

## **AMCHP 2007 ANNUAL CONFERENCE**

### **HEALTHY COMMUNITIES**

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#### **How to Do Economic & Cost Benefit Analysis in MCH Programs**

JUAN ACUNA: The Frankenstein approach is you get a little piece of the data from here and a little bit from here and a little bit from here and a little bit from here and you start sewing them together until you get a Frankenstein. So you've got a huge set of information out of different sources.

Is that something that is allowed in economic analysis? Of course. Is that something that we can do in regular epidemiology and analytical epidemiology? That's a big no-no because you incur probably into some sorts of biases. But here you can do it. Why? Because we're talking about something else. So the perspective is money.

So you can get all these cases, all these numbers. Where do you get the one million cases (inaudible) from Kaiser Permanente. Where do you get the 53,000 from Kaiser Permanente as well as Medicaid. Where do you get the 12,000 episodes of meningitis? The same sources. Maybe billing codes, maybe whatever. Where did you get the vaccine costs? From your program. Where did

you get the number of the costs of it? From the World Bank. So you assemble your Frankenstein and you're ready for analysis.

Now what is the other approach? Well the other approach is the Dracula. And the Dracula is—oh, a good friend of mine moved to Framingham 40 years ago and decided to follow-up these guys forever. So he had been there for 40 years following up this little town and he has a humongous dataset so I am going to suck this data like Dracula. So you just call your friend and your friend says here's my neck and then you just jump into it and you suck it all and you get the data. So you get the number of episodes, the number of cases, the number of things. So there are those two ways.

Of course, there are no humongous datasets that you can piggyback on unless you have good relationships and actually your items are included because remember our equation. The more things you measure, the better your explanation and the fit for your line that you will have. Okay? Good.

Net health outcomes per annual birth cohort. For prevention of 120 deaths from pneumococcal infection. Cost effectiveness ratio, \$80,000 per life year saved. So that is what we paid. I mean you can plug in these numbers and come up with that indicator. It does not include non-fatal health outcomes. So you have to know what it does not include. Because we cannot measure it all. So this is our

error term. If I am interested on the non-fatal health outcomes, I don't have them there. Okay? So that is my source of error, but it's a very good dataset.

It's a very good analysis and it tells us that for each life year that we save we need to be prepared to spend \$80,000. Is that good? Well you have to compare that with something else. In general, things that go over \$60,000 per life year saved or later per DALY or QALY are good investments in health.

So somebody has determined that. Who? Well somebody with a very global perspective. Who is that? They're usually of the two institutions—World Bank, so you can get many of these indicators from World Bank. Why? Because the World Bank actually finances health in many places. And who's the other one that actually many times execute these funds? WHO so you can get a lot of these economical indicators from WHO.

Okay, cost utility analysis. So what are the points to learn from cost-effectiveness analysis? The points to learn are first, costs are always needed and the more you get into, the better. Number two, the effectiveness is measured not in dollars but in natural health outcomes. And what is what you want to get at the end? An effectiveness cost ratio indicator to understand how much do you really pay for each one of those natural outcomes. And you can compare that with something else that has the same outcome.

So for instance, if I have a Program A that does something and a Program B that does something else, but both are going to end up converging through different routes in to averting preterm birth, what is my problem? Which one do I do? Do I do Program A or do I do Program B? How do I choose? How do I make that choice?

Well, I need to understand how much money am I going to put in Program A and how much money I am going to get in Program B. I know or I have to know, I better know how many of Program A end up here and how many of Program B end up here. What we do normally is just that. This program avoids 20%. This program avoids 10%. So I'm going to go with this program because it avoids 20%. That's what we normally do, intuitively that's what we like to do.

I have had a lot of arguments and actually every time that I put this topic I am hesitant because of the extreme heat that it brings to the discussion, but I'm going to do it once more. Health risk factors are in the form of case management are pretty colorful, good, they promise a good sense of tranquility and more over, if that case management is done in the form of home visiting. There is a model that many of us, especially in Louisiana we're one of the big states that we follow that is the old home visiting program. How many of you know about that? See, that's why it's a heated argument. How many of you actually do it? Good.

UNKNOWN SPEAKER: We're looking at it.

JUAN ACUNA: You're looking at it? Okay. So Olds is a very well documented program. It has several clinical trials. It has a cohort that has been followed for many, many years. By the way, we have two ways to go. We can go into a break now and go until 12:30 as it was programmed, or we can just keep going and you can just keep walking out whenever you need it, okay. I just can keep going and going and going and going and going. So don't worry for me. So I don't need a break.

So what happened with this Olds model? Well it has shown that it's a very good model to prevent some outcomes. Unfortunately many of these outcomes are achieved very long-term. Long-term, so we're talking about even a decrease in the number of incarceration when you hit 18. We're talking about a decrease in violence or moms that stick more with their kids and stuff like that.

It has failed consistently to show—and consistently means that sometimes it's in, sometimes it's out—to show short-term outcomes. So a mom is paired with a nurse that goes many times during pregnancy and then some people say yeah, but these moms that I have less mortality rates, prenatal mortality rates, less preterm birth rates. I have not had none in my program. But the clinical trials don't really show that. So if you put the perspective and we will see a little bit later that clearly in this model of cost utility analysis I will bring your point, which is what is my perspective.

Let's say that I am a Title V director. This program is one of the most expensive programs that you can engage into, to the point that in Louisiana around 25% of the money from Title V actually went to pay for this program. Fortunately enough pretty early in the process it was picked up by Medicaid. So you kind of breathe easily just because somebody else is paying for it. But remember we have a same pot.

Okay, so now we're getting reimbursed for those visits. So the program from our perspective of Title V is much less expensive. But in general we ended up attending—well actually I don't remember the technical term for the program but graduating moms from the program because you graduate them after the second year postpartum. So around—I don't remember—around 2,500 women by the end of 2004. Katrina was 2005. So by the end of 2004 we had this number.

And what happened was that so far this program had graduated or was seeing around 4,000 women. But the cost for this program was around \$4 million per year, \$3 million per year. It doesn't really matter, one million more, one million less, no big deal. Well it's a big deal because it's just 4,000 persons.

So my next question so you get the perspective without getting engaging into it because it has an economic analysis and it says that for every dollar that you put into the program, you're going to be saving like—is that like too like three or four

something, \$4 long-term. But long term is like we're talking over the next 17 or 18, 20 years.

So what is the problem with these programs? Well, how many of you drive a more expensive than \$100,000 car to work? Well I don't see many hands. Is that because the cars are bad? No, they're actually quite nice. They have GPS, stereo system, now they have LCD. The kids can watch TV forever so you can engage into a coast to coast trip without fearing those moments of that when are we going to get there and stuff like that. Great cars.

So why don't we drive them home and work every day? Well it's very relatively simple because if this is our budget and this is the piece that goes to the mortgage of the house and this is the piece that goes to fit the kids and this is the piece that goes to dress everybody in the house and then at the end you would like that to be more, but at the end, this is the piece that is destined to pay for a car. That amount of money represents around a \$15-20,000 car. And that's the average. Can we not pay for a \$100,000 car? Of course we can pay. We could dedicate all this money and we can increase the value of our car to \$100,000. We're planning to go to work naked but who cares, I mean I'm driving this such a great car.

So what is the difference between this and investing in an expensive program in the state that you really do not understand how your money is partitioned? Why?

Because you have so many ways that you could have spent your money that justifying a program that has a good reputation and is of a good value long-term, et cetera, et cetera, is good. But the problem, conceptual problem that I always had from this perspective with such an investment in states that usually are poor is we're going to be sacrificing something else that maybe is more effective just because this looks good.

So of course the next question that I get is well, okay, show me something that is evidence based that is as good as this and I will change the program. Well that is one of our limitations. We do not know nor we engage in this type of analysis frequently enough to know more about the programs that we do. I mean we certainly evaluate them, which is a shorter term process, much less do economic analysis. Yes?

UNKNOWN SPEAKER: Isn't that just an argument for another agency to help pay for that program?

JUAN ACUNA: Well, what is the perspective? So is the perspective of this program societal? Okay, that's easy. The perspective of my car is societal. I'm going to drive my friends to work. I'm going to drive my aunt to work. I'm going to drive my mom to the MD and stuff like that so I want everybody to pitch in for my car. People don't do that.

So if you go to, for instance, if you go to the legislator and you say, you know, we are through this nurse home family program engaging into a couple of kids that have 50% less incarceration by the time they are 18. They say well good, keep paying for it and we're glad. Oh no, no, no, no, no, no, you misunderstood me. I want your money to pay for my program so you don't have to deal with these kids. I won't have to deal with those kids. That's 18 years down the road. So who cares. I don't care.

Some people care, but they say—what is the next most common response? Oh, but I lack the administrative mechanisms to put my money into your pot. I'll just have to justify my pots. You know that is a problem. So the problem is not that the car is not good. The problem is not that you cannot do more. I mean how many of us feel really lousy driving alone many, many miles per day knowing that the cost of gas is going up, that we're having problems because of we're needing that gas and we could have five more other people in our car. Well we feel bad for a tiny little moment. It's just like a flash. See, and then it's gone. That's how the human mind is great. We forget. We negate. We adjust. So we really don't care.

Of course that would be a great perspective just to have one single manager for all the money to be able to invest only in things that from the societal perspective are good. Well, we would not be where we are. Some for good, some for bad

because the system would be totally different and actually a really unknown of us.

The second one, cost utility analysis. It's a variant of cost effectiveness analysis because it still measures things not in dollars but in natural outcomes. But the problem is that—oh not the problem, actually the advantage is that the natural outcomes has been expressed or standardized in the form of quality adjusted life of years. Life years, which is the famous QALYs. There is another measurement out there that is DALYs and I will show it later which is it adjusts not only for disability but for death as well. And DALYs are heavily promoted by WHO. QALYs are heavily used by everybody else. So it depends on who your funder could be, you need to use QALYs or DALYs depending on what is your perspective.

It's a method to compare interventions. Remember it's always about potential different programs or interventions tailored to the same natural outcome that affect both for fatal and not fatal outcomes. So I can actually adjust and include. You remember that study that I showed you that said I am not adjusting for this? Well because you can't. So what I want is something where I can.

And of course, putting this into QALYs makes it a little bit harder for people to understand. Imagine you go to the legislator and say you know what, I'm going to save two QALYs per dollar that you give me. The guy's going to look at you say

30 seconds, 39—bye, bye. You didn't make an impact. I mean the guy doesn't even know QALYs unless he's like the economist. So if you know that the guy is an economist, tell him or her that actually you're going to be saving several QALYs or the cost of the QALY is going to increase from this to that and then you've made your case.

But be very careful because you guys are knowledgeable both in health and many of you in money and I am going to ask you a little bit before the end how difficult conceptually was this for you. And this is something that by an hour from now, by lunchtime you would be confusing the three of them again. But at least now you know. And at least now you have the paper so you can actually go back and keep refreshing. Because what I heard and I forgot to tell you is that everyone wanted to know what approaches to the evaluation of costs there were. So that's what I'm telling you.

And cost utility analysis is many times referred as cost effectiveness analysis but many people separate them altogether. Not because the methodology is different but because the outcome is so different from the one that we use as net. We need to estimate again the net cost. So it always boils down to the same point. If you do not know how much money are you spending, you actually will not have the results that you want. You have to measure both health—you have to measure health outcomes in terms of QALY. What is a QALY? A QALY is a

discount that you do to life years based on quality. So those years are discounted from the perspective of quality or from the perspective of life.

How many life—how many years is worth living? Five years perfect health or fifteen years crappy, crappy health? Bad health? I'm meaning the works. I'm meaning an extreme limitation to do anything, feeling pain all the time, feeling bad all the time, not being able to work or work just a tiny percentage.

Do you know people that have those conditions? Yeah, there are those out there but actually they are not out there, they are in there because they actually (inaudible) to housing or long term health care arrangements or hospitals.

So what would your choice be? So let's do a quick survey. The health condition that I'm talking about is something that will not let you work but maybe from home. Maybe. And that just part time. Second, you can only engage in outdoor activities through support, which means very, very rarely. Third, you will have some type of physical feelings in the form of pain or discomfort or GI tract, nausea, vomiting and you will not be able to actually eat the food that you like but you will be precluded to dietary adjustment and stuff like that.

So that is the scene. I mean just imagine yourself in that situation. And of course you cannot live by yourself. You need somebody to take care of you. Okay, so that's a given. Now, the other one is you as you are now. So I'm going to ask a

few of you straight questions, so let's start here. Five years of your current life or ten of those?

UNKNOWN SPEAKER: I'll take the 10.

JUAN ACUNA: You'd take the 10 of those? Okay, how about nine of those? See where I'm going? I'm going to break you. But that's the whole point. That's what this does. Nine?

UNKNOWN SPEAKER: Okay.

JUAN ACUNA: Still take the nine? Eight?

UNKNOWN SPEAKER: I'll take the five good ones.

JUAN ACUNA: You'll take the five good ones? I mean so your threshold is eight. See? Okay.

UNKNOWN SPEAKER: I'll take the five.

JUAN ACUNA: You'll take the five?

UNKNOWN SPEAKER: I'll take the five.

JUAN ACUNA: Okay, how about four? See where I'm going now?

UNKNOWN SPEAKER: I'll still take the four.

JUAN ACUNA: You'll take four? Three?

UNKNOWN SPEAKER: Three to ten, that's—

JUAN ACUNA: See, it always happens. I use this with my kids and they hate it. When you put alternatives and this is a rule of life, when you put alternatives that are totally opposed you can easily negotiate a breaking point so you know who you're dealing with and what are the conditions. See? So 3 to 10 ? It's getting here, huh?

UNKNOWN SPEAKER: It's getting there.

JUAN ACUNA: It probably got there because two you say no way.

UNKNOWN SPEAKER: Yeah.

JUAN ACUNA: So three. How about you? 5 to 10?

UNKNOWN SPEAKER: I'll take the five.

JUAN ACUNA: Five? Four?

UNKNOWN SPEAKER: Uh-huh.

JUAN ACUNA: Three?

UNKNOWN SPEAKER: I'm getting to the breaking point.

JUAN ACUNA: Three? How about you?

UNKNOWN SPEAKER: The five.

JUAN ACUNA: Five? Okay, four?

UNKNOWN SPEAKER: Uh-huh.

JUAN ACUNA: Three?

UNKNOWN SPEAKER: Uh-huh.

JUAN ACUNA: Two?

UNKNOWN SPEAKER: No.

JUAN ACUNA: No way. So three. How about you?

UNKNOWN SPEAKER: I would take five.

JUAN ACUNA: Four?

UNKNOWN SPEAKER: Uh-huh.

JUAN ACUNA: Three?

UNKNOWN SPEAKER: No.

JUAN ACUNA: No. Okay. Are you seeing a central tendency here? Now if I put these interventions which are real—these conditions are for real, I mean just think on two outcomes way opposed and when mutually exclusive that you can put in as (inaudible) you only need 50 people to give you a population based estimation of what the people would like and you have just seen a very quick example of it.

So I can safely conclude that in general people would break around three to four years of good life against ten years of that type of life. Okay? Now, how do I plug that into the equation? If I know what is the cost of keeping you healthy or paying for you being sick I can put the cost for the outcome and I get an adjustment based on the discounted life years. So you guys have around two years or three years of discounted life when you are willing to trade for being sick in such a manner. Do we know what that type of sickness is for many health conditions? Yeah, we can come up—or actually we can describe it.

It's so relevant that we can actually put many outcomes, many, many outcomes and people are still able to decide between one or two and you can get good estimators. Then you have to take into account what is the probability. Because I could have told you that the likelihood of these 10 years of that type of life is about only 10% and 90% of having a good life. I mean your trading point totally changes, totally changes. You can go even down, down to maybe even one year because you know that even if one year you're still 90% sure that you're going to be healthy for five than having that status for ten.

So the probability of actually having those outcomes can be negotiated and is known. How it is known? Well, you get healthy people at risk. How many of those that smoke develop lung cancer? Four times more. So you have lung cancer, no lung cancer. Now if you have high risk here, you can either smoke or not smoke.

If you don't smoke you still get cancer or no cancer. What is the difference between getting cancer and no cancer and the smokers? The proportion. See?

So when you get lung cancer, baby you're dead because you will die in the next two to three months. Now if you were lucky and somebody took an x-ray and they diagnosed that very early, then you might have a few more years to live, but those years are going to be after taking a whole lung away and maybe getting all these problems associated.

So what is your choice? Oh my God, I don't know. How many years of good life do I have? Well you will have probably two years of good life and then you will feel sick. And when you feel sick, you're going to be dead in two months. Or in the other side my choice is take one lung away. The probability of being cured is at this stage around 90% or 80% which means that I'm going to live a limited by health life during many, many years. Okay? But if it comes back then I'm going to be dead in two years—in two months. I mean what a crappy decision. I did everything by the book. I went into suffering, into pain, into surgery, I still die? That's not fair. Well that's not fair, but that's how life is.

Do we know that proportion? Yeah. So we put all the proportions and we give a potential for a choice. And people choose. And that's how you adjust these things. Is that more or less clear at least conceptually? Great. Yes?

UNKNOWN SPEAKER: Is there a standardized gradation between the zero and the (inaudible).

JUAN ACUNA: No. You always have to because it depends on many, many, many things. So who's your population? Well my population is Californians. Oh, those guys like to surf forever. So they will trade one year of surfing and not 20 of being in that health condition.

But if you go to Mississippi or Louisiana then those people say, oh no, I can take that life. My life is even worse than that. So who will I care? I mean somebody's going to be with me. Somebody's going to feed me. These days, nothing—mosquitoes.

So you see how it goes with the population. So the good thing is that once you define your population then you can go and do this very quick surveys and you'll need more. You have established your preferences for your population.

Okay, this is an example. The projector cost effectiveness, cost utility analysis of the same thing, same vaccine, pneumococcal vaccine and the cost effectiveness analysis calculated was 113,000 pounds per life saved. Do you remember the U.S. one? It was \$80,000. Much better here than there, much more expensive there. Now, the cost utility analysis for them is that they pay around \$60,000 per quality adjusted year saved, which means it's another mechanism, another form

to inform the results that makes you even have more power to choose between programs.

So remember the limitation of the other study. They could take into account non-fatal outcomes. Now if you can take non-fatal outcomes into account it really makes your approach much more effective because it reflects more what you actually do, which is, you know, invest in health. So non-fatal outcomes are actually a big deal, especially we're talking about something that is relatively common. So then you probably would like to measure that in QALYs and not really in life years saved. There are QALY estimates for many things. So those are publications, those are standardized. You just need to look for them in the literature and you will be surprised.

Let's go into the third and last one which is cost benefit analysis. Cost benefit analysis is used to compare costs and benefits, but benefits mean money, remember CMB go together. Benefits cost, which means cost benefit analysis we measure in money. Don't forget that. It's very important. Where consequences are valued in monetary terms. So if money is going to be compared with money are the outcomes that we measure related? No, because the outcome is money. So whatever generates money as an outcome is actually going to be permissible.

So my Program A now changes because the Program A only promotes housing. And my Program B changes because my Program B actually only immunizes

kids. Would have been able to compare from my perspective appear if I could choose a program investing in housing and one investing in immunization? Well that's kind of crazy. You say well how are you going to compare something that promotes housing and something that promotes immunization. I mean is housing a big deal? Does that prevent deaths? Yeah. Disease? Yeah. So it actually has its consequences, doesn't it?

Okay, can I compare these two from the perspective of cost effectiveness analysis and cost utility analysis? No, I cannot. Why? Because the outcome here is housing and the outcome here is immunizations or consequences, so I can't. But if I can put this into money and I can put this into money then I can compare money to money and choose the one that saves the most money.

How do you think that we get less money for health than for whatever? Well there are political reasons of course, but let's make the world perfect without politicians. You actually do this, you actually evaluate as an administration how much money am I going to save if I put more money into health than if I put more money into highways? I translate them into monetary terms and I say that if I put money into highways I will be making several millions. If I put them into health I will be making several hundreds of thousands of dollars. Which one do I choose? The highways. So it's pretty piece of cake. What is the problem? You have to be able to put the final outcome in monetary terms.

So what is the main difference, striking difference? With the other one you can compare programs that will use a single same outcome while here we can produce different programs, totally different programs. Why? Because the outcome is going to be just, just savings or costs. Okay, can also include non-health benefits, road making, housing, et cetera, et cetera. And the yields estimate of net benefits which is the benefits minus the costs are expressed in the dollars. So the steps are to calculate net costs as it has been done for all the others.

Bottom line, and I think that that really, really strengthens the answer to the first or second question which is if I do not know my program costs, can I do these? No. Or actually the answer is yes, you can, but you will have the right answer for the wrong question. Okay, which is really bad. Place dollar value on all outcomes. If you cannot do that you cannot do these. So you need to have money against money. Okay?

There are different methods that can be used to value even deaths. I told you there are standardized forms. Now you can say well that is a societal perspective. Well so be it. So the only perspective that we can have if our outcomes are going to be deaths is actually a study from the perspective of the society.

Can we assume the perspective of the health agency? No, you can't because you do not know how much is worth—is a death worth for your agency. You are actually be able to know how much a death is worth for the society but not for your agency. No. If you do a study where you come up with that figure, then you can do it. Why? Because you know how much your program costs and how much a death is worth for you as an agency. Okay?

The value of economic productivity loss due to illness, that is extremely important. In the previous example where you were, you know, juggling, does it make any difference of how many years you would have chosen if you would have been a software programmer as opposed to if you would have a construction person?

Well a construction person that ends up in bed is ruined while a software programmer could even become more productive. So a software programmer can actually tolerate many more years of disabled living than a construction worker because a construction worker if he cannot get out and work then that's it.

So you see that there is another ingredient that actually makes this equation different. And then you calculate the same—remember that everything boils to ratio, which is net benefit is the total benefit minus the net cost. So if you end up negative it means that you're expending more than what you're saving. Now if you are spending less than what you are saving, that is too expensive. But 80% of

those programs that have been measured in health are of that characteristic. Our 20% of programs that we engage into are cost beneficial from the perspective—or are—excuse me, are cost savings, which means that we save more money than the one that we invest. So public health needs to be done even if we lose money because it's not just about making money. It's about providing services.

So this is another example that you can actually follow now where you can see that the final column is the cost savings minus whatever in cost is in net cost savings of \$143 million for programs that address spinal bifida as opposed to (inaudible) or you know all this screening and stuff. So I won't go into detail. You can look at it in your graph or actually you can pull the paper quite easily. And there are many, many, many more papers studying different aspects.

And every time that you see a costs benefits analysis paper what you're going to see is that the table at the end gives you a dollar value, not a dollar per value. If you see a dollar per value then you are facing a cost utility or a cost effectiveness analysis. If you see a dollar saved net number, that is a cost benefit analysis.

Now cost effectiveness is defined as a good value for your money. So when you get good ratios you can say I am getting what my money's worth, you know, I'm getting good value. \$80,000 per case averted that's really good. \$20,000, \$100,000 per QALY that's good. That's fine. You know I'm willing to pay that amount in order to get this number of outcomes. Improved health is worth

additional money spent. So we have to put that perspective as well. Cost savings, what I already said. Averted direct cost exceed the cost of the intervention. So it's just a sum there. (Inaudible) so if you end up in minus then you're spending too much or more money. But if you get positive values, I mean that's a really good program to sell to the legislators for instance.

Now it will be good to be able to choose between that program and another program to tell them this is the one that I want. If you need to make that case, then that's a your decision type of thing, which is I am going to choose Program A as opposed to Program B just because I save more money with program B.

Well the exception in health care and public health we don't want to save money. This is not a business. This is about providing health. So we are not prepared many times—we don't need to be prepared to justify that our programs actually make money. We need to be prepared to justify that our money pays for good outcomes and that that was our best choice. A net benefit is the value of health and averted costs together.

So you put health into the perspective and the cost together exceed intervention. So you need another value there which is you need the value of health. But then again, many of these values are published, are tables, are books that you can consult. Most health interventions have a positive net benefit. Why? Because you plug in another valuable outcome which is healthier people. So if people are

healthier, then I can say well how much money is that health worth and put it together with my costs, which is going to be much better. Okay?

An outcome is not necessarily something that we pursue in the form of dollars. An ounce of prevention is worth a pound of cure. He was not talking about how expensive it would have been. So yeah, it is worth to invest in the ounce of prevention just because we're going to get a pound of cure, but that's going to cost us \$50,000 per ounce. Okay? So it's going to be an expense.

And that's the second important message that I want you to take. Because many times that you present this type of data you're going to be facing the question on how much money are we saving. So you have to say, what we're doing is paying for good outcomes. At the end health could be expensive which means that our business is to produce better quality of life, much less people that die that we can avoid, much less injuries even if the end cost for the agency is not a positive one. Why? Because for the society it will be good.

Now unfortunately we are the agency that take care of those outcomes for the society. So my agency is prepared or has to be prepared to lose some money for good health outcomes. My issue is not that. My issue is the choice between these two programs. Which one is best? So people understand really. I mean somebody says no, that one person is going to become very unpopular, very, very fast.

So you have to center the discussion quickly not into the net cost savings or the net savings but you have to center the discussion rapidly into this is not about the business of producing money, it is about the business of producing health. Okay? And it's a very well taken message.

There are other types of economic analysis. But I think that at this point you guys have enough with the ones that we have covered and those are the more important ones. We will go quickly, but we will not spend much time. Burden of disease and injury, body studies, they represent the inclusion of death. So you can put mortality and morbidity all together in one indicator. And that standardized indicator is called DALY which is a disability adjusted life year. So there are some studies where you're going to see DALYs instead of QALYs. The only thing that you have to keep in mind is that they included mortality and morbidity and lumped them into a single indicator. Okay?

This is an example. Over here, what is important? Look at the—at this column. If you are able to calculate DALYs by disease you can actually rank disease in order of economic impact for your society. So you see what is helpful here is that you see that out of all DALYs spent or expenditures, 9% of the money is spent in morbidity and mortality per use by ischemic heart disease. Isn't that something? And if you know that ischemic heart disease, cerebrovascular disease go

together, this one goes up to 14% and the next one is 4%, which is motor vehicle accidents.

So any program these days that actually can show that you are averting a number of hearts that are going to become ischemic or (inaudible) in the later portion of life is going to be well funded and well seen. Why? Because you're addressing around 14% when the next one is 4% of the expenditures in health or the cost per outcome of health.

Generalized cost effective analysis is a different formula. It's a twitch of the CEA but used in developing countries. Why? Because of the limitations of data. So basically what you do is that you pull indicators in a much broader sum, but you guys are not facing this so we will not go into that. There is a good example that has been published. So if you're curious about these you can go and just put in in Google, Chile and (inaudible) and you will get most of the papers that have been published including this one. Okay?

Economic benefit of prevention. This is an issue that it's important because it's kind of a cost benefit analysis without the program costs. So what you do is that you plug in the net of the outcomes money and you compare the two monetary terms if you do not know exactly what is the cost of those two outcomes. So there are some programs that as you were pointing them out, that there is a point where you can say I really do not know. I mean I really don't know how this

happens. Why? Because this is just a web, just I cannot get all the points for the costs for my program because I (inaudible) with these guys, this (inaudible) then it expands, then it shrinks and so it's I don't know. So what you have in general is a cost estimator of the outcomes of whatever you decide. So you can put money to money, but of course it's much more limited.

Any one of the three last ones that I have mentioned is much less valid. So the gold standards are the same three, cost benefit analysis, cost effective analysis and cost utility analysis. As long as you remember those three you're good, you're fine.

These are seldom done. But in the next case—in any case, you have examples of how this used so you can later go back into the slides and try to see what is the issue. Here because the issue, and I want to bring this point because the issue is just comparing costs, what you have to establish is a base case cost, which is kind of the average cost and then establish a lower bound and an upper bound.

So you know where are you in between and you know how far each way you go. So you kind of have an idea of how unsafe your data is. So if you say that any one of my interventions costs or is between this and this you know the security of your data, the validity of your data. But then again, unfortunately, we don't have

enough time. I will not go into these and I will jump to the last set of slides, which is around 180—184.

This is just a hint for you to go and read the papers. So this is going to be just a warm up. What happens when I read economic analysis or any paper? What happens is that I am not sure because I am not a methodology expert of how good the methodology is to get these results. We just explained the surface of what these studies are and what these designs and methods are. So it's very hard for you to go and read a paper and understand that they actually went through the checkpoint. You have that checkpoint in the slides. So for those of you who are interested you can actually go and get the 10 or 11 or 12 steps that need to be followed to actually do one of these analysis and they have to be reflected in the paper.

But you need to determine when are the results robust, meaning when can I really believe them and give them a sense of importance. And remember the net value cannot always be expected to be positive because we are not into making money. So net value could be negative in cost benefit analysis. That does not make a case for a bad intervention. It just says that the cost per is this and actually I'm losing a little bit of money. But if I would have an alternative what I don't want is to lose more because there is a good one that makes me lose less. So this is my first best investment.

Dominance is maintained through the cost effective analysis and cost utility analysis which is these. You have to have a clear explanation of which programs are dominant and which are not. So they have to explain that there were 14 or 15 or 16 programs evaluated or 4 and that 2 programs were not even taken into account because they were not dominant.

There are two ways to present that. The first one is something like this. and the second one is a curve where you will see that of all the programs once they are calculated the ratio you can follow one program here, one program here, one program here, one program here and there is kind of a line and suddenly you see one or more programs that are here or here or here. So you see that these programs were dominated by these programs.

So it's another way to express those cells that are in the middle of the graph when we cross out those programs that really do not make sense because they are either not very expensive but they don't report many outcomes or because they are too expensive and they don't get good outcomes. Okay? So dominance has to be always there and has to be maintained and has to be logged into the analysis. The results are within the range reported in the literature. That is important for every single paper.

Totally doubt papers that produce or report miracles. And those papers probably have a problem. Okay? So for instance there was a program that reported

amazing outcomes of nurse visiting programs and said, you know, we got like almost zero infant mortality, zero—this program is the way to go. But they didn't explain very well that those moms referred to that program were not selected randomly.

That the OB/GYNs because they knew that this program was going to be a treat for these moms that otherwise wouldn't have any counseling or any access to health. They choose those moms that are nice. What moms are nice for an OB/GYN? Those that stick to your prenatal care, that talk to you, that if you say do so the next time they come and say, oh and I did this and this and this and this and this. So what are those moms? Well those moms obey what we call in epidemiology the healthy club bias.

If you say I am going to do a study to study cardiovascular disease in subjects and I want volunteers, who are you going to get? Those that are healthy, very motivated, very interested in healthy issues that probably already eat well, that have the five a day, that don't smoke that—and then they want to go (inaudible) so you measure, you know, my (inaudible) and my heart and you tell me that I'm doing well. So there is no cheat. So that's what we call bias population because they were not selected randomly. They were selected based on specific characteristics. So that's what happened to that one. So that—there's no brainer there. The results that are actually (inaudible) within what is reported for similar programs or evaluations in the literature have to be carefully examined.

And which type of sensitivity analysis? We haven't talked about that, but all of these papers have to have what is called a sensitivity analysis. There are two ways to do it but the one that is intuitively—the one that we understand the better is the worst case, best case scenario. There are many of these costs that we do not know. So your point is now extremely well taken. I tried to say no for the sake of clarity but now it is actually a problem and it appears frequently. And I could say that almost all economy analysis have that problem that you couldn't put every single cause. You know that that you're going to miss something.

So what do you do with that? Well in the same way you could miss some outcomes, you could miss something. So you say well okay, what is my best scenario? Well my best scenario is go all the way to this side. So you calculate all your formulas and everything and indicators based on that one and say it cannot get better than this. I mean this would be dreaming.

And what is my worst scenario? That means I would be the most pessimistic person in the whole world, what would be my worst case scenario? This one. And then you recalculate everything based on that scenario. And then your findings should fall in the middle. So you say, these were my findings and the worst case is here and the best case is here. So you've got to be somewhere in between. So if even the worst case scenario makes sense, you're good. Okay?

Then you want to know that they did something that is called a Monte Carlo simulation which is basically that many of these programs are unique. But what happens if we recreate these programs 10,000 times? So what you can do with the computers today is that you can take your data and you can actually run these programs over and over and over again randomly selecting the indicators and generating new, new, new results.

And after 10,000 runs nobody would ever be able to implement 10,000 of the same program. So 10,000 is kind of a magical number. We just say well this is like really more than enough. To decades ago it would take several days to run a Monte Carlo simulation. These days it takes a couple of minutes.

So today running a Monte Carlo is not a big deal, so you have to do it and you have to do it always. And then you get the results. So you ran any number of trials what makes sense. Sometimes you say well, for these type of program I am running 100 simulation is enough. Sometimes you saw well this is such a program that could be so easily implemented that maybe we need to run 10,000 simulations.

And then you do it and then you measure that what you got actually falls within the terms established and the range established by the simulation. And then you want to use other measures of the sensitivity of the probabilistic analysis that you

use in your papers. And I think that with this you will have enough understanding of what important points are there where you're going to read economic analysis.

So let's recap for a second. What we did this morning was first we tried to determine what types of economic analysis are there. Number two, we reviewed the five more frequent types of economic analysis. Two of them do not have outcomes. Three of them establish a relationship between the outcomes and the costs. Those three that we call full-fledged economic analysis are cost benefit analysis, where monetary outcomes are the rule. So we are seeking for money as an end point. Because money is an endpoint, it allows me to something very special which is compare programs that are not related.

Now, if my goal is to compare programs that are related, which is more frequent in health, I am bound to two other designs, which are cost effectiveness analysis and cost utility analysis where the outcomes are measured in natural health outcomes. The difference between the two of them is that cost effectiveness analysis does use natural outcomes by name and cost utility analysis a special form are cost of cost effectiveness analysis measure the natural outcomes in a standardized way. The qualities—the QALYs, which are quality adjusted life years that mainly take into account morbidity and the DALYs which are disability adjusted life years which take into account both morbidity and mortality.

The important take home message is when I am reading economic analysis I want to understand first the design and that that design accommodates to the type of limitations that are intrinsic to design. Second, that they definitely establish a perspective for the analysis that different perspective determine the costs that I will be able to include. If the individual is the perspective of the analysis the individual usually don't care about medical costs. Why? Because somebody's going to pay for him usually.

When the payer is the perspective of the analysis, many costs are included. But for instance, lost wages are not a business for the payer. He doesn't really care about lost wages. So why would you calculate lost wages if you are using the perspective of the payer, which is usually health insurance or Medicaid or you guys, you know, Title V, stuff like that.

On the third common perspective is the societal perspective. If the perspective is that of the society, then you have to include everything, every single cost and every single cost of the outcome. Okay? Now, if you're going to read the third thing that you want to understand is that they included a sensitivity analysis which means they really, really manage the amount of uncertainty that always is intrinsic to any of these analysis, establishing a form of a worst case, best case scenario. But there are other methods that you have in your papers.

Fourth, you want to understand that they use other forms of simulation to establish that the boundaries of your findings are correct, such as a Monte Carlo simulation. And then you want to read some other items that are related to the conclusions and outcomes of these papers that are relevant. One of those applies to everything. You do not want to over conclude. You want to conclude based on your findings.

So many people say because one plus one equals two I assume there that if there would be four, then life would be so different. Well the point is you didn't get four. You got one plus one equals two. So you don't want to jump from a finding to an assumption and then end up concluding because that is wrong.

I hope that this has been informative. I really hope that this has been what you envisioned when you signed up for this three-hour crash course in economic analysis. I hope that you're going to go back and read some of it. There is a very simple, easy to use and easy to read book that was published by CDC authors that is called Prevention Effectiveness, whose main author is Anne Haddix and is a red book, small and it has—I mean you can almost read it in a trip. So whenever you're going to go to the next conference, if you start reading it while you start flying and you use your flying time, your hotel time, your boring time, you do much networking and then you keep reading and you fly back and then you probably will read it all. And it's extremely easy to understand.

And it has—a good thing is that almost half of the book are appendixes. So the appendix is in the format of all these tables of these—so you will get a very round picture of the methods that we use the most in health economics. Are there any final questions?

UNKNOWN SPEAKER: (Inaudible)

JUAN ACUNA: Anne, A-N-N-E and last name is Haddix, H-A-D-D-I-X. And the other one is Steven Teutsch I don't remember. I hope that Steven will forgive me. It's T-E-U-S-C-H. Yes?

UNKNOWN SPEAKER: If you prefer to answer this question after this is final, it's off the topic but—and this is very opportunistic of me, but given what you know of state and Title V programs, what do you think the biggest mistake of Title V (inaudible) is with respect with using MCH Epi staff?

JUAN ACUNA: The biggest mistake is to have the MCH Epi staff in a closed door unit and just contact them when you need a number. That is the biggest mistake that I have seen which means different things. It means that the biggest time and you will just say yes or no if I'm wrong. The biggest contact that you have with your MCH Epi people is the months before the Title V Block Grant is due. And that is wrong. Why? Because you are basically seeking 15, 16, 20, 30 indicators that are basic proportions that actually sometimes mean not much.

Why? Because they are looking for the low birth weight rating you said and probably is stagnant forever for the last 10 or 15 years. So why—what is the point of pulling it again? Well it's important at least from MCHB perspective it is important to keep you thinking about preterm birth even if the rate is the same. But so—but anyway, that's one point. I have seen many places that actually have that for characteristic.

The approach that I like and this is the one that I encourage in each one of the states that we support today, which are 23, which makes almost half of the country through fellows or through assignees is that MCH Epi should be driving a lot of your programmatic decisions when it can be done. Meaning, if you don't have PRAMS data you're missing a big chunk of your potential for data.

But still if you don't have PRAMS and your analysis of vital records is just limited to probably using annual reports and proportions and answering to people or programs requests, then that's probably wrong. Why? Because the people that drive programs are not data savvy people. So they don't really understand the potential of the mechanisms and the tools that you could actually use to inform those programs.

Now what is the limitation? The limitation is that the data people don't understand what the programs look like so they have no idea what to do with those hundreds

and hundreds of variables that they have there and be able to produce those models for you which means, you know, I have just run an analysis in breast feeding and the next question that you get from the program person is, okay what is the proportion of breast feeding. This at a week, this two weeks, this three weeks. And that's the end of the communication many times.

Okay, what is the distribution by race? Okay, yeah, black less, white more. What is the relationship between that and places? Well they're more in the north, less in the south, more in the east, less in the west. So what? What are you going to do with that? Are you going to build a breast feeding program with that? No. There are many other relationships.

For instance, risk factors for not breast feeding. Seldom the program people are able to visualize that you can actually plug many conditional variables into one single analysis and calculate these things. Seldom they understand that the rates are totally meaningless and they're actually not meaningless but dangerous unless you use sophisticated analysis to correct those rates and put them into the right proportions.

So many, many places still use raw rates to actually drive the—what is needed the most. So for instance, if you have your states divided into 8 or 9 or 10 regions, you will calculate your infant mortality rate and then you will score your regions from the highest mortality to the lowest mortality and then you'll say well

that's the place that I need to go without adjusting for those rates. When you adjust those rates, you put actually all the regions in the context of the other regions and you homogenize the rates. You make them homogenous. And you will be surprised to see how many of these regions flip from being the worst region into being almost the best region. So that is another common mistake.

Another common mistake and I will just say that these are mistakes. I would say that this is unused potential to increase the relationship between data people and program people is that you focus more on the number of people than on establishing leadership for the data personnel which means if you have just like \$300,000 many places much rather have five masters level people crunching data all day long lead by a program person that is somehow knowledgeable about the whole picture but not very knowledgeable about data than to hire one senior MCH epidemiologist and two masters level persons that are going to be enormously more productive and that will probably increase that relationship.

Why? Because that senior MCH probably can talk from the perspective of the program and the data without any problem. So he's actually the translator between the two groups. So that is a very, very, very, very common and I think that that is the reason why MCH Epi assignees are actually successful. Why? Because that's what we emphasize on. We emphasize on translators. We don't want people that are extremely savvy crunching data.

And actually one of the assignees tells me—calls me and say well, you know, I have published three papers in the last two months. I say and what time are you working because that's not really what you should be doing. That's very good for the acclamations but how many of you are strongly supported by your school of public health MCH'rs? Very few. Why? Because the MCH group in university which usually has senior people are very concerned by seeking grants that are many times fatal to specific research. So they don't really, really bring the local people or the state people to the next level.

And those are general appreciations. I mean it might be that your place is totally different or not. I do not know. But places based on the experience of places that have had strong MCH Epi leadership and have lost strong MCH Epi leadership am I right?

UNKNOWN SPEAKER: That's very true.

JUAN ACUNA: The difference is like night and day. And sometimes, unfortunately, it takes to have one and lose one to really understand many of the things that I am trying to communicate. But there are very good examples.

Unfortunately South Carolina is a good example. They were spoiled because they had one of the best, which is Bill Sappenfield and that had it for an unusual length of time which was 10 years and then they lost Bill and then things kind of

just started to, you know, fade. I hope that I somehow answered your question which was not very specific but very general.

But we have just done a more detailed large work on trying to assess each one of the 50 states under MCH capacity. And that job was done by Debrah Rosenberg from UIC that is one of our projects. And we're waiting for the results. But just to give you an idea, there was a scale complex. You might have problems with the scale. It doesn't matter. We can redo the scales to the point that everybody is happy with it.

But usually when you develop a scale the points that come up as obvious are the strongest points. So we think that the scale at this point, even though preliminary, has its value. And one of the things that the scale was to measure success in MCH. How do you find success? Well I mean that's for starters complex. But then again, if we measure successful MCH programs we were able to relate that to the fact that they have a unit of MCH epidemiologists with a lead MCH Epi person there that understands very well what the programs do and what the data people should be doing. And if you do that, you're four times more likely to be successful than another state that doesn't do that. So it's not the number. We have known this for 20 years. It's not the number of people. It's how you use the people and for what.

In general in public health, my perspective and this is a personal perspective, the biggest failure that we have here is the lack of understanding between program, policy and data. There's a big hole in the middle. And actually the efforts to bridge those three and I say that those are the three, it's kind of a tripod for public health. So if you don't have one of those legs working well it's going to totally affect the other two. So if you lack the data you're not going to have strong policies, you're not going to have strong programs. You might have pretty programs but they're not going to be strong from the perspective of efficiency. The same with the policies.

So the same with you if you don't have policy. How many places do we know that are very strong, very good data people but there's nobody actually, you know, singing the song of MCH at all levels? So they don't do squat. Why? Because nobody knows that they're there. Who is the ultimate executioner of our programs as we design them in public health? The clinicians. Who knows less about MCH driven programs in our states than the clinicians?

I mean it's so sad to see for instance that 25% of the women today after 15 years of strong amount of money spent in public campaigns, public health campaigns for folic acid, 25% of women know that folic acid exists and only 12% know why, 75% don't even know that it exists. And the question is why? Well because we public health has spent the money in the public health campaigns but the physicians and the nurses are the ones that do not information, the women.

So the contact is not between us public health people and the clients, it is between the clinical system, what we call the health providers. Why? Because they don't know? No. They know. More than 90% know. It is because it is not intuitive to put a concept such as folic acid fortification together with prenatal care and much less with family planning. If I go to a family planning clinic what is the least thing that I want to happen? A pregnancy. So I am not expected to be talk about pregnancy and the physicians and the nurses are not expected to teach about pregnancy or if you would be pregnant or get pregnant.

So that's one of the big fallacies that we are facing that is connection between information or evidence, policy and programs and the clinical world, which has a totally different agenda—a totally, totally different agenda. These days clinical world is fighting for survival more than we do. We work with a budget. They work with billing. And billing is much worse world than budget. So anyway, but that's a whole other thing. Okay, well thank you very much for your patience. Thank you.