Introduction to Environmental Economics
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Lecture - 33
Damage Costs/Costs of illness and Lost Output Approach

Hello everyone. So, we are discussing table preference method. And, this is the last method that we need to discuss this is the Cost of illness Approach. And, sometimes we are saying this a cost of illness approach is a part of the Damage Cost Approach or Lost of Output Approach. So, that is why we have taken into account. So, it can be sometimes synonymously used.

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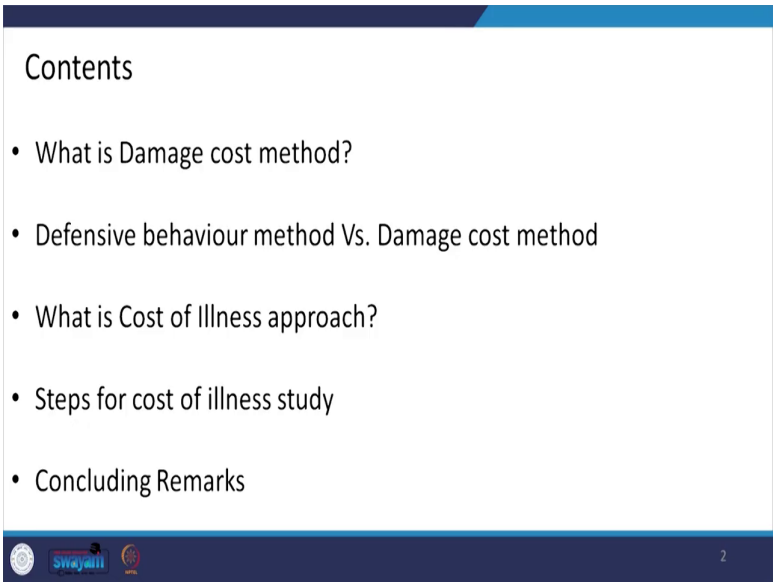

So, and these are the outlines of this cost of illness approach. So, first of all we will be discussing, what is the damage cost method? Then, we will be comparing between these

defensive wave behavior method, that we have already explained with the damage cost method. So, that we can get to know what is the similarities and what are the differences between these two methods?

And, then we will be discussing, what is the cost of illness approach and how this cost of illness approach is different from the damage cost method, whether it is the same method or something different. Then, we will be discussing what are the different steps that we need to take into account for doing this cost of illness study and then we will be having the concluding remarks on the cost of illness approach.

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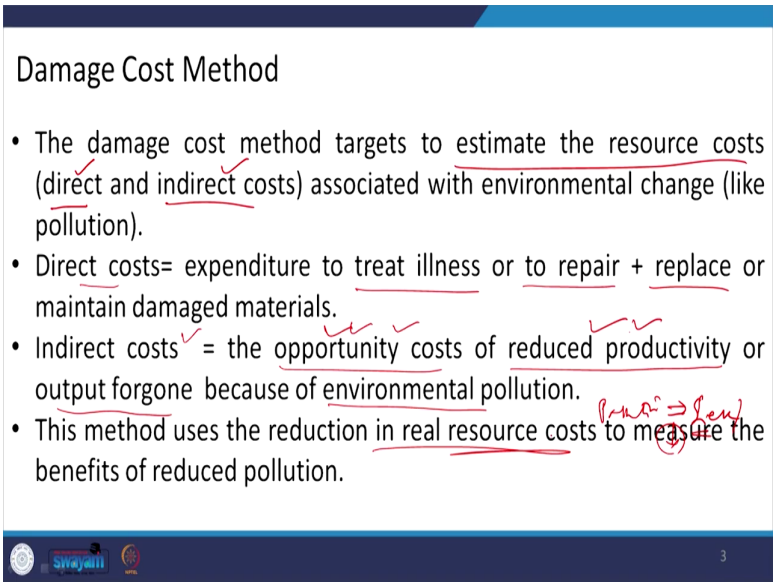

Let us discuss with the damage cost method. So, what is the very meaning of this damage cost method? And, then we will be comparing with the defensive expenditure method. So, as you understand from the very meaning. So, in damage cost method, what you are targeting is to

estimate the resource cost?. So, why resource cost? Because, what are the cost that is occurring to the resources in case of some environmental changes. Let us say, environmental bad like the pollutions.

So, here in damage cost method what we are doing we are estimating the direct resource cost as well as the indirect resource cost. And, combinedly this is representing what is known as the damage cost. In a lemans language I can say damage cost is nothing, but we need to calculate what is the amount of damages that a particular change in environmental bad has created?.

And, this is represented in terms of direct damage cost to the resources and indirect damage cost to resources and combinedly, we are saying this is the total damage cost. And, again we need to understand, what is direct damage cost and what are the components? That we need to take into account in to estimate the indirect damage cost. So, in direct damage cost we are if we are taking the case of let say, the pollutions right on any of the resources let say your health.

So, in that case, we can say that direct cost are the expenditure that the individuals are making right for treating their illness, or to repair any of the property, which is been affected by this environmental change that is because of the pollutions. Or and also if you are doing any kind of replacement in the property or in this resources because of this pollutions so, that the materials would be maintained right.

So, in direct cost what you are taking into account expenditure to treat the illness or to repair the particular resource or replace the particular resource are maintained the damaged materials. And, in case of indirect cost, we are take into account the opportunity cost. So, what is the opportunity cost? The, next best alternative, that is forgone right.

So, we are take into account the opportunity cost of reduced productivity or the amount of output, we are forgoing because of the environmental pollutions. So, in this case, let us expand that how this indirect cost are measured? We are saying that we are using the opportunity cost of reduced productivity. So, how it is so? So when you are saying that

pollution because of the pollutions, you are falling sick right and that is why your productivity is decreased.

So, because of the pollutions, you are losing or reducing the your productivity right. So, that must be taken into account, which is known as the opportunity cost of reduced productivity. So; that means, if the pollutions was not observed, then your productivity could be added right, you are not going to lose any kind of productivity.

So, this is the opportunity cost of reduced productivity right or you can say output forgone because of environmental pollutions. So, if you are not actually sick if you are well then; obviously, your output the household of production output could have been increased, because you are not well that is why, you are not in a position to increase the do any kind of work and increase the output of the household.

So, that is expressed in terms of output forgone because of the increased pollutions in the environment. And, as you understand that this damage cost method takes into account both the direct cost that is in terms of the medical expenditure or repair and indirect cost. So, this method uses the reduction in the real resource costs right, to measure the benefits of reduced pollutions.

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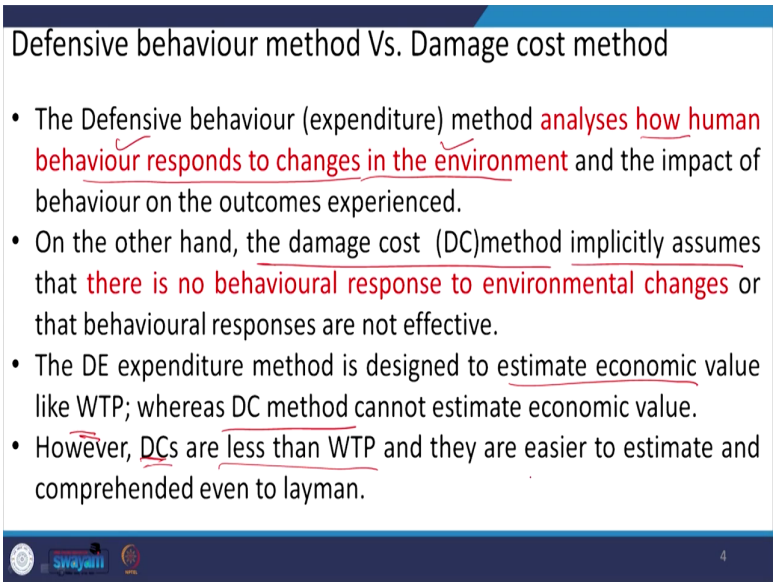

So, after understanding this damage cost, now let us analyse, how this damage cost is different or is similar with the defensive expenditure method that we have already explained. So, if you are talking about defensive expenditure method or defensive behavior method we are saying. So, what is the target? So, it analyses how human behavior is responding, is there is any change occurred in the environment. And, the second what would be the impact of this behavior on the outcome that we are experienced, that we are experiencing.

So, in our defensive expenditure examples right, what do we have taken into account the pollution as well as the noise pollution or air pollution as well as the number of sick days right. So, here in defensive expenditure, we are analysing how behavior responds to changes that when pollution changes in the environment, when pollution increases then how human behavior is changed, whether you are not exposing your children to the outer outdoor or you

are making some expenditures like, fitting some sound systems. So, that are insulating your house so, that the noise outside noise cannot be entered into your house.

So, here when the environmental changes happens, your behavior also changes. So, this is what we are analysing? How the human behavior is responding to the change in environment and what is the impact of this behavior on the outcome experience that is; obviously, you need to increase your utility.

And, in this context the damage cost it implicitly assumes, that there is no behavioral response to environmental changes. So; that means, here the same situation happens; that means, you your household and you observe that the pollution has been increased right. So, when the pollution has been increased and you got to know and you changed your behavior either in terms of taking some aborting, or some expenditures, or you are actually changing your very behavior by changing the life style, or changing the time itself right.

The way you are making use of time, then it is a case of aborting expenditure method right. But, when you know that certain environmental changes have already been done as already occurred and the pollution has increased, but still this is not reflected in terms of your behavioral patterns; that means, you are not actually responding to the environmental changes right.

So, in that case this is known as the damage cost method. And, in defensive expenditure, the second more important difference that we can make between these two method is that, in case of defensive expenditure. The method is typically designed to estimate the economic value, that is we are more interested to find out what is the willingness to pay right. But, whereas, in this damage cost method, we cannot estimate this economic value of this particular environmental bad.

And, the third one we can say or in continuation to this we can also say that this damage cost are actually less than the willingness to pay, and they are easier to estimate and it can also be understood by anyone, even a laymen can understood understand this damage cost

estimations. That, when the pollution increases or any of the environmental changes occur, how it is impacting the health or how it is impacting the resources and what is the cost to it?.

So, in contrast to these differences there are some similarities that we can also bring out between this defensive expenditure method and this damage cost method. So, what are those similarities? So, as you understand we talked about the reveal preference method; obviously, this both of this methods are under the family of the preference method.

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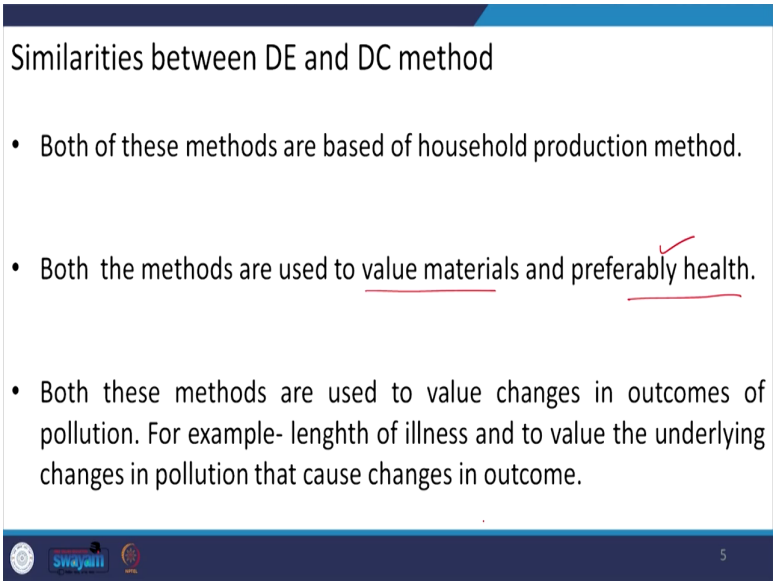

More over both of these methods are based on the same theoretical arguments or theoretical under penning's that is the household production method. And, both of these methods they are used to value the materials as well as the health. And, in most of the cases in both the methods, we are financing the examples that it is these methods are applicable or generally applied to the health valuation case.

And, again both of this methods they are used to value changes in outcomes of the pollutions and here we are talking about, let us say the sickness or the time of the duration of a illness, and to value the underlying changes in the pollution that can cause changes in the health outcome right.

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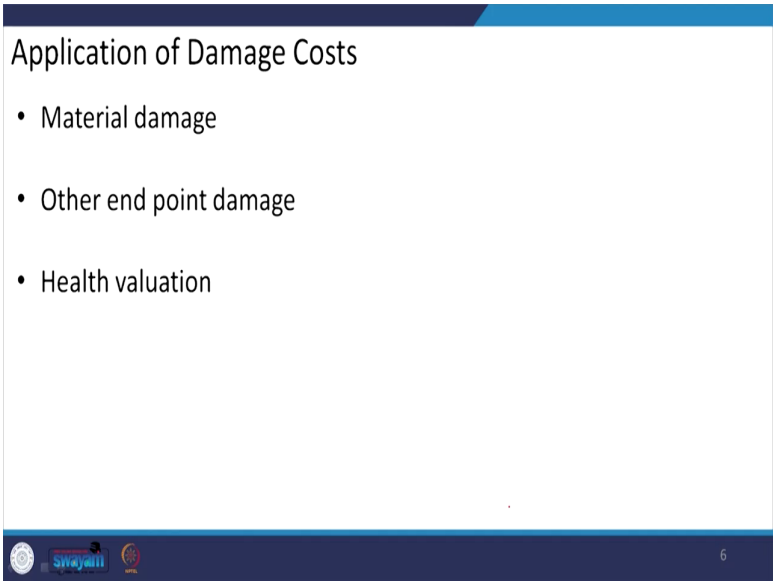

So, this is how we can actually bring that, what is we can segregate, we can understand that what is the damage cost method, and how it is different from the aborting or defensive behavior expenditure method. So, now, let us understand what are the applications of the damage cost method? So, we can apply this damage cost method to the materials and damages, if some environmental changes occurred, then how the materials have reduced their value or what kind of physical damage that has been occurring to the materials, because of these environmental changes.

Let us take the pollution itself; we can also apply this damage cost method for other end point damages. So, it may be some other materials. And, we can also apply this damage cost method in the health valuation, because of the change in pollutions.

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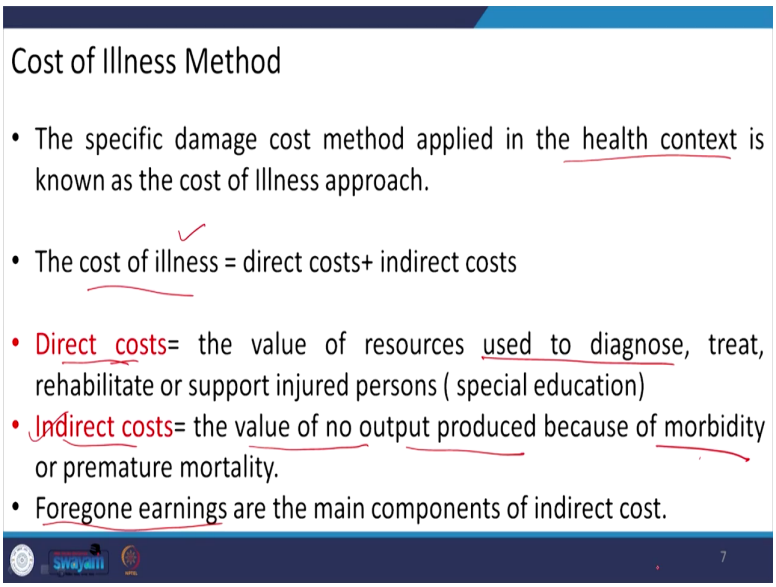

So, now let us understand, what is the cost of illness approach? That is what we are targeting to analyze? And, whether this cost of illness method is something different from the damage cost method or are they same. So, when we are saying damage cost method we are talking about, the cost that is in terms of the resources, that is again we are talking taking into account direct as well as indirect cost. So, here when you are talking about, or when you are specifying some specific applications on the damage cost. And, that is in the context of health, then this damage cost can be known as or it is termed as the cost of illness approach right.

So; that means, this damage, this cost of illness approach is a special applications in the context of health. And, when this damage cost is applicable in the is applied in case of the health context then it is known as the cost of illness approach. And, we can take the same logic the way the damage cost is measured. So, the cost of illness for estimating this cost of illness we can take into account the direct cost as well as indirect cost, but our focus is on in the health context only.

So, take into account the health context, that when pollution increases, how it is impacting the health and what kind of cost we are incurring in terms of health expenditure or something that is related to health, because of the increase in pollutions. So, incase of this direct cost because of the change in the increase in the pollutions, we can say direct cost can be estimated take into account the value of the resources used to diagnose, you are consulting a doctor. So, fees that you are actually paying for consulting a doctor.

And, even the treatment cost or the medical, other medical expenditures juts like your outdoor expenditures, indoor expenditure, the pharmaceutical expenditures or sometimes we are take into account some educating that how to avoid and this kind of; this kind of problem, that we are facing because of this pollutions.

And, we can also take into account the indirect costs right. So; obviously, this is the value of no output produced or reduced number of output produced, because of you are falling sick that is the morbidity or you face your death right. So, that is a kind of remark you are mortality and because of which you are losing output produced.

So, in a note cell you can say this for estimating the indirect cost, what we need to take into account is the foregone earnings; that means, the earnings that you are not getting right, because either of your morbidity or mortality. So, in this context we can actually discuss about, what are different methods or approaches for measuring the cost?.

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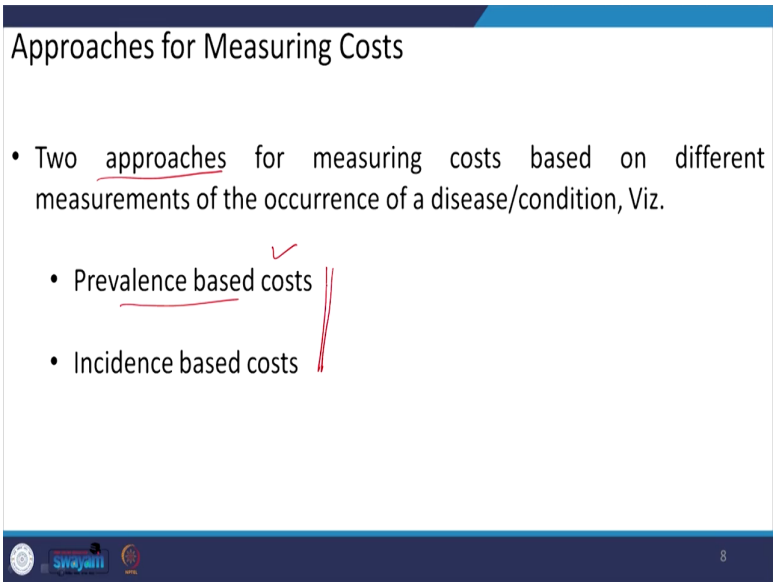

Because we are saying this cost of illness can be of this direct cost, we need to take into account indirect cost also. So, for measuring this cost we can apply two approaches, this approach of measurement is based on different different measurements of the occurrence of a particular disease or the condition that you are in. So, based on these we can either apply the prevalence based cost or incident based cost. So, cost can be measured in terms of these two situations.

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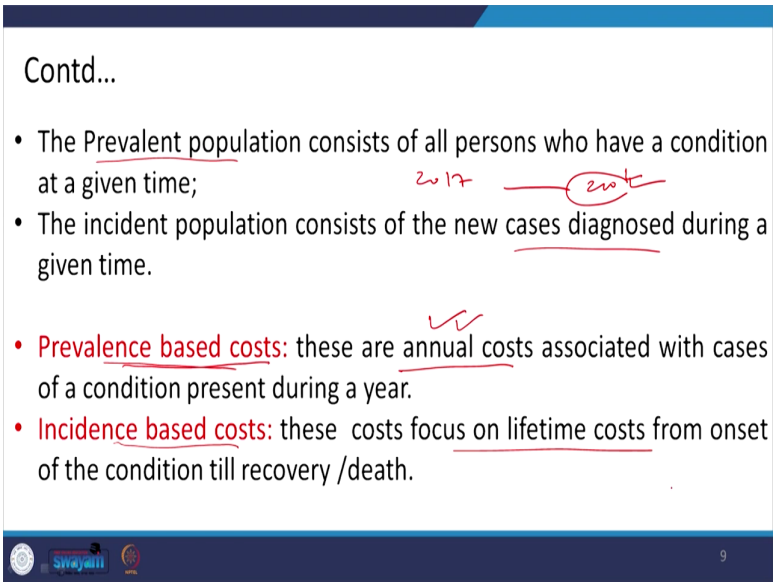

So, what are these two situations? When you are talking about the prevalent cost, we need to take into account the prevalent populations. Who are these prevalent populations? So, they are consisted of all the person's right, who have a conditions or a particular problem, let us say the illness of asthma at a particular given time right.

So, when you are saying it is 2017 and the number of persons who are suffering from asthma is let us say 200 in a particular locality. So, this is what we are saying the prevalent population. This 200 populations number of persons are the prevalent populations. And, the second thing second cost is your incident cost that is explained in terms of take into account the incident population.

So, what is incident population? They are consisted of the new cases juts discovered or registered cases just now, in that particular year. So, new cases diagnosed or registered during

that given time. So, accordingly the prevalence cost or the prevalence based cost can be the annual costs associated with the case of the level of the conditions of persons during a year.

So, this is what, this cost are expressed in terms of the annual cost whereas, when we are talking about the incidence based costs, then they are we are saying that the new cases registered right. So, that is why for having an idea on the cost on the incidence, we need to take into account the cost related to the lifetime, starting from the diagnosis that this particular disease a person is suffering till the recovery or till the death. So, for example, we can say that if you are following this prevalence approach and here our example is we are measuring the cost of this illness asthma.

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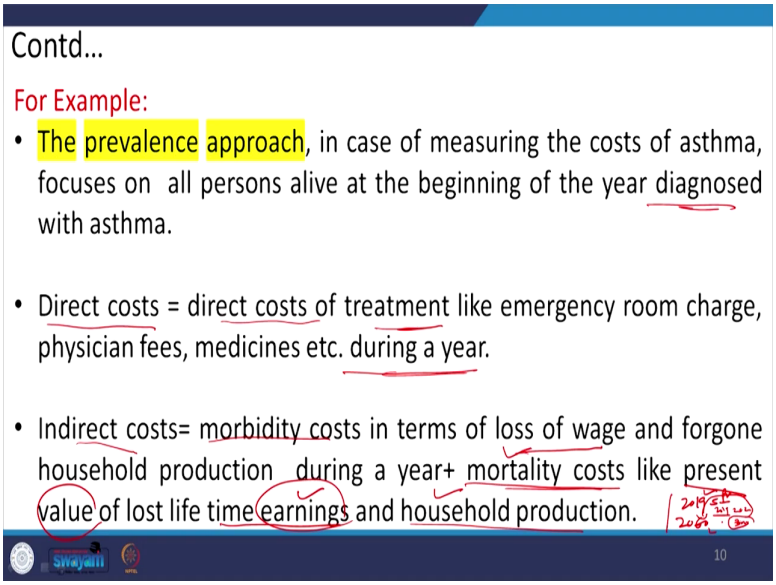

Then, what we are doing we are focusing on the all the persons alive at the beginning of this particular year those who are diagnosed with asthma. So, in that case what we are doing, we

are calculating the direct cost, by take into account the direct cost like, treatment, treatment cost, charges that we are paying for the emergency room, emergency room, or you are saying the physician fees, or medicines that we are consuming right during a year. But, in an likewise we can find out the indirect costs by take into account the morbidity cost, in terms of loss of wages or forgone household productions, during that year.

As well as we need to take into account the mortality cost. For example, if the person has not faced his death then; obviously, he could have added some earnings or some household productions right. So, these household productions, amount of household productions and value of this earning right, it can be expressed in terms of present value.

So; that means, when you are saying the person got his death in 2019 itself, but he has a life expectancy till let say 2060 right. And, this life expectancy you can find out from the relevant medical literature that, what is the life expectancy of a person right now. So, based on this understanding in order to find out the mortality cost, we can say that, what is the, what is the earnings the person has lost from 19 2019 to 2060.

And, we need to actually a express these earnings right, in terms of the present value for the past few year 2019. So, what is the earning let say it is 3000 rupees. In 2020 what is the earning? Let us say it is again 3000 rupees. (Refer Time: 22:19) these 3000 needs to be converted to the best year that is 2019, because your actually apprising what is the cost right now.

So, we need to take care of this discounting or you can take into account this present value considerations. And, likewise we need to take into account the household production or the amount of output he, if suppose say he is alive he can produce this much of output and the value of this output would be this much, that we can also take into account in indirect costs.

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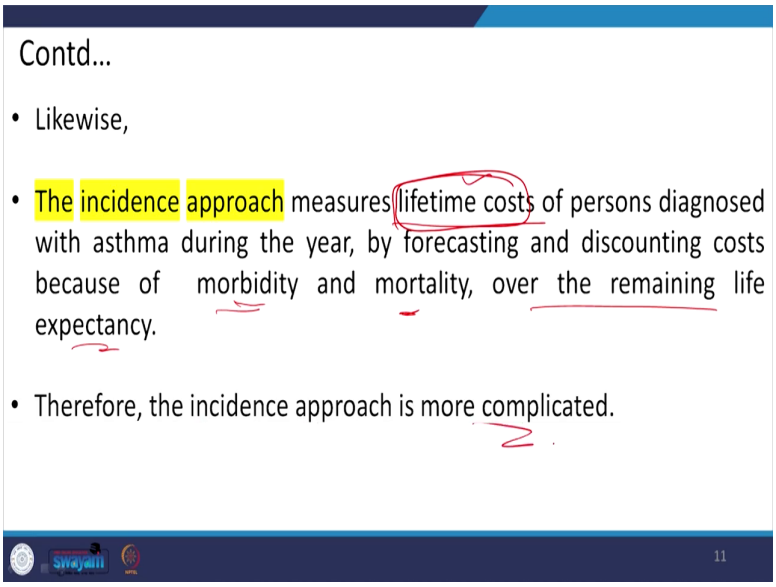

So, likewise in this second approach that is incident approach. Here, we are not measuring these costs in terms of annual or for year rather, we are measuring these costs for lifetime right. So, what you are measuring the lifetime cost of persons diagnosed with this particular digits during this year and, we are forecasting and again we need to take into account the discounting cost, because of the person is falling sick or in the case of it is death, over the remaining expectancy life.

So, what you are doing that, either we can take the first approach or this second approach in order to find out, in order to estimate, the total cost that is your damage cost right, but here this is your cost of illness. Therefore, when you are saying that we need to actually take in take into account the lifetime cost itself, not a particular year ok. So, that is why this cost is complicated is more complicated than the cost approach.

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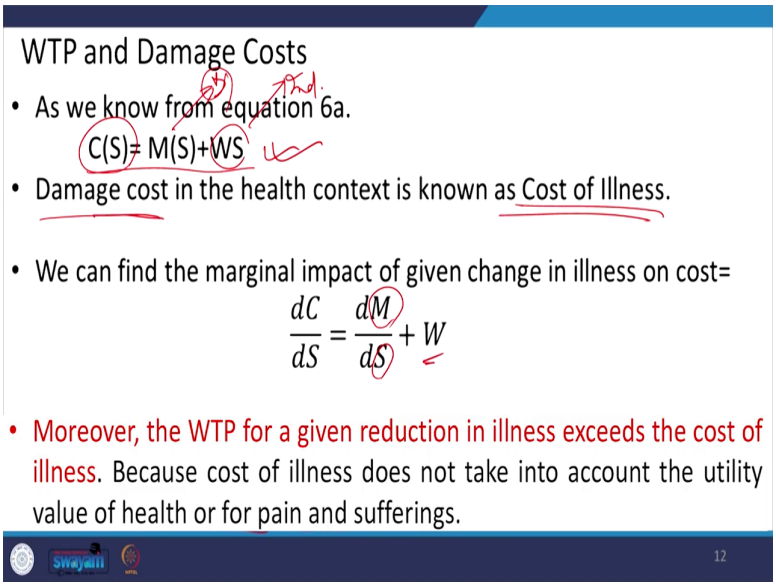

So, now we will just have the understanding that, how this willingness to pay and damage costs are related? Because, in our aborting behavior method, we found that this cost of sickness is from two sources, that is your medical cost, because you are sick and the second one is loss of ways. So, this is a direct cost this is an indirect cost right. And, from these the damage cost in these if this is so, this damage cost in this particular case would be known as the cost of illness approach, because we are only focusing the case of health.

So, here we can also find out the marginal impact of a given change in the illness on the cost. So, just by take into account the first order derivative of these, cost of illness you can find out this is what, if this thickness is increased by one more time, then what all be happening to the medical expenditure, that is the direct cost and also your indirect cost in terms of loss of wages.

And, again because we are comparing this willingness to pay and damage cost method, this willingness to pay for a given reduction in the sickness, it exceeds the cost of illness right. And, why it is so, why you are making this statement that willingness to pay for reducing this illness is actually a greater than the cost of illness, because we have not take into in this calculation of cost of illness, we have not take into account, the utility value of health for just like pain or suffering.

For in case of calculating this cost of illness, what we have taken into account? Just we have taken into account, some direct cost and some indirect cost like your medical expenditure on that the direct cost category right. And, in on indirect cost, we have taken into account the loss of wages or loss of warnings or loss of output. But, in this utility functions that we had already discussed in your aborting behavior expenditure, we have not taken into account that, how because of this illness, how the person will not be happy because of the pain from this particular disease or how he is suffering?

What is the value of this pain, how he is valuing to avoid, or is he doing something, or what is the cost of this pain and what is the cost of this suffering? So, this is not actually reflected in the utility function of the individual, but it should have been. So, that is why this willingness to pay for a given reduction in illness it exceeds the cost of illness it itself.

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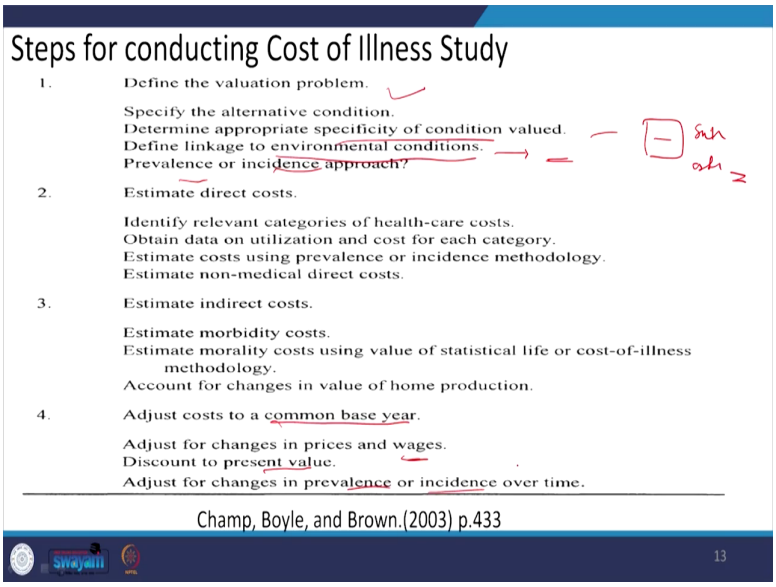

So, based on these understanding if one has to conduct a cost of illness study, we need to actually take into account these particular valuation problem, that determine the appropriate specificity of conditions, that which conditions you are trying to value. Whether it is pollution with health and which kind of health whether it is related to the skin cancer and the pollution, or you are saying it is asthma and the pollutions.

So, we need to actually specify the conditions to be valued. Then, we need to define the linkages that, what is the link linkages or what is the correlations between this? Environmental conditions and the kind of diseases that we are facing. Then, prevalence of incidence, prevalence approach or incidence approach, which kind of approach you are take into account. The second step would be estimating the direct costs.

So, we know what are the direct and indirect costs we need to take into account. So, after that what we need to do, we need to take into account to the adjustment by take into the account the common base year. We need to adjust for changes in prices, take into account the depilation or inflation or we just even, we need to discount the present value, because may be in the future, after second year, fourth year, third year whatever you will be getting some utility in terms of cost. And, also adjustment for changes in the prevalence or incidence above the time that we have discussed in this approaches.

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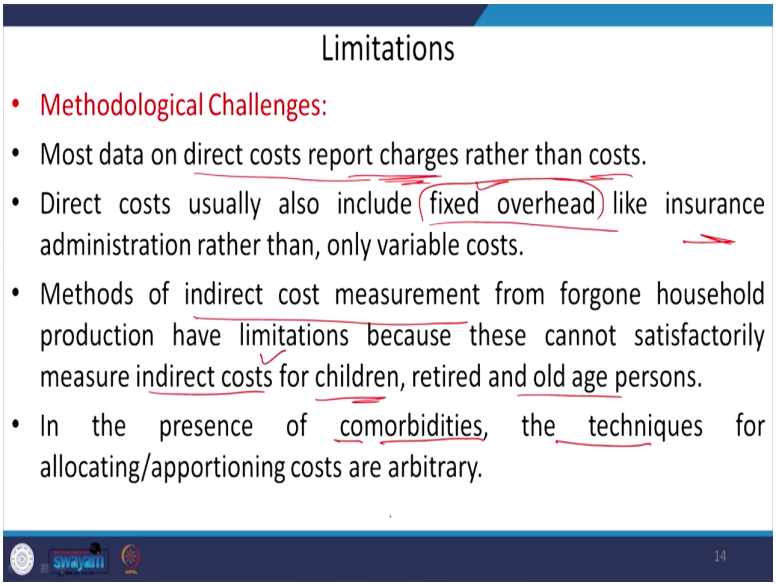

Moreover, in this context we need to look into that, what are the difference what are the different limitations or challenges that we are facing in this method? So, firstly, we can say that we are facing some limitations, there obstacles in terms of the methodological challenges. So, what are the methodological challenges? Again in under this methodological challenges we need to take into account that most data on direct cost report charges, rather than the cost.

So, when you are saying that under direct cost, the person is sick and he has to pay the medical fees, they are the charges now the cost.

And, the second one is this direct cost also include this fixed overhead like the insurance administrations rather than, the only variable costs right. And, why you are saying this, this is a problem, because fixed cost fixed over cost are likely to be fixed for the kind of illness you are having.

And, moreover the method of the indirect cost measurement, that is drawn from, that is largely based on the forgone household productions, it has limitations because they cannot satisfactorily measure the indirect cost. Just like for children can you assign any wages for their value. So, that they you can value that this is the time we are not exposed to the outdoor pollutions and they are kept indoor.

So, can we actually value that? So, it is not possible. So; that means, we cannot have satisfactory method of measurement, in order to deal this indirect cost for children either for children, old age or retired persons. And, more over in the presence of comorbidities; that means, for the in the during the same time you are having different sickness.

So, this particular technique for allocating or apportioning cost are very arbitrary, that if you are saying that you are suffering from this sun burnt as well as the cancer, because of this particular problem environmental change, then you cannot actually appose or allocate that, what are the cause right. For having this sun burnt or what are the cost that is you are incurring, because of these cancer.

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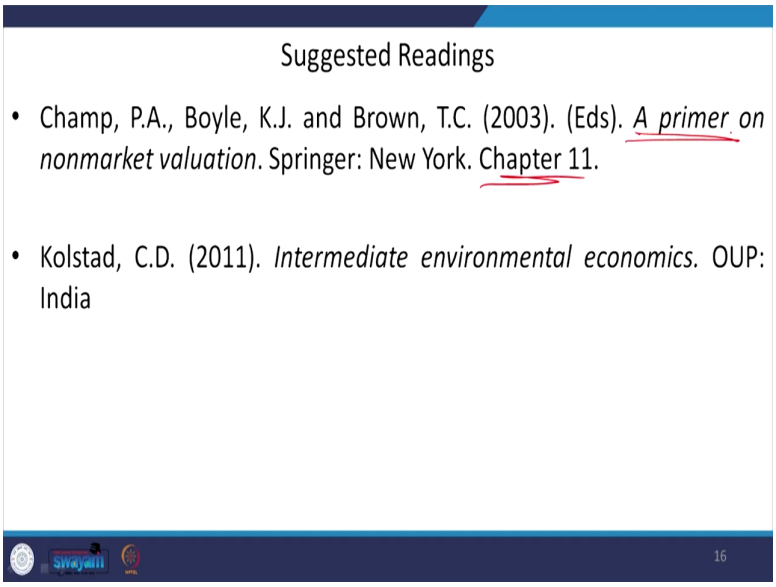

And, moreover we are also facing some fundamental challenges. So, you can see this method is not a money measure of welfare change; that means, in a true sense we cannot actually express this in terms of willingness to pay. So, if you are relating this willingness to pay with this cost of willingness approach, then we are actually finding a picture of lower bound or lower limit on the willingness to pay.

So, that is all about the cost of illness approach and these are the suggested readings that you must go through. So, this is chapter 11 of this same book the primer on nonmarket valuations. And, for the beginners you can start with the Intermediate environmental economics book by Kolstad.

Thank you very much.