AMCHP 2007 ANNUAL CONFERENCE

HEALTHY COMMUNITIES

March 3rd to 7th, 2007

How to Do Economic & Cost Benefit Analysis in MCH Programs

JUAN ACUNA: Is that okay? Is that okay? Okay, good. Sorry.

UNKNOWN SPEAKER: It's all right.

JUAN ACUNA: I saw you jump like--okay, guys. We're going to start--this is going to take--we have a plan for three hours, three something. So we've been--want to end by 12:00 as I was supposed to be in another session, and they just put them together. So, initially my partner, who is Scott Gross, who is a senior economist from CDC, we were supposed to teach together, so we were going to split, and then Scott ended up getting--being in charge of an emergency which is a three-day long course out of CDC that he put together with his partner, and his partner accepted a job in Africa. So it's kind of a chain of events that happened urgently so I would like to at least be able to go to the session for half an hour. So we're going to try. If we cannot end by 12:00 then so be it. No problem. We have covered the other room.

My name is Juan Acuna, and I am the Maternal and Child Health Epidemiology

program director out of CDC, which is a breed of a state-based program that actually I work in putting senior MCH EPI persons assigned to states. So you might have met or you might have one of our assignees in your state working probably mainly with your MCH program out of Title V, and we have an Atlanta-based team that puts together several other projects and collaboratives, and one of those is the (inaudible) for mortality collaborative, which is the one that is being discussed in the other room.

I moved to this position from being the MCH epidemiologist in Louisiana for five years, and I replaced somebody that you might know very well who is Bill Sappenfield, so when Bill went as the MCH EPI person in Florida, I replaced him in Atlanta. So we just keep swapping in charge. It's a very Federal government.

So I have been there for almost two years, and actually these--the interests for money and economic analysis was born not out of my CDC training, which I started eight years ago, but out of my clinical epidemiology training because cost analysis or health economics is a very, very, very big field today in clinical medicine and in clinical services. In public health, we're catching up, and you will see why we are not just yet there.

Well, the first question is can you hear me well? Yeah? Okay. Good. If at some point it just fades away then just say like, "You're fading," and we will crank up the volume.

So, my background is clinical medicine. I am a physician, then I became an obstetrician and gynecologist, then I came to the States and did a training—well, a training, now--what is a used to be a fellowship now it's a clinical residency in clinical genetics in fetal medicine, and that's how I got into this world of MCH. So I come from the very grass roots of high-tech medicine. That was probably the late '80s. I did my residency in OBGYN in the early '80s, and then I ended up in genetics in the late '80s. And then I work in clinical medicine not public health because you know that as higher--the higher that you go in the complexity of the medical practice, the less public health that you do, which is a shame, and now I know it. But I kept seeking for the truth because it was clear that it was not there where you can make the most out of the least. And then I got curious about counting so I became a clinical epidemiologist, and after that I was offered a job at the CDC in '98, and since '98 I'm here.

The first thing that I would like to do is for you all to just go around and introduce yourselves and see who we are, and I would like to know, or I guess that we would like to know who are, where do you work, what does most of your work is represented by, are you are a program person, are you an EPI person, and last but not the least, why are you here? What is the purpose of attending the workshop? Let's start by Lucia.

UNKNOWN SPEAKER: I'm Lucia (inaudible), Department of (inaudible) Health.

I’m a—definitely a program person. And I’m the MCCI (inaudible). (Inaudible) and I’m here (inaudible) have (inaudible).

JUAN ACUNA: Thank you.

CHESTER RANDALL: My name is Chester Randall. I am a pediatrician, and I work for the California Department of Health, and the (inaudible) Medical Services Branch, and I am a program person. In fact, I’m the chief program development. And I am typically interested in this session because our branch is going to develop a waiver so that we could provide an inner (inaudible) services (inaudible) to get the prime (inaudible) of care, and (inaudible) our services. In part of the waiver that (inaudible).

JUAN ACUNA: Great. Welcome.

UNKNOWN SPEAKER: (Inaudible). We’re introducing? Yeah.

JUAN ACUNA: Yeah.

UNKNOWN SPEAKER: Okay. I’m (inaudible) of Maternal and Children with Special Health care for (inaudible).

JUAN ACUNA: Great. Thank you.

UNKNOWN SPEAKER: (Inaudible).

UNKNOWN SPEAKER: I'm (inaudible) from the State of Alaska with the Children's health (inaudible) program managers (inaudible) especially clinics, and I also want to (inaudible), and I'm here because I (inaudible).

UNKNOWN SPEAKER: (Inaudible).

UNKNOWN SPEAKER: (Inaudible) director in (inaudible), and our economic situation (inaudible) our general (inaudible) in this position is (inaudible) 37 percent, and contemplate we're in our Federal branch circling down. We're trying to figure out exactly what things are causing us in terms of what we're doing because we don't have enough money. So, I'm always interested in economic analysis (inaudible).

JOYCE MARSHALL: I'm Joyce Marshall, and I'm the director of (inaudible) health, and we're particularly interested in for the economic evaluation (inaudible), and I'd like to (inaudible) starting to be more interested in (inaudible) so, we want to be able to show (inaudible).

JUAN ACUNA: Thank you.

UNKNOWN SPEAKER: Hi, I'm Jeanette (inaudible) Ramirez, and I'm from (inaudible), and I'm here because (inaudible) find out different ways to (inaudible).

UNKNOWN SPEAKER: Hi, I'm (inaudible) I'm an epidemiologist from Maine Department of Health, and I'm here because we did an analysis of a particular home visiting program about a year or two ago, and I tried to (inaudible) in there, and it's very interesting what we found out, and so I just I want to know who are available to apply into the work they (inaudible).

UNKNOWN SPEAKER: Good morning. My name is Kate (inaudible), and I'm (inaudible) with the California Department of Services (inaudible). (Inaudible) every section (inaudible), and I've done some economic analysis (inaudible) definitely would be a different problems (inaudible). A way to (inaudible).

UNKNOWN SPEAKER: Good morning, I'm Trisha (inaudible). I'm a Title V director and Maternal and Child health administrator (inaudible) Department of Health and Services. I'm here because we desperately need to know how to create an MCH story. We have such little resources and (inaudible) resources within the state to do that so we all are going to chip in on.

UNKNOWN SPEAKER: I'm Juliana (inaudible). (Inaudible) Maternal and Child Health in Washington State, and we've done a lot of work (inaudible)

performance measures and so in a kinds of tools that are (inaudible).

JUAN ACUNA: Great.

UNKNOWN SPEAKER: I'm Terry Grant, and I'm (inaudible) chief (inaudible). We have (inaudible) governor and then the secretary, and I want to (inaudible) of information (inaudible).

UNKNOWN SPEAKER: Good morning. My name is (inaudible), I'm the (inaudible) for South Carolina. (Inaudible) and so I'm just here to update my skills but I've done that in the past but (inaudible).

JUAN ACUNA: Great. Well, thank you. Well, we have a very diverse group that actually reflects pretty much all the different fields in public health, and in public health, of course, MCH is part of it. This is not going to be just limited to MCH as you will see but other aspects that are more into the field so far of reproductive health, and we could actually jump to other, other, other and other fields where economic analysis examples are published or are present or have been done. But the whole point is it seems that you're all are interested or actually are concerned about money. So I guess that that's a common denominator that brings us to the table. So that the whole point is let's don't forget that this is about money, and money is dangerous, especially dangerous when it's presented to people that do not know a lot about money and do not know a lot about health

but make decisions who would those be? No kidding, the legislators. Wow. Well, some of them are actually pretty good with money and some of them are actually pretty good with health, but you cannot count them with the hand--the fingers of just one hand, you'll need like not even two. So most of the decisions are made by people that actually do not know much about our fields. So our field is health or is money? I think it's health, so we are actually bad with money. Many times, we are actually really bad, but we are good from the perspective that at least we have to be a part of our budgetary decision. So, from that perspective when you ask a program person, "Are you good with money or bad with money?" I mean, the first question that you want to be asked is what do you mean? But in general, they say, "No, I'm good with money." Why? Well, because of two things. First, because I have the budget and I almost end my budget period in zero. And that is good, isn't it? Because if you're leftovers then maybe something was missing, maybe you didn't spend it all, maybe you're just this idealist that is thinking that you can do much more than what you can really do so you get money left or maybe it's because you did what you promised but you don't really need that money. So what happens to that money next year most likely? It just fades away from your ceilings. So probably you have had the experience of, oh my god, I have to obligate these 200,000 or 200 million, however, your place is by the end of this week, and then you end up inventing something or coming up with a solution so your budget ends up at the end of the way and period in zero. And that is probably one of the closest and one common context that we have with money.

We want to think, and this is just a general statement so totally disregard this statement for practical purposes. Actually, if you use it ever in a court (inaudible) I'll said that you're liars. But the whole point is—no, you can actually court (inaudible). Twenty-four years ago, the situation was exactly that, we want it to be given a budget, and then spend it. People will kind of trust you that you're the man or the woman and then you will do your job right, but you want to end up in zero. So zero was pretty much the focal point. Then time passes, and then people started saying, "Well--," they would like to have some idea of how this whole thing ended up in zero because just three months ago you have a bunch of money, and then you end up in zero, or three months ago you were already in zero, so what do you do these three months? So people wanted to see some type of receipts or something like that. So then we entered into a new decade, which is the decade of accountability from the perspective of just accounting, which means I want to show receipts, and I want to tell you what I did. So the boss was very worried but if you say, "Okay, out of my chunk of money, 20 percent I've spend it in my nurse home visiting program, 10 percent in my family planning program, 40 percent in my salaries and wages and stuff for my people, and then five percent in the data unit and these amount in whatever on a great chunk in travel." Then that's it, and they'll say, "Oh, well it kind of make sense, doesn't it?" Good. So 10 years pass, we enter into the transition between the '80s and the '90s, and then people say, "That is not just right." I mean, we need to know that actually your choices were the right ones. So we enter into this '90s

wave, which is why did you spend this in home visiting programs when you could have spend it in strengthening the oral health program? So the moms, because I just read the paper, and they say that if you have stuff in your gums then you're like going to have a small baby and you have told me millions of time the small baby is kind of are important because we spend tons of money caring for these small babies. So what's going on? So why don't I see here oral health? And you have to explain yourself, you have to say, "Well, oral health, you know what, I don't think that it's such a biggie because there is another paper here that says, 'Well, there's (inaudible), and then there was a letter to the editor.'"

So, it comes another whole line of work that we have to do, which is what we have called--and it was actually a term coined in the '80s by clinicians and it ended up, of course, being so popular that it transcended clinical medicine especially--and the term is evidence-based, so you have heard it. That evidence-based concept is a whole big problem in itself. I did here a two-day workshop on evidence-based public health. So, I think it's a whole big deal. Why? Because you are requested to be evidence-based. You are requested to have evidence-based programs. You are requested to be evidence-based for your grants applications, and if you don't really get the term there is a phone number with a contact person, and then you call, and you say, "Well, I just have question. I mean, I get the whole thing, the whole application grant and the whole thing is really nice, really pretty. But I don't get that evidence-based thing. How do I do a grant application that is evidence-based as opposed to one that is not evidence-

based?” And they say, “Well, it’s obvious. It has to be evidence-based. Thank you so much for your presentation,” and that’s it. So you say, “Well, how do you do it?” I don’t know. Are there 10 steps to be evidence-based as opposed to four steps to be evidence-based? How many of you know? Maybe there are six, and if those six are there, how do you start, which is step number one? And if you get to number one, what is step number two? So how do you really know that you’re evidence-based? Well, many people take a paper and say, “Well, it was a clinical trial. This is good evidence, that’s it.” Well, just take a look at (inaudible) analysis where they have accumulated the information from many clinical trials--and we’re going to talk about that later, so that’s why the long introduction--and you end up looking at clinical trials that ended up saying this is a problem, and another one ended up saying this is good. And both were clinical trials, and both probably were well designed. So you say, “Well, science is cheating. These guys cannot just--I mean, how can they expect me, a non-science person but the person that actually does the stuff, to do it right if you guys that are the scientist cannot make up your mind? You go one way for one thing, and then somebody published his own and then you’ll go the other way, and then they just keep feeling like the ping-pong ball, not one of the players, and I should be feeling like one of the players.

Okay, so, but that’s another whole big problem, so we’re going to talk about that a little bit through out but we’re going to actually limit on that. We became evidence-based, evidence-based became the big deal. There is almost not a

plenary, not a presentation when you do not hear a word or the term evidence-based or something that means something like that. So, this is kind of a scary panorama because in the last 30 years people, people meaning everyone, has really complicated the panorama a lot. Life is much harder these days than it was 30 years ago from the perspective who are actually doing public health with the same or even less money. But where are we jumping? So what is the fourth phase? Well, the fourth phase is that now these guys--I mean, now you all probably know who know this guy is. This guy or this lady are pushing me not only to tell them that I was able to zeroed out my budget, give them all their receipts, tell them what I did and that it is evidence-based, but now they expect me to tell them that this is cost-effective. What the heck is that? I mean, what is being cost-effective? They don't know. They just think that it's more for your box or the same thing for little box, and that's it. It all boils down to that but it's not so easy, and that's the purpose of this next three hours to show you, give you an idea that this is not so easy. And why do I say so? Well, just because in the same way that evidence-based term has been widely used but probably widely misused. The term being cost-efficient or cost-effective or being good from the perspective of money or being of good investment are terms that are many times misused. So when I get the question both as a program person or as a data person, and in the few times as a policy person, oh yeah, but that is not cost-efficient, then I just go back and say, "Okay, we're jumping into something else." What do you mean but cost effective--oh, well, that is good. Well, I don't think that that is being cost-efficient. So if we're talking of how good but you are using

this other term, then I understand. You really want to know exactly what. So you don't really care about we becoming technical in discussing money for outcomes.

So, you mentioned several things with regards to your interest, how I'm discussing costs. And I'm going to try to address--I think that we will be able to address most of that. Just a warning, when you have me your hands as a handout is around 210 slides. It's impossible to go over 210 slides in economic analysis in three hours. So what you have there is just a hint that these--what you have in your hands is the whole thing for the two-day course (inaudible) is doing somewhere else. Okay? So we're going to try to synthesize, which means if we don't get to the end, that is fine but it's going to be because whatever we got, we got it right. We got it to the point of understanding, which means that we're going to accept that this is a group. So if you came here to try to learn how to do economic analysis, this is probably not the right spot. If you came here to understand what economic analysis might be, this is the right spot. And probably from that point to the end point, which is the other one, we're going to be sticking more towards this low end of the distribution of knowledge about economic analysis. So we're not going to get into in-depth discussions about how do you actually do it because that would take several days, and actually you could do a whole two or three credit course in each one of these methods. So that's how it goes. Putting in other terms, I am giving you programs for MCH 101 or I'm giving you MCH EPI 101. I'm trying to put all that into a three-hour format, okay?

Great. So what are your concerns, and if you have not seen me before, some of you, and I know many of you have, you will have to know and understand that I am extremely interactive, so we went over my shy period. So from now on my shy period is actually gone, okay? The first thing is that the only person that we do not know--

UNKNOWN SPEAKER: (Inaudible) could relate.

JUAN ACUNA: No problem. And your interest in being here is?

UNKNOWN SPEAKER: I'm the Title V director from (inaudible) in Minnesota I want to be as effective or director as effective manager as I can, which means I have to have a superficial knowledge of a variety of things to do battle (inaudible) people.

JUAN ACUNA: That's what we call the big picture guy, and I have unbecoming one big picture, and you're totally right, and that is very, very important, so you came to the right place. Because then again, we're not going to be the one slice person that actually can do these things but we're going to try to understand what they mean. That's why there are several things that we want to--the first one that we want to is to define economic evaluation, okay? So we want to know when we say we want an economic evaluation, what do we mean? I mean, what is it that we really want to do, okay?

The second thing is to define the most common techniques to use when you want to understand the cost relationship with an outcome and try to understand if differential outcomes or differential strategies to reach that relationship are there. So, we're going to define cost of course. You all were talking about money, and several of money, many of you actually mentioned I am very interested in how much money, how much cost, what were the costs, okay? What can I get for this money? You're talking about almost the same thing. Cost benefit, cost utility, and cost-effective analysis, which are the whole big ball game. Each one of these is a specific design for a specific purpose. To be able to distinguish cost effectiveness and cost savings, which are those two important points. Not everything that is cost-effective actually saves money. You could be loosing money from your perspective but am I doing the right thing?

That's the first question, and second, is this my best alternative? That is the second important question. So you can answer those questions through doing some of this analysis. Understand the use or uses of economic evaluation in public health so economic evaluation didn't come from health. It came from economics. So those guys are the experts in money. I am not an expert in money, they are. They understand the bigger picture which is not only how these interact with our small world in health, and in public health, and within in MCH but how this plays a role in the whole big picture when you jug out money, big money, and identify the key points used in reading articles in economic analysis.

So that's why you have two papers that were stapled in one. These two papers come from a series of papers published (inaudible). So those of who want to be first evidence-based, you need to pull the whole series and start reading those because what these papers teach you is how to be able--whether to believe or not all their published papers. Do you think that that is important? Well, let me give you a hint. It is estimated by a couple of studies done in the '90s and early 2000's that around 60 percent of published literature has methodological flaws, which means you cannot believe the papers even if the papers talk about something that you really cherish because that's our problem. If you like the support to our health for the prevention of preterm and you see a paper, and you're going to start reading the paper with passion, and with a great desire to believe the paper if the paper tells you that the outcome is good. If it tells you that the outcome is not good and there is no relationship, you say, "Oh, what a crappy paper. I mean this is really bad," and then you toast it. But you never really understood, if you were talking about one of those that is going to lead you to one side of prevention or to the side of risk. So we read papers mostly with interests for the topic and with passion, and we accept them which is the worst beast. We accept them because of bias. So we are very, very biased when reading literature. So I have gone to some programs, and they tell me, "Oh my god, so you're talking now at this program and you're saying that this program doesn't really work well?" And I say, "Yeah." And I will tell you the first one, the first of these discussions. I were presenting the first year when I went to Louisiana as an MCH person, I said, "Well, you know what, we are not talking

enough with the regions." There's a huge disconnection between the regional folks and the Title V program. I mean those guys don't believe in us, and without them believing us, we are not going to be successful. So why don't we (inaudible)? Why don't we bring them and talk to them? So I organized a two-day meeting, and the basics of that meeting was to put my staff at the service of this regional guys, and actually be able to discuss with them their own statistics, and we chose a very key subject which was infant mortality. So I presented this and I was in one of the presentation like this saying that the real best investments in programs to increase infant mortality were a couple of options based on data, and the medical director for one of the regions,--huge guy, he's like seven feet. And he just stood up, and he just say, "I'm sorry but I have to interrupt you." And I said, "Well, okay. So, I'm at your service." Then he say, "So what you're telling me is that what I have been doing for the past 20 years doesn't really work." I said, "Well, no. I don't know because I don't know what you do. What do you do?" "Oh, I have one of the best programs in teen pregnancy prevention, and a lot of my resources go to teen pregnancy prevention, and the education of these teens with the hope that we will be able to decrease infant mortality because these guys have a very great risk for mortality as opposed to other women in their standard years of delivering babies." What do you say to do the guy? What would you have said?

UNKNOWN SPEAKER: (Inaudible).

JUAN ACUNA: Yeah, well, he had some statistics so he thought the mortality rate in teens is a problem. So if I address teens from the perspective of having infant mortality rates that are high, I will be helping fix the problem big time. So it's a good investment for the money. So to speak, and we will understand later why it's a very cost-effective decision to do that. And my answer was, "Yeah." My answer is, "Yeah, you should not be doing that." Why? Of course this caused an immediate heated discussion.

UNKNOWN SPEAKER: Yeah.

JUAN ACUNA: I mean as you can tell. I mean the implications were clear for this guy. I have to dismantle my program. I have to dismantle. I have to fire people or I have to figure out what to do with them. So it was a big implication, plus my money for the last 20 years has not been spent in the best option. So somebody can give me the why with that answer be. Volunteer? Yeah. Somebody?

UNKNOWN SPEAKER: Maybe everybody was spinning or actually isn't the best option for the prevention of--

JUAN ACUNA: Why?

UNKNOWN SPEAKER: I mean that's one thing.

JUAN ACUNA: Yes.

UNKNOWN SPEAKER: (Inaudible) his program where a reduction of infant mortality is that.

JUAN ACUNA: Through teen pregnancy prevention.

UNKNOWN SPEAKER: But I think the next question would be (inaudible) and how that happened, and I don't know (inaudible) effect, just that (inaudible) teens are at a great (inaudible) of mortality and (inaudible) babies, I don't (inaudible) that program actually. And if I also (inaudible) you're saying that infant mortality (inaudible) but I don't (inaudible) relationship between the program and the outcome.

JUAN ACUNA: Okay, that is a good reason but there is a better reason.

UNKNOWN SPEAKER: Actually (inaudible) the highest infant mortality (inaudible).

JUAN ACUNA: Well, but it is a specific group that has higher mortality rates. Of course, we understand that there are always that have higher mortality rates, but if these teens were most black what would you say? That changes the panorama. I mean those guys right immediately just by that statement have a

threefold in this region mortality rate. So, it was actually something that would make sense. All the point is simple because the proportion of teens is minimum compared with the proportion of the rest of the births. So you're addressing--you're spending a lot of money on a small proportion of a small proportion of a small proportion. Even if they have three times more mortality rate than the rest of the population. So you're not being very effective. Why? Because we know that addressing teen pregnancy prevention is expensive. It's almost a one-to-one thing. So that was the summary of discussion. And here we came a very good ally, so he said, "Should I stop my teen pregnancy prevention program?" I said, "No." And why is the reason for the answer is no? Well, because this is very simple. You were just measuring the wrong outcome for the right program. The right outcome for a teen pregnancy prevention problem is what?

UNKNOWN SPEAKER: (Inaudible).

JUAN ACUNA: Number of teens that end up pregnant, and why should teens not be pregnant? Just because--I mean (inaudible). It's so obvious that you don't even have to explain it, and if somebody says, "I totally disagree." My first second question is, "Do you have kids?" And if they say, "Yes." "Is one of those a daughter?" And if they say, "No," they're a little bit off the hook. And I say, "Okay, so how old are your sons? So would you like your son to get her girlfriend pregnant when he is 15 and she's 13?" And I don't know of anybody has answered yes because he might end up being hanged by the ceiling lamp at that

right spot. So it just makes sense that teen pregnancy should be prevented because teens should not get pregnant. Period. It's not because of something that you need good justification for something that is intuitively well justified per se. Yes?

UNKNOWN SPEAKER: Well, (inaudible) and one of the problem that I agree with you. I mean the program (inaudible) to pregnancy rate is high (inaudible), but we also have a lot of people from other culture (inaudible) so we probably don't have to explain that in this culture, I mean being pregnant (inaudible) at teens a lot but it impacts the life of that child, and (inaudible) is almost a geometric increase in that, so we're talking about the lives of children.

JUAN ACUNA: I absolutely agree.

UNKNOWN SPEAKER: I mean I could put that for as pieces of facts beyond my (inaudible).

JUAN ACUNA: Why do you think that teen pregnancy has been a hot issue forever? I mean how many issues do you think that are hot forever?

UNKNOWN SPEAKER: Very few.

JUAN ACUNA: Very few. I mean even infant mortality, which we have a

broaden—is it just cools down and then it gets hot, and then it cools down. Teen pregnancy never cools down. It's like hot forever because it's such a--well, it's a social problem. So yeah, I agree, but unfortunately, we're not discussing teen pregnancy, so let's get back to the point, which is good point. Let's continue. What you have there, then again, is you read that and you would be able to understand what are the key points that you need to address when reading literature. And what I did was that I framed these three hours from the perspective of you being the users of information that is being published, and not being the producers of those papers. Okay? So now, you understand what are we going to do, why are we going to do it, and what is going to be the perspective. Okay? So then again, if you wanted to learn how to do economic analysis, this is not the right place. If you want to understand how economic analysis actually work, should be read, and how do I pay attention to this evidence, this is the right spot.

So, analysis can be done analyzing the cause and consequences of diseases and risk factors. Of course, that makes sense. Cost of health interventions or programs, you—several of you mentioned that, and comparison of costs and benefits of prevention strategies or interventions. The benefits could be measured in different scales, so this benefit is not the benefit from the perspective of one of the designs, which is cost benefit analysis. You will understand why I say so and you will understand hopefully at the end and you

will be able to carry it home that cost benefit is a very specific way of analyzing money and outcomes. Okay? Good.

So, why do we do this? This is an economic principle that stands. It stands from your own pocket, your own wallet all the way to the national or world budget, which is if we would have more money, we would spend more. We would probably get more, we will find a way to spend it as well. So, money has a limitation of—precisely, be unlimited but needs or investments are endless. So, I could tell you, okay, how big, how large, how much is your MCH money, which means usually in many states, Title V will have much in funds. So, how much money do you have? You could say, “Well, I have anywhere from six million to a couple of $100 million. Okay. Great. So, how do you invest that money? And you can say, “Well, this is what I do with it.” “If I double your MCH money, would you spend it?” “Oh, yeah. Look at the list that I have in my to-do drawer.” And then you open this file cabinet of all those papers and interventions and notes that you’d taken all the meetings, and napkins that have been there for 15 years and are all yellow, and you say, “Look at this. I’ve been saving this napkin for 15 years and I don’t have the money. Never have the money.” So, on that drawer, there are opportunities for investment that are as large as the money that you actually really have. So, that supports the principle, and it’s a very basic economic principle. Without that principle, economics would not exist, period. It was just be a matter of spending the money, which is no big deal.

Now, health care now accounts for 16 percent of GAP and rising costs lead to more uninsured people. Why? Because the pot of money is limited. The more we spend, the coverage goes down. The more money is left, coverage goes up. Why? Because we want to zero out the budget. That's a magic thing. So, at the end, we want to be given, for health, a pot of money at the local, the regional, the state or the federal level and be able to spend it all so we get the same or more, but just a tiny bit more next year. What has happened in the past three to four years we have not gotten more. We have gotten less and less and less by three to five to six percent. So, all of our budgets are probably smaller. There are someone's budget that has grown. Somebody in some program was the lucky person that got the money because that program is a priority. Well, guess what, the neighbor of that person is pretty sad because she was caught to pay for that increase in this program. So, that's how we juggle money these days. Why? There is not a horizon where we can get the society to put more money into health, much less into MCH. So, MCH has grown even lower because BT is growing higher. We all got less money because AIDS came into the picture, et cetera, et cetera, et cetera. So, that's always the problem.

One of the problem in dealing with chronic diseases is that acute diseases always get the money, so we never get it because we're never very hot. They are very hot. And when one of them gets cold, then somebody else is going to pop out and the virus is going to be a new one, and now we're talking about pandemic so now we have to put money into prevention of pandemic and the

year before there was terrorism, et cetera, et cetera, et cetera. So, the objective is to allocate those scarce resources, scarce from that perspective, that we all have that drawer of napkin notes that we would like to invest on good ideas but we cannot do them because they are not the priority or they are my plan B. So, unless plan A completely goes down the drain, plan B never gets funded. And effectively and cleverly, it has to be the allocation so at the end, we can improve health and we can improve—provide equity with the same amount of resources.

So, when do I want to do an evaluation? We want to do it as a prospective project before an intervention is set up. Why? Well, same old, same old. This is data issues. So, unless we all have data, we cannot come up with conclusions. So, how do we collect better data? By being prospective. So, if we are retrospective, the data already mostly, most of the time, is it flawed—it's flawed or has flaws. We—that other people called that biased, so data is biased. But it's worse than biased because sometimes it is biased, we know it's biased but we'll still use it because it feels, well, good. To get a number feels good even if we know that the bias is there, so sometimes we just—there's a wonderful defense mechanism that we humans have, which is negation. So, we just negate the bias and we just go over with life, and it can give you many, many, many proofs that that is right. So, we would like to prospective better than retrospective. It's, of course, intended to guide decisions in funding or intended to change those funding strategies if they are not going well, and it requires projection of costs and outcomes. Why? Because we are investing today and tomorrow's problems

with tomorrow money. So, if we invest today with today's money in today's problems, tomorrow, we're going to be totally of track because you know that things changed. Actually, we work to make change in the health outcomes.

And we can do a retrospective evaluation, which is based on observed outcomes and cost, so we feedback on some older data sets. We can validate prior analysis, but the data has to be strong, which is seldom the case. Many times, it is at the most good. Cutting form policy decisions elsewhere, so we do an analysis here with little bits on our data to try to support somebody else doing something in somewhere else. What is the problem? The populations are different. So, if you're calculating something in a population in this country whose composition is 65 percent White, 35 percent Black, and then you go—I mean, talking about the south, talking about Mississippi, talking about Louisiana, talking about even north, District of Columbia, which could go even to 70-30 or 75-25, and then you go to the West Coast which is like everybody. You have Asians, you have Latinos, you have—or you go to the tip of Florida, several million people live in there, mostly Spanish-speaking people and many of Hispanic or Caribbean Island ethnicity. So, how do you apply even though the populations are so different? Sometimes you can, sometimes you can't. There are some criteria, but those retrospective criteria are never, never, never good.

Okay. We have several methods that we can apply. There are partial economic evaluations such as program cost analysis and such as cost of illness analysis,

and there are other like cost of burden and like the cost of burden of disease and death. You will see a little bit of that if we make it to that point. My goal is to be able to at least go over these five which are the most common and the most popular. And there are full economic evaluations which are cost effectiveness analysis, cost benefit analysis and a form of cost effectiveness analysis that is called cost utility analysis.

I am going to show you a slide later and we're going to talk about this. But now, I want you to understand the main difference. Anyone knows the difference between cost effectiveness and cost benefit analysis? No one? Great. You're in the right place. Cost benefit analysis analyses—don't make notes now because you will have opportunity to make notes later. So just remember that in cost benefit analysis—I mean, let's step back like three or four steps into just plain analytical epidemiology. What is it that you really want to know when you do epidemiological analysis? What are your interests, interest of doing epidemiological analysis, any interest?

UNKNOWN SPEAKER: The impact of (inaudible).

JUAN ACUNA: The impact measured in what form?

UNKNOWN SPEAKER: Outcomes.

JUAN ACUNA: Outcomes. So, you can emphasize on outcomes. That's a good point. An example: infant mortality, teen pregnancy, many, many others. Outcomes. What else am I interested and if I am especially a program person, how do I—I mean, let's say that your teen pregnancy, your infant mortality, your (inaudible) of rates, whatever is actually twice is high as the national indicator, what do you want to do? How do you fix it? How do you plan to fix it? By addressing what?

UNKNOWN SPEAKER: (Inaudible) what was the last—by doing what?

JUAN ACUNA: By doing what?

UNKNOWN SPEAKER: By using your money in the most effective manner just to get the best result.

JUAN ACUNA: So, you're thinking about programs. So, let me put it in an equation. Outcome equals an intervention, which we're going to call it program, and who determines what do I do. How do I design the programs?

UNKNOWN SPEAKER: Got to be evidence-based.

JUAN ACUNA: It's got to be evidence-based. That's a good use of the term. What do you mean by that? That's a good use of my term. My question, evidence

of what? I mean, what do you want? Think on any program that you have right now in your states. Anyone, what are you trying to do with that program?

UNKNOWN SPEAKER: Improve something.

JUAN ACUNA: Improve something. Give a name to that something.

UNKNOWN SPEAKER: Make somebody feel better.

JUAN ACUNA: Give a name to feel better. How do you make people feel better?

UNKNOWN SPEAKER: Give them drugs.

JUAN ACUNA: Drugs. Great. I want to think that you meant medications. So, actually, if you're speaking to Latino, drugs is a perfect term because drugs, drogas for us is medications. So anyway, not here though. So, medications, that's an intervention but your program addresses, let's say, medication distribution. Why? What is the problem that you're trying to fix through that? I mean, we cannot all Title V directors or medical directors or division directors be just opening pharmacies here and there. I mean, none of us do that. So, what is the real thing that we're trying to fix? Why does rural communities always—bad rates are usually always higher than urban communities, in general?

UNKNOWN SPEAKER: No access.

JUAN ACUNA: Access. Oh my god, where access is the problem. It's not really opening pharmacies. It's actually having people to go to the pharmacies that are already open or having the form to actually go there and get the medication. So, access is an important point. How do we call these important points that trigger something that actually causes a program to come to life? Risk factors. So, the equation so you never forget is extremely simple, and it always work. Risk factors or preventive factors are related to an outcome, and the programs just falls in the equal sign. The program is the vehicle to change the outcome through addressing or manipulating factors that are either risk factors which means that they make the outcome, if it's a bad one, worst or through preventive factors which are the ones that make the bad outcomes smaller or the good outcomes larger. And that equation does not change. So when you talk to your EPI persons, you want to really emphasize your very interest on the risk factors for this or that. Okay? Okay.

So, in that context, the outcome of a cost benefit analysis is actually money and only money. Okay? So you want to do a program and measure it in a form of a cost benefit analysis. When you want that outcome to be money, dollars, you don't really care about the infant mortality rates, you don't care about the number of babies that never ever happen because there were some interventions done in the teens which ended up preventing or averting pregnancies. So what you really

want is to understand that the only interest that you have is about money. Okay? Good.

Can we measure health outcomes or health situations in money always? An example: how much is your life worth in money? How about yours? How about yours? How about yours? I mean, can anybody put a life—your own life in terms of money? Well, you can. What if I say that the World Health Organization estimates that a life loss is around half a million dollars? Is that too much or too little as a meaning of that is what your life is actually worth? So, if somebody kills you or a disease kills you or an accident kills you, and the accident is a problem and it kills you and I want to know money then you are going to be worth $500,000. Isn't that lousy? I mean, that really takes the purpose out of living. I mean, $500,000, there are people that—and the TV shows make more in, like, an afternoon, so that's worth like three persons. I mean, that's pretty sad but that's what we're worth according to somebody. So, of course, there is a major debate about that. I would say that that is a societal perspective. But as an individual perspective, we know people that made $500,000 a month. We know someone that made $500,000 a year. We would like to be one of those. We know that there someone that made $500,000 in their whole life, and we hope that we will not go back there. We were there once. We hope that we have transcended the limit. So, how much is a life worth? Well, it depends on many things but it's extremely debatable. So, there are many things that cannot be measured with money.

Now, if they cannot be measured in money, how do we measure them? Well, by our outcomes in health, so the outcome becomes not money, but becomes a health outcome as we know them. So for many of us, sometimes it's much better to have results expressed in the form of a health outcome than in money because we don't really understand what that means when we put monetary value into one of the outcomes that we have to manage. We know how much programs cost. That we know very well. And we know how much risk factors cost. That we know very well. I mean, how much does—what is that cost of smoking in your state? Probably you have some figures that can tell you very well that smoking cost me several million dollars a year. So, that's relatively easy to come up.

Okay. Program cost analysis, which was the first one? Many of you were interested in this. It estimates the total cost of running a program, which is the cost is of personnel, of training, supplies, overheads, transportation, blah blah blah, et cetera, et cetera, et cetera, et cetera. Everything. Is that something that you have a problem understanding? No, I mean, most of you, I heard, that's what you actually do, so you have a very strong idea on what cost of running a program is or are. You can report the outcomes, and that is the point. It's not how much my program costs, but how much each one of these persons that is attended on my cost—by my program cost me, so the cost per client or cost per service. How many of you handled everyday figure such as, "Oh, every single

pregnancy test will cost like $22 so we have to charge 23, so this one tiny little dollar that actually can help us go over that gray zone of being unstable in our budget and et cetera, et cetera”? How many of you say, “Okay. Our cost per client is (inaudible) $100,000”? What outcome causes a cost per client of around $100,000 that comes to mind, which is pretty expensive? (Inaudible). Very low birth weight. Yes.

UNKNOWN SPEAKER: On the cost of (inaudible) based on some of the ways that we do things in my division, we have a number of contractors and we get the next amount of dollars, which does not pay the cost of program, and because when their budgets are put together, many times, they can’t tell us what they spent on our programs. So, sometimes (inaudible) termination, I’m not sure I ever know what our program is. I know how much money I have, I know how much money I give them. What’s actually been spent on that program, though, I don’t think we know.

JUAN ACUNA: Can you safely under the assumption that you are not contracting for an over budget? Meaning, you’re paying what the worth is—what the work is worth more of less because if you are overpaying your contractors, I mean, you have a deeper problem, which is jail.

UNKNOWN SPEAKER: Yeah. It’s also that.

JUAN ACUNA: The only next thing that somebody—

UNKNOWN SPEAKER: I definitely say we're not overpaying them.

JUAN ACUNA: Well, absolutely.

UNKNOWN SPEAKER: (Inaudible).

JUAN ACUNA: Absolutely. But you are actually even underpaying them. I mean, many of these contractors actually produce poor quality poor just because they want to go low to actually get the money and then they lower the quality, and then you are bound with a result that is actually of much lower quality than the one that you're expecting. Am I talking about something that you guys know? Yeah. It's pretty common. Why it's pretty common? Because people are fighting for the buck. I mean, everybody needs to survive and feed the kids and stuff like that. So, there is an enormous surplus of contractors trying to contract everything and then they promise the sky and you get the ground, sometimes the underground. So, that is a problem. But what you need to think from this perspective is if that is your point then probably the safe assumption is to say, "My contractors are actually getting the work done at the right price so that price is my price. So, that is part of my cost in my program." And then you put your salaries. It was easier. The days when we would do this stuff, we would the work. But you know that waves come and go, and we are now in the wave of no, don't

hire more people, contract with other people. You're doing two good things. First, you're not liable for all your fringe benefits and vacation and leave and all that. Second, probably you're not liable of training these guys every time they have the turnaround and you know that the salaries are not good so you're not competitive. So, what do we need to do? Contract with the people. I mean, there are experts over there so we don't have to worry about fringe benefits, we don't have to worry about this, we don't have to worry about that. What do we worry about? Oh man, the overhead. That thing gets us. So then, you try to negotiate the smallest, tiniest overhead which tiny is (inaudible). Probably if you get an overhead of 15 percent, you just like really sleep well that night. So, that is the problem today. So we are facing the days often we do not provide direct services. I mean, just look at the Title V pyramid. Direct services are way in the top, tiny point, and that's the wave. Okay?

The important first step for calculating any type of your analysis is actually to be able to calculate your costs. So if you are unsure that what actually your program's values or costs are then you have a major problem because you're losing usually one of the—either numerator or denominator of your analysis, and you will see that. Everything that we are going to do is put this outcome into some type of monetary relationship. Okay? So if you are not able to come up with the money then you have a problem. But I can assure you that even if it's a little bit costing time and an investment in trying to untangle all those numbers, you, at the end, have a very good idea of how much your programs are worth.

Okay. What is the problem? What is the problem—immediate problem that shows as a result of this type of analysis? Yes.

UNKNOWN SPEAKER: Waste of time.

JUAN ACUNA: What is (inaudible)?

UNKNOWN SPEAKER: (Inaudible) that will help you in your decision with respect to resources I have (inaudible) use that information to (inaudible).

JUAN ACUNA: That is correct. Now, my question is what is missing? Yes.

UNKNOWN SPEAKER: The outcome is missing. I think—

JUAN ACUNA: Absolutely. There are no outcomes. This is just my internal report. It's for me and for somebody else. It's pretty cool. It gives me a ballpark idea of how much am I paying per service or per client, which is what I do. It's of the—my outmost interest in knowing—I mean, just put it this way, you go to the gas pump and you fill up your tank, and you know how much money you spent so you know the cost of your gas. Does that give you an indicator of miles per gallon thing? No. I just know how much money I spent in filling up my tank. Okay. It is important to know how many miles can I get per gallon? Oh my god, well,

you can buy this car or this oil car just based on that thing today. Before, it used to be just the color and how the seats are comfy and—but today, we sacrifice all those things for a higher mile per gallon consumption. So, you need an outcome. Okay? Now, here, you could say, “Well, but I have an outcome. I have a cost per client and a cost per service.” So, it gives you a little bit of choice on deciding, “I am going to choose between this car and this car because the miles per gallon or the miles per gallon are here.” But that doesn’t really give you a perspective of how good the car gripes, how safe the car is. So, you could get a car that give you a hundred miles per gallon but somebody mildly crashes and you’re dead. So, that’s not a good car. I’m going to sacrifice a little bit of the expenses of my cost per client on a program that is actually going to give me more cost per client but is going to give me a better ride, a safer ride. So that’s what we want, too. Okay?

This is an example. Actual cost of operation—operating a (inaudible) hearing screen programs. Now, we’re talking about things that you know. So the total costs of the program are $110,000. Why? Because we know how much did we spend in screening, in laboratory, in personnel, in fringe benefits, in supply, in overhead, et cetera, et cetera. We have a very good idea of the cost of the program. Okay? Now, if I know the number of infant screen, which I should know. If you don’t know that then you’re in deeper trouble. Okay. So, you know that you screen 4,000 plus kids. It’s just a division. It’s just like how many—how much money I’ll make. Oh, look here, $26. So if you see other state screening babies

at the cost of $12 per screen infant, oh, at AMCHP, I have to go talk to this guy because I am spending twice as much. So then you go talk to the guy and say, “You know what, I saw that you have a publication and you’re spending $12.50 per kid screen and I am spending $24 per kid screen, and California is spending $70 per kid screen.” “So, what’s the point?” “Oh, yeah. No, no, no. We have a beautiful screening program.” “So, how many diseases do you screen for?” “Oh, we screen for eight.” “Oh, well, thank you much. Nice talking to you. Great knowing you.” I screen for 22 and California screens for whatever. I mean, I don’t care. I mean, it was just fiction. But that is the whole idea. So, yeah, it gives you a good measurement of comparison. Now, which one of those programs is much better from the perspective of the reason of existence of that program, which is what, why do we screen newborns? To avoid sequelae of diseases that is if managed early enough, prevent some pretty severe outcomes. Like what? Mostly, mainly mental retardation. How much does a kid with mental retardation costs to the society? About one and something million dollars if they live all the way to the end of the life and the life is usually a normal lifespan life for a kid with mental retardation. So for the economic perspective, which of these kids are the ones that really determine the least of expenses? Well, the ones who die. So if they die early, they can cost a million dollars, they cost a bill, which is usually a hospital bill. But now you see, we cannot think on cost savings because if we would cost—if we just put cost and try to save money, the wrong decision would immediately be the obvious one, which is going back to the ancient ages, and we

don’t want to go back again. So, we need to have a better outcome because just money is not enough. Okay? Good.

Are there any question so far? Are we okay? I mean, we’re going rather slow but I think that we need to go—at some point, somebody might want to say, “Well, we’re going maybe too slow. We already know this stuff.” Do you know all this stuff? Should we increase the pace a little bit? Remember, we have material for like two days. Okay?

Okay. Cost of illness. It is almost the same thing as we already did but measuring it divided by disease. So, it estimates the incremented cost associated with the condition, medical cost only or total cost. So, for instance, if you’re going to try to estimate how much an autism or a mental retardation in a kid costs, you have to come up with an answer for the question, “Am I just going to just find out how much are the medical bills of these guys?” If that is your answer, the costs of mental retardation or, for instance, spine (inaudible) are just like $35 or $40,000. This is no biggie. So you got the wrong answer. It’s the right number but you got the wrong answer because if you established that there are other losses, which are, for instance, productivity losses and you plug them in to the equation then actually, the amount of money is substantially larger, and that’s how they valued our life in $500 or $1 million. They estimate it not only all the expenses but all the production and the potential losses, and they came out with that figure. It can be reported, the (inaudible) cost per effective person or per cohort because you can

now analyze a group of persons and the present value of a lifetime cost and present the value of a lifetime cost, which is what we all raised. Oh, and indicate potential benefits of prevention.

So, if we then again find that this illness cost us this amount of money if we prevent a number of cases of that then we are going to be saving some money. So, that's how we can use it. Okay? When we went into the cost of services, does it really tell us anything regarding the real outcome of these kids which is actually a disease? No. So, this is the other side of the coin. If the program cost per screen is $26 because we screen 4,000 and it cost us $100,000, what would the cost of illness be if the prevalence of the diseases that it prevents is around two per 4,000 or one per thousand, one per 2,000? Sorry. Well, it's the same thing. If 100,000 was a total cost to screen 4,000 kids, which gives us 25 bucks per screen, it doesn't tells us what is the cost of the illness from the perspective of this program. So, we spent $100,000 in the program but we just get two sick kids, that gives us a cost per kid of around 500,000. This is the cost of the program. This is the cost of the illness. See. Same source, same thing, different perspective.

So if each one of these kids costs $50,000, well, we would be covering something else, more diseases. And each one of these sick kids actually costs the society around $500,000. We have a 10 time greatest return of the money for each one of these kids that is screened, picked up and treated. Now, that's an

easy approach. What is the real approach? Okay. These kids are—are we able to cure them? Not really. We prevent disease sequelae just by managing their disease's limitations differently. So, they cost a bunch of money. Just the dietary restrictions for PTA babies are big. So, let's say that this guy's cost an extra $200,000 per lifetime, which mean that we still have an overall savings—net savings of $300,000. That pays just a number of kids. Let me finish the idea. The number of kids screened which generates the number of kids sick give us the total cost of the program in savings that is going to be compared with the total cost of screening these kids. So, with the number of dollars that I spent, the amount of dollars that I spent screening these 400,000 in the long term, I am avoiding spending $300,000 or more in actually taking care of those kids. Who pays for that? Me? The society. So, it triples the value of the program. So, this program is not only cost effective but is actually cost savings, which is rare. Okay? Yes.

UNKNOWN SPEAKER: $50,000 look like the cost of identifying one person with the risk factor.

JUAN ACUNA: That is right. This is the cost of disease or this, I mean, whatever. But yes, you're right. This is the cost per each one of the disease identified. It's not the real cost of the illness. Okay? But you know how much the cost of the illness is so you can juggle it with the number of dollar that you're going to spend

taking care of all of the disease and then you come out with the real value of your program.

So, you see, that is—once you get the hold of how the dollars flow in the analysis is, it's relatively simple. Excuse me. I think that we went—yes.

UNKNOWN SPEAKER: You never get into part of the analysis considering what money you're saving and what money you're spending. For example, (inaudible) child that leads (inaudible) PKU is a good example of that that it not only allows us to avoid other complications of the disease but in fact allows us to point the resources to that child, that should be used for that child. For example, if they've got private insurance and the private insurance identifies that separate issue. If I've got 48 percent of the kids that are in my state, they're on Medicaid, I'm going to identify two kids that need help. One of these kids is a direct savings of state money that factors in on what the state budget is, the other child is actually a way for the state to identify that and bring in other resources that would not have been identified as soon necessarily as it would have otherwise. Do you ever get in that because when I have to justify the money, I justify the money in terms of what the state's paying and what the state's not paying as oppose to what all the society is doing.

JUAN ACUNA: Let me give you another example and I will try to give—let me put it this way. The answer is going to come.

UNKNOWN SPEAKER: Okay.

JUAN ACUNA: The answer is going to come, because that's an important point. I mean, it's actually logical point but you see how the train of thought is affected by knowing how the money is actually analyzed in the whole context. So then you start thinking, oh my god, this is not a possibility, or this doesn't really fit with what I do, or this fits with what I do. So, now, and just one this second, this is an example of polished paper, of cost setting, of cost of information and analysis, cost of (inaudible) analysis. And you see, look at each one of the lines, total health care, inpatient, outpatient, ER physician and (inaudible), and you can put as many things there as the illness represents. So, we're not really talking about, oh, we're limited to these or that, no. We are actually bound for a good result of a good analysis to come up with as many costs as we can for the outcome that we want to put into terms on money. So, the answer is, yeah, of course we have to take into account as many things as we can. Now, that is the easy answer. What is the hardest answer? And the hardest answer is, okay, but hold on. Who's perspective am I going to take here? You were talking at the beginning the societal perspective, and then you shifted to your perspective and Medicaid's perspective. And both of those guys are going to say, oh, (inaudible), and the governor might decide, no, it's ours, which means he takes the societal perspective. So he's not only talking if ever comes to the right age. He's not talking about just Medicaid, he's talking about Medicare, he's talking about

private insurance, public insurance, everybody's insurance, non-insurance, uninsured, everybody, so the societal perspective is the biggest of all. But then on the other hand, the perspective might be I just don't care. I mean, I just care what the guy that is sick pays. Well, that is the individual perspective. So, are you allowed to take a perspective on economic analysis? No, you're not allowed. You have to. If you do not have a perspective then you did your job wrong. So it's not that you're just (inaudible), you have to assume a perspective. And when you read the paper, you have to be able to identify the perspective clearly in the paper. If you do not understand or don't identify the perspective, drop the paper. Recycle it. It's not worth it. Okay?

UNKNOWN SPEAKER: Well, I think basically, you've already answered the question to the—that I've had in a sort of (inaudible) or the practical problems of the—in Minnesota is that are more (inaudible) and trying to switch that over to state funding may be sustainable as (inaudible). And as—then I could take the position when I look at those number, but I know I'm an elected official and those numbers are out there, and I'm not being elected yet. So, and one of the things that I'd like to figure out how to use analyses like this to get the equal that make the decisions, and are probably more concerned about maintaining the power (inaudible).

JUAN ACUNA: Well, that's the beauty. Are we all in the same boat? Yes, we are. I mean, we all want to be able to use these type of analyses for that point. That is

a very good point, and I think the way to address is what is going to come next among what has come so far. Why? Just look at this table. It doesn't matter about the numbers. What I want you to pay attention is about each one of the columns, each one of the rows, and to try to understand what kind or should we take into account we're trying to come with one of these indicators. So, in the same way that the miles per gallon is not the only indicator that makes a car good, it is an important one to make a decision. Nevertheless, safety is another issue. How well it drives, how fast it can go, et cetera, et cetera, et cetera, et cetera. So, in the same way how much an illness will cost from the perspective of impatient, outpatient, et cetera, et cetera, are different type of costs. Remember, the more pieces of the whole picture you get, the better your analysis and your results. If you mean analysis or analyzing data that has faulty number of items where your mean is the right number but with extreme limitations. But if you have a meaningful indicator that came out of a complete set of item or itemize cost expenditures, you will have a very, very strong result. Why? Because what is not in the analysis ends up being part of an equation that we know very well in epidemiology that is the error. So, let me give you a little bit—30 seconds overview of how do you plug into your mind these things. What we'll try to do is try to measure one of two things, either an association or a prediction. We would like to determine that this is related to this. We just don't want to say that the infant mortality rate in Minnesota is 11.1 because the next question that I'm going to get is, so what? Well, so it's 11.1. Is that high or low? I don't know. It's 11.1. So, it's not really worthless. You need to compare it with something. So, the way

that we handle things is that the Y outcome, and you can call Y outcome any outcome, give me one. Oral health status, give me another one. Infant mortality, give me another one. Low birth weigh percentage, give me another one. (Inaudible), give me another one. Teen pregnancy, et cetera, et cetera, et cetera. So, that is only the Y outcome equals—and remember, what I am going to try to do is explain the outcome, or associate the outcome to something. So, let's say that my outcome is infant mortality, that would be related. If they are related, it usually, from the mathematical perspective, produces a line. I mean, are we all okay with it? If somebody's not okay with what I'm saying, just raise a hand and we will go over it. So, these related to something represents a line. If the line is flat means no change. If the line is vertical means no change. The line has to be somewhere in between. Okay? So we produce what we call an association. Why? This means that even if this increases, their value is the same. Is that a big deal? No, (inaudible). They're not related. If it goes like this means that whatever the value is here, it doesn't mean that the (inaudible) is forever. It will not change. Conclusion, most likely not related. So you have to be somewhere here to be related. Okay? Good.

Now, what makes the line flatter or steeper from the perspective of our relationship with whatever we want to measure? Well, what we call the causes of that something. It could be money. How many of you in the analysis are interested in knowing if people are insured or underinsured? Why? Because that means access and it means money. How many of you have related infant

mortality rate—we're going to take the Y as infant mortality rate—with income? I mean, we know that there is a strong relationship between infant mortality and income. Aren't we? Yes, we are. So, my first indicator is how steep the overall relationship is, that we call our slope. And that is the single term that is totally independent, we would like to think, from others. And there is only one at the end that is called the error. And the error is if this line is the right truth and only but the truth, so help me God, what happens if I am away from the line? Well, it was a mistake. Wasn't it? Because I should've been—at this level I should've been here, and I was here, so there is an error. So all these lack of explanation in these units is part of my error. Okay?

Now, what happens in between, in between this every single thing that you can think of that is related to infant mortality? Everything. There is even a way—an index of broken windows that you can calculated and is related to infant mortality, and I make a joke very frequently that unmarried women are more likely to have higher infant mortality than married women. So what do we do, find priests? No. It's just what it means. So by marrying the women you will not fix the problem because there is no relationship, is what it means. See the point? If we go unfix all the windows, the infant mortality of the neighborhood, what is going to happen? And it's not going to change. Probably the window will be broken in the next couple of months, is a sense of abandonment of those buildings, of lack of resources to fix the windows, carelessness, et cetera, et cetera. It's a social construct. So, we're going to put money here, and we're going to give money a

number. Why? Because money doesn't explain everything. Money explains a bit of it. Okay? So we're going to give a number, and this is going to be the number for money. Then we're going to add—do you think that income is the only variable for mortality? No. You could be the richest person that if you are in the middle of nowhere, and you have a kid that chokes with something or get bitten by a snake, that kid is going to die. So it's not an issue of money. It's an issue of access to immediate care. So, access becomes another indicator, and access will have its own number. Those numbers are what we call odds ratio or relative risks. Have you heard of it? Yeah. We know that smoking for low birth weight has a number of around four. So, if we would have smoking here, that smoking will have a number that will be around four. Okay. So you keep adding to the in between, and you will give a level of explanation, but you cannot add it all. So, whatever you cannot add is going to become part of what? The error. How does this concept apply to costs in our case? It applies to everything that you guys do. This is the single most important and strongest epidemiological principle that drives life in general. Why? Because everything has an explanation (inaudible) we do not know which is that explanation, what is that explanation, or what are the compartments that that explanation is made of. So, these could explain 20 percent of that phenomena, which means that the error is going to explain 80 percent. So, it doesn't matter if this number is very strong, or that number is still product of just 20 percent. So the relationship is very strong. But at the end you don't even understand why the whole thing happened because 80 percent is unknown, and it's not part of smoking because you already have smoking. So

when people tell me, oh yeah. (Inaudible), yeah. That's not big in Colorado, in Wyoming, or in Michigan, whatever, because we build these models and these analyses at a (inaudible) data, and then we have that smoking is very strong, and race is very strong, and parenting is not so strong but is there, and then counseling is strong but is not being there. And so, what was the prediction of your (inaudible)? And then they (inaudible). Because they know that it was not higher than probably 10 percent. But we forget that in purpose. It's a defense mechanism. So we want to actually just work with the numbers and not with the overall. Essence of the issue is that we many times do not know enough. So, with the same with costs, if you do not plug in all those X's and items, then your whole analysis is going to be mostly in your error turn, which means that if this prediction is 80, 20, all your new evaluations for people are going to be close to your line. Within what? Within 20 percent. But if it is the other way around, for the same line, you're going to be all over the place, 80 percent error and just 20 percent of truth. That's bad, isn't it? Yeah, it's bad. And that's the life that we live of. And that's the problem.

Okay. So, let's go into—this is (inaudible) WUR. You actually have the slides so you can go and check the references, and it basically tells you how much mental retardation is worth. So you see that mental retardation, computing all potential costs that we could, is worth—or it costs around a million dollars. Per what? Per life. Do we account if they live 20 years or 40 years? No, not really because, well, this is a whole population estimation. What is the population? Well, we will have

to read the paper and see where did they come (inaudible)—what was the origin of those estimations of those costs?

Okay. Full economic evaluations, and now we come to the hard part. These were the easy part. So now we go to the hard (inaudible). It's used to compare costs and outcomes. So now we go to the Y, before we were just here. We were just calculating this intermediate thing. Is it good? Yeah. It's helpful, yeah. For what? Well, it has limitations. We already saw. So, now we want to try to understand when money is plugged in into the equation, how does that relate to the outcome, all when the outcome is actually the money. How much do we spend per each one of these things that we try to do? The evaluation methods differ depending on how the outcome is measured. So you already know that. Cost effectiveness analysis, the outcome is measure in what? In?

UNKNOWN SPEAKER: (Inaudible).

JUAN ACUNA: No, that is the other one.

UNKNOWN SPEAKER: (Inaudible).

JUAN ACUNA: So remember, cost benefit is money. Okay? Remember that the B and the C go together. Benefit costs money, okay? Effectiveness is measured in natural outcomes, and this is a special way where these natural outcomes

have been standardized that is the cost utility analysis, and we will talk a little bit about that. The cost effectiveness analysis is used to calculate the ratio of net costs of an intervention to the effectiveness of that intervention measured in natural health outcomes. So the outcomes are going to be per natural outcome, per life averted, per whatever. Cases averted, that's prevented, number of kids that are not sick, which means (inaudible) could've been, which means disease was prevented. For instance, immunization programs. How would you measure the economic impact if you would be the wing at cost effective analysis of immunization schemes? Well, they would be measured in—no. You don't really care how much they—that you say I am going to not fund this immunization scheme because I don't make money. That's it. Bye-bye. Why? Because it's kids, and sick kids that we're talking about. So, even if immunization costs a lot and doesn't save us money, well, we still do it. Why? Because we are very interested in not having sick kids. Of course, I'm just kidding because immunization we know that it's actually one of the most cost effective, and actually there are cost benefits analysis, which put it in terms of dollars and we are actually saving millions of dollars by immunizing kids. Why? Because you know that if kids are not immunized the next thing that we would get is what? A number of cases that is humongous just in a decade. And then we get so many of those cases, the expenditures are going to be huge because this is as many of them are extremely expensive. Okay?

So, we could talk about extending life. For instance, which one is more cost effective intervention from the perspective of cancer treatment? Surgical initiative or intervention, or chemotherapy? So you see how that question is important. How do we measure the outcome? I mean, would it be case averted? No. People are going to be already sick. That's prevented, maybe, although we know that many of the cancers will produce very long term the same amounts of death. So what is the big deal? Well, the big deal is many times with surgery, the surgical procedure kills a lot of people. But those who survive have much better quality of life than those who go into chemotherapy. Is that a problem? Of course it is a problem.

Now, let's talk about other types of cancer because not all of them are equal. Cancer of the larynx. The surgery for cancer of the larynx is amazingly aggressive. So, there are many who will say I want to live without part of my neck and my face gone. I mean, I cannot talk, I cannot eat, I cannot—that's not (inaudible) going to go out. So, I much rather you give me whatever you give me even if it kills me, but I don't want to have surgery. So, is that an acceptable alternative? Yeah. How do you measure the outcome? Cases averted? No. that's prevented? No, that's no longer the issue. The cancer is going to kill you anyhow in the term of five years most, and 95 percent of the people are going to be (inaudible). Life-year save? No. You probably live exactly the same time with one or the other. So what is the issue? Quality of life. So the natural outcome is, how many quality years can we buy given that the expense is this as opposed to

(inaudible). How many of you have credits? Come on, everybody. Why do you have credits, mortgages? Because you are buying quality life now even if you have to pay later. Well, this is the same principle. Why you would want to buy is quality of life. What is the quality of life without any single credit saving all the money, and whenever you have $285,000 then you go buy your house. And whenever you have $20,000 then you go buy your car. And whenever you have $40,000 then you put your kid in school. Probably your kid is going to be grandpa by the time that you're able to put him through college. So what do we do? We buy in advance quality of life in the same principle. So quality is actually a natural outcome.

Okay. How do we do this? Where do we start by the same principle that we always start? Which is we calculate total costs and number of outcome for each strategy being compared. We're going to compare strategies. Why? Because it doesn't make sense to try to use for just one single thing. Why? What is Minnesota's infant mortality rate? 11.1. So what? So nothing. It's just 11.1. Is that important? I don't know. But I know the number. So we need to compare, always compare. Remember, we're trying to talk about either preventing things or relating things, and that's it. Descriptive analyses are good just as a starting point, and if something comes next, which could be comparing it with other descriptive analysis, somebody else's mortality rate.

We exclude those that both cost more and have fewer good outcomes. What does that mean? If I have, let's say, four different options to do screening, neonatal screening, let's say (inaudible) screening, how many options do I have? Well, I have the 10 disease scheme, the 14 disease scheme, the 29 disease scheme, and the 68 disease scheme. Okay. Now, I can do 14 in test tubes, or I can do 14 with this machine, or I can do 14 with MASPEC machine. Now, I can do 22 with tubes, 22—so how many options do I have? Wow. Too many. Okay, what do I do? If I have those many options and I want to build a grid where I'm going to put my programs and how much money they really save, how much they cost and how much—not really money—but outcomes they save. Remember, we're talking about natural outcomes. So, what you normally would think in the terms of dollars is no longer relevant because you cannot put those outcomes in dollars, so that's why you measure natural outcomes. So you have several natural outcomes, and then you have—you could have several or could have just two, and then you have your programs, so your options. So let's say that these are your programs or your combinations of strategies. And they have cost and then you have benefits. In this case, measure in natural outcomes which is we're going to measure effectiveness. Okay? And then some programs cost more, this is the number of natural outcomes and this is the cost. So we have program A, option A. Option A is here. We have option B. Then option B is here. We have option C. We have option C here. Do we know these? Well, we better know these. How do we know these? Well, we know how much money, and we pay for the program, and we know how many outcomes do we get out of that program.

So it's very easy to feel up the grid once you have done your homework. So B, C, then D, E, F, program 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10. So you have many, many, many, many. Which ones are bad right from this view? Do you think that program C is a good program? No, why? Huh?

UNKNOWN SPEAKER: And what is the cost? Where is the (inaudible)?

JUAN ACUNA: Oh, look at this, is D most expensive and the least number of outcomes. So, exclude those that both cost more and have fewer good outcomes. So this program goes without even thinking about it.

Now, we're going to eliminate some. We're going to establish boundaries. Some will say, well, this, yeah, cost too much. It hurts doesn't it? Do I cross it or not? Yes or no? Yeah? Why? You fell into the trap. Give me a good reason to cross that program.

UNKNOWN SPEAKER: Well, we want to get it down to (inaudible) the number of options.

JUAN ACUNA: Well, then it's very easy. Why don't we just choose the least, the most? I mean, that's—

UNKNOWN SPEAKER: (Inaudible) a lot of money (inaudible).

JUAN ACUNA: Yeah. I mean, we really do not know. We really do not know. If we do not know what is the threshold then we have to compare, because this is just the beginning. So we can cross that one. These cost very, very cheap. Now, no (inaudible). How about this? (Inaudible). How about this? Well, if we didn't cross this, we're going to cross this. Actually it will become good. See? Now, we might decide that this amount of outcome for this cost is actually really, really good. So, if this is good we have to cross this. See? Because it doesn't make sense that we keep (inaudible) amount of outcome with such a different cost. And once we do this, it's pretty easy to try to determine, okay, this one goes or not. No, this one stays, this one goes, and if this one goes maybe this one goes, and maybe if this is the case then maybe—and then you start crossing them and you would have a bunch of (inaudible) less to one of us.

Now, these go for a very competitive analysis, which is the next point. You have to calculate the differences in costs and outcomes. And how do you do that? Well, there are many ways. You can estimate the net cost, which is just the numerate, and that somehow how we did this. So it was really for the ones that are very expensive. We want to have many, many outcomes. And for the ones that are least expensive, we can tolerate more. Why? Because they are very, very cheap. Cost of an intervention relative to the comparison, or cost of health outcomes prevented. Let me give you an example of a—who can come up with a good example of a cheap program that is not very good than we have there? I

mean, actually I just defined some type of tests that we use pretty often. Screening tests. Just think of Pap smear. Is that expensive? No, it was cheap. I mean, colposcopy is much more expensive. Biopsy is much more expensive. From the perspective of what? What is the outcome? Number of cases of cancer, or number of women that are at high risk of getting cancer, and then you go into a second set of testing. Testing is very complex. So just accept what I say for the sakes of the exam. So, if you have four different choices to try to determine whether a woman is at high risk for cervical cancer, and if a woman has cervical cancer. The screen test is usually, the cheapest one—but it has the least amount of security. So, you don't really want to say the woman has cervical cancer until you go into a next year of more expensive but more secure tests. All the way to one, that is the most expensive but it can give you 100 percent assurance that you do have or you do not have cervical cancer. In the same way you can do breast screening tests, so you can do mammograms, or you can do ultrasound, or you can do physical examination, or you can do biopsy, or you can do punctures. How do you combine those? Well, you can't them. So you have not only five but several many options. How do you decide which one is really cost effective? Well, go back to your grid. What are your outcome? Well, your outcome is the number of women with breast cancer that with cure, for instance, which means goes back to the natural outcomes, number of lives saved, number of cases averted, number of—remember you have to talk into plain language, and this one the health prospect. Okay? And then put them into the grid because you know how many women with breast cancer are actually positive at the end

for breast cancer once they have gone into a physical examination self-assessment type of protocol. You know that out of the hundred that come because they felt something one is positive. So that the overall detection rate is not really good. Actually you get many false positives, so you end up into a second tier of examinations or testing to determine out of those hundred how many have more risk. You end up with 10, and then with those 10, you end up with more testing to end up probably with the one or maybe three, and then you go into maybe a surgical excision and then you come up with the one that really has the cancer. Was it worth it? Of course it was worth it. So, there are many economic analyses that you can actually get published studying these alternatives for these diseases. Then what you do is that you estimate the cost effectiveness (inaudible). So everything becomes the relationship between your outcome and your expenditures. So, you establish this ratio and you establish—you have to come up with the net cost and you have to establish with the net health outcomes. You have to know these. What you're doing here is actually establishing those ratios. But you really thought because of logic that beyond or below this ratio I will not go into further testing for these alternatives. For instance, projected CEA are cost effectiveness analysis of PCV-7 vaccine in US. So, you can analyze the net cost per annual birth cohort, the vaccine cost—you can analyze that it costs four doses, $63 per children, four million children, $5 per cost administration, (inaudible) medical cost, $12,000, 53,000 of pneumonia--