$  yeah something like that. And we can estimate the odds for each of these  $x$  or  $x+1$  which is like probability of  $x$  and  $1 - \text{probability of } x$  is actually the probability of  $x+1$ .

So, anyways so or not yeah so if we are going to these odds then it can be an exponential of this linear regression equation. So, I can state it like  $y$  exponential  $e$  to the power  $a+bx$  so this is my linear regression equation and exponential to this is my the odds ratio and odds and when I do my odds ratio then it is pretty much odds of one category  $x+1$  if it is you know one category 0 and 1 category and getting another category  $0+1$  dichotomous you know.

So, odds for that category 1 if that is clinical visit to a clinic divided by odds of  $x$  if that is not visiting a clinic or something like that, you know all we can also estimate in terms of contingency matrix if we have a contingency matrix. I am just giving you a broad overview you know you can probably look at this contingency matrix. We have studied in epidemiology whereas this odds ratio in this formula is well studied.

In discrete choice models in econometric yes so contingency matrix is basically if we have the abcd you know smoking not smoking having cancer or not having cancer or something like that

these kinds of 2/2 matrix are known as contingency matrix. Then we can estimate our odds ratio as you know something like  $a/b/c/d$  which is  $ad/bc$ . This is my odds ratio yeah so again this is exposed to our disease smoking and this is expected to.

Or not the disease and the condition and this is disease this is no that smoking not smoking cancer not cancer and you can so for those who are smoking happening cancer and not happening cancer. That is the ratio that is the odds of happening a concern among those who are smoking at this the odds for happening and not happening a cancer for those who are not smoking that is  $c/d$ .

So, these odds are for those who do not smoke but among them happening a cancer and then we can estimate an odds ratio. As the ratio between these 2 odds and then we can finally get this  $ad*a*d/b*c$ . Thank you.