

# 16th Annual MCH EPI Conference: Plenary II — Opportunities for Chronic Disease Prevention: Targeting Women with Gestational Diabetes and Hypertension December 16<sup>th</sup>, 2010

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PATRICIA DIETZ: Good morning, everyone. I want to welcome you to this session. As Lee said, we think it will be one of the best and I'm glad you're here. We are talking about targeting women with gestational diabetes and hypertension. This fits well within the framework of the life span that we've been focusing on the last couple years because the session is to highlight that women's responses to pregnancy yield important information about their health risks in the future. And this information gives an opportunity to prevent or modify future risks of diabetes and cardiovascular disease. There's a lack of awareness among providers and among women, a lack of systems that connect prenatal care to primary care after delivery and a lack of programs in the community to refer women for prevention services. So the session today will cover ideological and biological reasons for this future risk. It will review what we know about lifestyle interventions to mitigate the risk. And we'll be presenting a public health program designed to educate women and increase their use of prevention services. So we have four speakers and we're going to take questions at the end, so please write down any questions that might occur to you during the talk and then come to the microphones at the end. So our first speaker is Dr. Catalano, professor and chair of the department of reproductive biology at Case Western Reserve University Metro Health Medical Center. He is and has been for a long time a leader in the field of diabetes and metabolism in pregnancy, with over 120 peer-reviewed publications. His research is focused on the evaluation of women before and throughout pregnancy to determine short and long-term risk and long-term effects of maternal obesity and diabetes on both the mother and the fetus. Our second speaker is Dr. Seely, who is the director of clinical research in the endocrinology diabetes and hypertension division in the department of medicine at Brigham and women's hospital, and she's a professor of medicine at Harvard Medical School. Her research is focused on the unique risk factors in

women. Our third speaker, Dr. Ferrara, is a research scientist at Kaiser, Northern California. She is the principal investigator of a large randomized intervention of diet and physical activity designed to help women lose weight after pregnancy and reduce their risk of type 2 diabetes. Our final speaker is the director of diabetes prevention and control program at the New York City Department of Health and Mental Hygiene and she will be highlighting a program focused on educating women after pregnancy related to their future risk of type 2 diabetes. So please welcome Dr. Catalano. [ Applause ]

PATRICK CATALANO: Thank you, Patti. I'd like to thank the organizers for the kind invitation to come today. And what I am is an obstetrician, and what I would like to do is kind of give you some background as to some of the things that occur in pregnancy that may relate to these chronic diseases in both the mother and her offspring over the years. I guess our underlying philosophy is if we can understand these issues better, then we can design our treatments that are really aimed at the specific underlying mechanisms. And so rather than giving an epidemiology talk, my talk is going to be more physiological and dare I say sometimes maybe even basic, but we'll give it a go. So these are data that I'm sure you all know very, very well. This is the CDC slide of the adult obesity in the U.S. In 2007. The point I want to make here is that it's almost super-impossible on the risk of adult diabetes at the same time. So that obesity and diabetes really go together. And my mentor in medical school calling this term diabetes. My talk is going to go back and forth between these two issues of obesity and diabetes, what are the mechanisms, what are the implications. So here's some data looking at the trends in gestational diabetes in the U.S. Between 1989 and 2004. And, again, depending on the age, you can see the previous lens has increased over time. However, the criteria that we use to define gestational diabetes were developed in the 50s and 60s in \*\*\*. The primary reason they were developed was trying to determine what was the long-term risk of a woman developing diabetes. Since that time there has been a follow-up study, which has as its goal to say, well, in addition to that, what levels of glucose in pregnancy relate to adverse outcomes for the mother and the baby at that time, not long-term, but short-term. Without going through a lot of data, basically the study was done. It involved 25,000 women in many countries around the world. And then the criteria were then developed based on risk factors of having a large baby, having high cord insulin in the umbilical cord which is a risk factor for long-term problems. What's important is if you look at what the previous lens would be, if you have just a fasting sugar, could be 8.3%. If you include one-hour value it's 14%. The 2r value would be up to 16%. We're talking about 16% of women having a diagnosis of gestational diabetes because any one of these values could give you that criteria. The American diabetes association is now looking at these criteria and will come up with a statement. I think the issue is it's important to realize that this obesity

epidemic is being translated into risks for the development of diabetes. In Cleveland we deal with an \*\*\*care population. 23% of our patients will have a diagnosis. It's amazing. What's that going to do with the health care system that we have. Again, it may be important for long-term prevention. So this is our underlying model. This is based on the hypothesis of adult disease that basically say the in-utero metabolism of the mother can basically have an effect relating to neonatal and childhood obesity that perpetuates this life cycle. This isn't something we thought of. This is something that we've been trying to apply to our research over the past few years. It's finally caught on because it finally hit the literature. When it hits time magazine, you know it's real. This was published in October of 2010. The whole point is that in-utero, the environment that you are exposed to can have long-term consequences for the offspring. So this is our underlying hypothesis that we're aiming to further examine. You know about the obesity epidemic and how it's increased in adults and children. But this is data from our own hospital. What we've seen is that the average birth weight has increased 116 grams over the past 25, 30 years. And this is all related to maternal obesity. The obesity epidemic can even go down to the fetus in-utero. One of the ways that we've elected to look at growth is not just birth weight, but body composition. We think it's a better way to assess risk. This is a study looking at women who had gestational diabetes and who had normal glucose tolerance who were well-controlled. If we just looked at birth weight, there was no significance difference, but what you can see is even in these women who have gestational DNS who were well-controlled, these babies were much fatter. The second analysis was taking a woman with normal glucose tolerance and breaking them down into those women who before pregnancy were average weight or overweight and looked at their babies. Infants of women who are overweight have bigger babies. The question is what makes them bigger? The issue is they're bigger because they're fatter. Same thing here. I want to mention these women with a normal diabetes test because they are overweight or obese, their babies at the time of birth on average have as much body fat as the woman who had gestational diabetes and was treated. We know that this is a risk factor because we know that this percent body fat at birth is correlated to body fat at children at age eight. There's a lot of metabolic dysfunction associated with this. The biggest risk factor is not how much weight you gain in pregnancy, but it's your pre-pregnancy weight that increases your long-term risk. This is what we're going to be looking at trying to understand the mechanism. What are the factors that facilitate fetal fat? We'll start first with maternal glucose. This hypothesis has been around since 1953. It very basically says that increase in mother's glucose really crossing the placenta increases the glucose that the fetus see, increases the pancreas to make more insulin and that results in increased fat accretion. It's true. However, what else do we know in the last 50 years? When people were treating

women with diabetes in 1953, they were dealing with very lean, thin women with type 1 diabetes. What we deal with now in pregnancy are proportionally the increase has been in type 2. We have been looking at lipid changes in pregnancy. A longitudinal study looking at the triglycerides in obese women as compared to average weight and overweight women. There's a pregnancy effect. The further you go in pregnancy, your lipids go up. This is a normal change. These women over here who are lean. But what the issue is that if you're already overweight or obese to begin with, your lipids are that much higher and this may be a risk factor later on. There's been plenty of studies to look at this. Here's data we have not published. The fat mass of the fetus is related to maternal triglycerides. And this not only occurs in late pregnancy, but early pregnancy. So whatever factors are relating to this don't begin in late pregnancy, but in point of fact can develop early. And this is why a lot of the research we are looking at really focuses on placenta and early changes that can affect the different genes that get expressed and then result in a big baby. So one of the issues -- and I'm not going to go through a lot of detail on this slide, but just to say that it's always been an argument, what happens to maternal triglycerides. How do you get these lipids from the mother to the fetus? There's many different pathways. The issue is for years we didn't think that lipids could cross the placenta very easily. Through a lot of research not only in our group, but in other groups, you can see that there's a lot of intermediary metabolic pathways that result in increased transfer of lipids to the fetus. If you think of a woman who's obese, her sugars may be in the normal range, but lipids are elevated. In pregnancy, because these lipids also go up, the issue is that they may relate to increased fatty acids being available to the fetus. And some of the basic studies that have been done, this is from our group, what we did is take a look at what are the substrates. How do you make fat? These are cells from the placenta. After birth you grow the cells in a tissue culture. The issue is how can you make fat? The fat is located in these pink colors here. If you just have glucose, what you see is you don't really make too much fat at all. But if you add a fatty acid, what you can see is that there's much more pink. So there is the potential for the placenta to make lipids, which can get transferred to the fetus. These are the type of studies that we're going to need to know, not only is glucose important, but lipids as well. How do you transfer these? You take placenta from different individuals and in this particular case it was women who were obese and had gestational diabetes and we compared them to type 1 diabetes. The women with type 1 were thin and the women with gestational diabetes were generally obese. Blue are those genes that are repressed. What you can see is that if you take a look at the women who have type 1 diabetes, orange colors, genes are related to sugar metabolism. In obese women the genes are related more to lipids. In women with obesity, these may also be a risk factor. In pregnancy we check a lot of sugars but we never check lipids. It's not to say

we shouldn't, but maybe it's something to be looked at. Finally what I want to talk about is cytokines. We're not talking about inflammation that's associated with acute \*\*\* or someone who's really sick, but the type associated with metabolic diseases. You may have heard of the hormone that's made in fat cells that have to do with energy regulation and appetite. A lot of these are related to issues that we're looking at inflammation causing insulin resistance, where during pregnancy a woman becomes less sensitive to the effects of insulin. This is why these nutrients go up. Well, not only are these hormones made by the placenta, but in point of fact is with the exception of one that is an insulin sensitizer, all of these hormones are also made by the placenta. When we look at this, it's a relatively complex situation in that what you have is that you have the maternal fat cells making these cytokines, you have them circulating in macrophages. They're made in the placenta and also in the fetus. The key is if it's made in the placenta, it can go into the mother's circulation, causing metabolic changes. It can also cross into the fetus. But the mother can't get to the fetus and the fetus can't get to the mother. So the placenta is the central role in developing site cines which affect metabolism, which affect the amount of glucose available and the amount of lipids that are available. So if you take a look at inflammation -- again, this is not inflammation or infection. It's just this profile that relates to your metabolism. In women who are obese they have an inflammatory profile. Aisle 6 is elevated. And CRP is elevated. These elevations in these lipids are the factors that relate to those changes that allow nutrients availability to come across to the fetus. Where do they come from? They come from these cells we call macrophages. This is a biopsy of standing of macrophages in maternal fat cells. What you can see is that the fat we used to think of as just a storage depot, but in point of fact your fat tissue makes lots of hormones. Not only do they make hormones, but these macrophages make these site kinds, which give you that profile. They also exist in the placenta. Without going through a lot of that, there's preliminary data that says if your mother is obese, you see kite toe kinds made in the placenta may be of maternal origin. These are just measures if you take a look at maternal fat tissue, these cytokines being elevated here, the same thing in the placenta. The profile is similar. What you can see in an obese mother you start seeing in the obese placenta and eventually you may see you it in the obese baby. Long-term risks of gestational diabetes? As we age, unfortunately, we all become more insulin resistant. That resistance is because we lose lean body mass, we gain fat mass. This is why type 2 diabetes is more common in older people or used to be more common. What pregnancy is that pregnancy is a stress test. In pregnancy you become more insulin resistant. After you deliver, you come back down. The key is that if you cross the threshold like what we call gestational diabetes, wherever you like to draw the line, what it says is that you may fall below the line later. If you live long enough, you do have an increased risk of developing

type 2 diabetes. The concept is different if you start lower. If you start out more normal, with a more normal insulin resistance, you still have this change in pregnancy, but you never hit this threshold. Then you're less likely to hit the threshold when you're not pregnant. Pregnant is a good model for metabolic dysfunction because the changes that occur in a pregnant woman over nine months take decades to occur in a non-pregnant individual. Okay. These are data from Dr. Kim up in Michigan showing the risk of development of diabetes in women with pre-gestational diabetes. The bottom line very simply is -- and these are all individual studies -- that your risk in ten years is close to 50% or 60%. So we've known that for a while. What I want to do is weave in the issues of obesity. This is a follow-up study done looking at insulin resistance syndrome. With the prior history of gestational diabetes. This showed if you have gestational diabetes, you had a 27% chance of developing the metabolic syndrome, which is defined as obesity, hypertension, hyperlipidemia, all those factors relating to chronic disease. And the control population, women with a normal glucose test, were only 8%. However, the hazard of developing this syndrome was five and a half times higher among women who had \*\*\*. Very simply, this is a study done in Copenhagen began looking at the prevalence at metabolic syndrome in the Danish population. Showed the same thing. If you had gestational diabetes, close to 40% of them will develop the metabolic syndrome, where only 13% of the control group will. When you break that down and look at obesity, if your BMI is greater than 30, you still had a sevenfold increase. Pregnancy is a good stress test for seeing if you would develop these problems. The last thing I'd like to do is wrap up. We got these issues. What can we do about it to maybe improve things? Again, our goal as obstetricians is what factors can be modified in those women who are obese to limit this problem? Based on the slides I showed you earlier, this is a risk factor for neonatal \*\*\*. Nutrient supplements can be used. Our group is now looking at supplementation of fish oil because we know that it's inversely related to fetal \*\*\*\*. Depending on the level of omega 3 in your diet, it's correlated with neonatal body fat. This is the mechanism by which it works. Increases fat oxidation and insulin resistance. And finally, there's been a lot of work done in the last few years. Not only you are what you eat, but it also depends on the gut flora inside you that helps determine a lot of these factors. And what we know is that your diet can affect the absorption, depending on what bacteria you have, increasing factors such as LTF, which can increase these cytokines I told you about. That can affect your liver, at possess tissue and muscle and even your placenta when you're pregnant. If you are obese, you have a higher concentration of LTS in your circulation. This may be related to diet and obesity, which stimulates site kinds. These factors can result in increases in cb14, which is a cytokine profile. But the point is that they can increase inflammation in the system. And it may be related to the gut flora. What I think has been interesting is

that when we take these cells and grow them in culture, what you can see is that there's a much greater effect of this LPS in obese women as compared to lean women. Finally, there was a nice study done in Finland looking at the effect of probiotics. If your gut flora can affect your cytokine profile, can you alter the diet to have some effect? Very basically this is the last slide. What it shows is that women on \*\*\* on the particular diet as compared to a control diet had a lower glucose profile, lower risk of gestational diabetes. With a diet that was similar, but just supplemented with probiotics. It's affecting your gut flora and hence the way LPS may act on your macrophages. I'll end with there and say pregnancy is a great model. We can understand a lot about what happens during pregnancy. We potentially can do more that may have long-term beneficial effects on the mother and her offspring. Thank you. [ Applause ]

ELLEN SEELY: Thank you. Good morning, everyone. I'm Ellen Seely. I'm an endocrinologist. I'm going to shift gear, talking about Preeclampsia and the future risk of \*\*\* disease. I want to give you a little perspective of how I address women who have -- are asking questions about cardiovascular disease risk factors. I'm going to start with a case of a 54-year-old woman who presents to discuss their \*\*\* risk factors. She's postmenopausal. She was on hormone replacement for two years. Her father had coronary artery bypass graphing. She's overweight. Has normal renal function, fasting sugar of 90. I gave you her triglycerides and cholesterol measures. Traditionally this is what we look at to be able to assess \*\*\*\* risk. What I want to develop over the next 15 minutes or so is what we're doing as caregivers and clinicians sufficient to really inform women about their \*\*\*\* risk. And raise the question of what other information about past medical history should we be asking women to better counsel them of future risk and potentially modify their future risk. So if we look at the traditional \*\*\*\* risk factors in women, I have on the left side the risk factors that were first established in men and now have been established to hold true for women as well. But in women we have some unique \*\*\*\* risk factors that are not present in men. And we certainly know that menopause and its use of estrogen may modify \*\*\*\* risk and in the premenopausal group hormone contraception. Now these are increasingly well-accepted as risk markers. What my research group has been working on is reproductive life complications and how they may be useful to inform risk and possibly modify risk. And what I'm going to be focusing on for the rest of the talk is specifically on Preeclampsia. So since it's not a big topic that I noticed at this meeting, what I wanted to do is tell you a little bit just so we're all on the same page about what is Preeclampsia. It affects about 3% to 5% of pregnancies in the United States. It's a leading cause of fetal morbidity and mortality. It's defined as in a woman who starts a pregnancy with normal blood pressure, blood pressurizing to greater than 140 over 90 after 20 weeks, accompanied by \*\*\*.

The time course is reminiscent of what we see for gestational diabetes. We have no idea what causes it, but we know it affects multiple organs and affects both the mother, the placenta, as well as the fetus and the offspring. And it's associated with hypertension, as I mentioned urine in protein. It can cause renal failure. It can \*\*\* a syndrome that affects both the liver and platelets. It can cause blood clotting and can progress to generalized seizures associated with increased maternal and fetal death. Parallel to the way we're thinking about gestational diabetes, preeclampsia has effect in the uterus that may affect offspring health as well. We know it's associated with intrauterine growth restriction. It's a leading cause of prematurity in the United States. Increasing evidence shows the offspring of mothers who had pregnancies complicated by preeclampsia have an increased risk of developing hypertension that can be seen as early as teenage years. We know there's specific risk factors, but we have no treatments for preeclampsia that can reduce the risk of preeclampsia. A number of the things that have been tried or failed are low dose aspirin, calcium, supplementation with antioxidants, vitamin e and c. As I was talking to bill about last night, there's a lot of fervor now about how vitamin d is going to be the cure. And I put a caution just that the jury's out on that. We had the same level of enthusiasm about all the other studies that have not been shown to be effective. The only cure for preeclampsia is delivery of the pregnancy, which is one of the reasons it's a leading cause of prematurity. It goes away postpartum. What's been increasingly recognized and I want to leave you with today is that preeclampsia may predict the risk of future \*\*\*\* disease for women who are affected by it. And I want to bring back to what Dr. Catalano was talking about. When I started working in gestational diabetes in the 1980s managing patients with it, we said you have the good kind of diabetes. This is the kind that will go away after you deliver. And that was often the end of our conversation. Although we now say how it's so clear that gestational diabetes portends and is an owe men for future gestational diabetes, future risk of diabetes, this was actually debated until the 1980s. So it's been for about the last 20 years due to some of the studies that looked at women with gestational diabetes and long-term risk for type 2 diabetes and now we really accept that gestational diabetes predicts future risk for type 2 diabetes. And what I want to pose is that's where we're standing right now with preeclampsia. The focus has been really on the pregnancy, because of the adverse effects it can have both on the mother and the fetus. And that over the next five to ten years we're really going to be doing a shift and also devoting attention to the long-term prediction of \*\*\*\* risk in women with a history of preeclampsia. So there's increasing amounts of data that show that preeclampsia predicts risk for hypertension, \*\*\*\* disease and renal disease. In the interest of time what I'm going to talk to you about is some of the data that supports its predictive value for hypertension and \*\*\*\* disease. So as early as 1960 studies were beginning to be published showing

that preeclampsia although it resolved after delivery, that women with a history of it were at increased risk for developing hypertension. But when a lot of these studies were being published, there was a lot of debate, was it really true and was there a problem, were we actually shifting focus away from where it should be, that the focus should be on pregnancy, on the mother during pregnancy, on the fetus and that we were doing a disservice by looking at long-term risk. This study done in the 1960s had 150 women who had a follow-up of about 20 years. And they were compared to 185 women who had normal blood pressures during pregnancy and about 200 women who had never had a pregnancy. And if you look here at the blood pressures, 15 to 20 years later, about 60% of the women who had preeclampsia during pregnancy had hypertension by our current j & c recommendation guidelines of a sis too long lick rate of 140 and a diastolic rate greater than 90. Women with normal blood pressure during pregnancy had a 20% to 25% incidence of developing hypertension later in life. And what I find particularly interesting is if you look at the women who never had a pregnancy, their risk was intermediate between these two. I think this really stresses that not only should we look at pregnancy as a way to inform us for increased \*\*\*\* risk during pregnancy because of it being a metabolic stressor, but that women who have uncomplicated pregnancy may be at decreased \*\*\*\* risk and that may be equally important. I wanted to show you one other study from the 1980s. This was about 400 women where there was blood pressure follow-up data. The data was very similar, that women who were normal during prior pregnancy, this is their risk of developing hypertension over the next 25 years, whereas the women who had severe preeclampsia had an accelerated risk of developing hypertension later. This is -- idea has been receiving increased attention over the past several years, and this was an analysis that was just published in 2007. I'm going to summarize this so that it's not important that you actually see the numbers, but here's the risk being one. And this was women who had a history of preeclampsia. Their risk of developing future hypertension. And what you can see is this included 13 studies over 20,000 women, included in all these studies. The follow-up was about 14 years. The relative risk for hypertension in the future was approximately four. Not incredibly dissimilar from the earlier studies that were published. One of the big issues in doing these studies because they're not true perspective studies, they're studies where data is looked at from discharge diagnoses or chart reviews. The majority of these studies did not adjust for body mass index. We know obesity is a major contributor to the future development of hypertension. One of the things our group is asking is how much of the future risk that's associated with preeclampsia as well as gestational diabetes is carried by the risk factors that cause the preeclampsia and gestational diabetes to begin with, one of which is obesity, versus the condition itself. So I wanted to show you another study that was just published in

2010 that actually then looks at the history of preeclampsia and risk of future dying of CBD. This study looked at women who were enrolled in the child health and development study, where they had data on their pregnancies. So the women in this gray line were women who had had pregnancies that had not been complicated by a preeclampsia. This line with the x is the line of women who had pregnancy complication of preeclampsia that was over 34 weeks of pregnancy. And the dotted line is women who developed preeclampsia before 34 weeks of pregnancy. Not only is hypertension associated with future risk of preeclampsia, but \*\*\*\* disease is associated with increased risk of \*\*\*\* death whether you look at late preeclampsia and mar markedly if you look at preterm Preeclampsia. Hypertension is only one. There's multiple other risk factors associated with preeclampsia including elevated lipids and elevated levels of inflammatory markers in Preeclampsia pregnancies that may also play a role in increasing the chance of developing CBD and death from CBD. So what are some possible associations for the associations we're seeing between preeclampsia and future CBD? What I want to stress at this time is what we primarily have are associations. And the paradigm that my group has been using is to look at it in three different ways. So the three views that we've been looking at are -- is pregnancy a stress test that unmask future CV risk? I think we have increasing amounts of data that that is true. An alternative view would be that preeclampsia and/or gestational diabetes actually cause permanent damage by their existence over a pregnancy that increases future CBD risk. And then since I'm someone who usually integrating different approaches, that it may be a combination of the two. And I think there's increasing data that it's probably a combination of the two, that we have unmasking in pregnancy of risk factors for \*\*\*\* and \*\*\*\* metabolic disease, but some evidence is occurring now suggesting that preeclampsia may actually in and of itself increase risk. And this becomes increasingly important when we think potentially about interventions. So if we look at the idea of what is potentially unmasked by a pregnancy complicated by preeclampsia, we can look at what are the shared risk factors for both preeclampsia and CBD. So my group has done studies on \*\*\* in preeclampsia pregnancies as well as women who are completely \*\*\* two to four years following a preeclamptic pregnancy. Obesity is a risk factor for both, as is insulin resistance and diabetes, hypertension and dyslipidemia. If these are risk factors for both, could we modify these prior to a pregnancy and decrease risk for preeclampsia. Or can we modify after pregnancy and decrease risk for CBD? This is a similar slide to the one Dr. Catalano mentioned. This is modified with permission from those who published the study. If you look at the concept that here's a threshold for showing a clinical disease, these are women with uncomplicated pregnancies who are below this threshold and that we really need to take -- if we talk about a life course approach, the life course approach really needs to look at what happens during pregnancy as well as

what happens in older age. \*\*\*\* disease is rarely seen in women before menopause, but that doesn't mean that what happens before menopause doesn't tell us something about \*\*\*\* after menopause. The paradigm is if you take, for example, preeclampsia, that it's manifest during pregnancy, it resolves after pregnancy, but that it gives us potentially a window for \*\*\*\* disease prevention, which will change the trajectory of the development of \*\*\*\* disease in later life. Cardiovascular disease is the leading cause of death in U.S. Women and more women die of heart disease than all cancers. More women fear breast cancer than fear CBD, CBD is claiming the lives of more women. This crosses races and ethnicities as the leading cause of disease. So can we modify risks for CBD? And we have evidence-based guidelines suggesting lifestyle intervention and risk factor reduction. And what's very important what we talk in the public health's setting of these interventions, we need to know who are we going to target for these interventions, because we need to because of limited resources target those at higher risk. So this is from these guidelines. Women are divided into high risk, at risk or optimal risk and low risk. So the idea being you wouldn't target this group. You would maybe partially target this group. And then you'd do most of your targeting in the high-risk group. So what we're proposing is that complicated pregnancy probably should be added to these aloe rhythms and used over time as a way for us to target preventive risk strategies. So to summarize, we view cardiovascular -- reproductive life, gestational diabetes as offering a window into future CBD risk in women and really allowing the potential for targeting CBD risk modification to prevent the morbidity and mortality for developing CBD in these women. And these are recommendations for future directions. They're only my recommendations. They're based on the perspective that I have. So I've divided them into clinical and research. So in terms of clinical, what we're really working is on the concept that reproductive complications should be a routine part of every patient history. The patient I present in the beginning had a comprehensive evaluation for cardiovascular risk factors, but no questions were asked about her complications during reproductive life. That importantly to allow this to happen that electronic medical records really need to link pregnancy and primary care record. We are looking at whether the linking will improve risk reduction strategies in the primary care setting. That internists really need to obtain training in obstetrics, which is currently only done in medical school. Obstetricians do actually obtain much more training in internal medicine than internists do. In terms of research, what I want to close with is I think it's really important that we really have interdisciplinary teams to ask and answer questions about a life course approach and that the teams need to be interdisciplinary in terms of having endocrinologists, primary care physicians and obstetricians and in terms of the different fields in medicine we're trained in, but also that we need approaches of different levels of research, including

population science, clinical science and basic science. So that we can figure out what to do after a complicated pregnancy to take opportunity of that predictive window and decrease cardiovascular risk in women. Thank you. [ Applause ]

ASSIAMIRA FERRARA: Good morning. So my name is Assiamira Ferrara. I work as a researcher with Kaiser in northern California. And I'm talking about diabetes prevention in women with gestational diabetes, what can we do during and after pregnancy. I set to work on this more than six years ago. Finally I received the funding only recently. So one of the beauties of this conference is that there are several investigators. My major message is don't give us. The previous speakers introduced gestational diabetes. I don't have to repeat. But one of the major message I want to give here, that gestational diabetes is quite common, affects from 4% to 10% of pregnancies in the United States depending on the racial and ethnic composition of the population. And 15% to 50% of women with gestational diabetes would develop diabetes later in life. It is recommended that women with gestational diabetes should receive a blood glucose test six weeks postpartum and all women should be educated about lifestyle changes. Those women who have a glucose intolerance at the first test should receive intensive nutritional therapy and an exercise program. This recommendation is based on evidence of the high risk of type 2 diabetes in this population and evidence from screening. I'm showing that the diabetes is preventable by lifestyle intervention. However, a few of these lifestyle intervention focus on women with gestational diabetes and none of them have been translated to women with gestational diabetes during the prenatal and the postpartum period. One of these studies was a randomized screening of women for a full year. This is a diabetes medication. However, it's no longer in use because of its potential liver toxicity, so it has been discontinued in clinical care. But this study showed that women who were assigned to this group had an incidence of diabetes was significantly lower than women who were assigned into the placebo treatment. After 30 months, women who were assigned into this group show in the 55% reduction in the risk of diabetes. An important finding was that protection from diabetes required an initial increase in insulin sensitivity that was due to the triglyceride treatment and reduction in the insulin production by the pancreas. Another important study into the diabetes prevention known as the DPP, this was a randomized clinical trial among more than 3,000 individuals who develop diabetes. Women who had pregnancy 12 years prior to randomization. The result, among women who were in the study. Women were randomized in three groups, placebo, intensive lifestyle intervention. Diabetes medication improve insulin sensitivity. So we can see here that the gestational insulin, both were associated with approximately 50% reduction in the rediscovered diabetes. In the lifestyle intervention was equally effective among women with gestational diabetes and women without

gestational diabetes. This was despite the fact that women with the gestational diabetes were less likely to adhere to the weight loss physical activity recommendation than women without gestational diabetes. As you can see in this slide, women in this study over gestational diabetes, weight loss six months postpartum. They rapidly started to regain weight again, weight gain, and then at the three-year follow-up, there were also 2.6 kilogram. While women without GDM, weight loss six months after intervention. Four kilograms of weight loss at the three years of follow-up. It's also worth to notice that both women with or without this study of GDM, with intense lifestyle intervention increased physical activity by 1.5 hour per one week by one year. However, women with gestational diabetes did not sustain this increase. By three years of follow-up, the increasing physical activity was only 30 minutes. This difference between women -- in the behavior with gestational diabetes and women without gestational diabetes may be due to the fact that women with gestational diabetes were significantly younger than women without gestational diabetes. So maybe that didn't make them able to completely adhere to a lifestyle intervention. Particular strategies are needed to translate the lifestyle intervention that has been shown to be effective in older population to young women. So what we have learned from the studies, from the second study we have learned intervention may be most beneficial before they develop because it's a chronic stimulation that leads to diabetes. We have learned that unique approaches are needed to translate the lifestyle modification affecting women. Diabetes prevention program, is helping women to gain weight in the recommended range. It continues postpartum. By helping women to lose pregnancy weight and additional weight if they were overweight or obese offered the opportunity to prevent recurrent gestational diabetes and diabetes at a younger age. So here I am going to present preliminary data over 50 studies we conducted at Kaiser in northern California. The study was to evaluate randomized lifestyle intervention soon after diagnosis. Women were given the goal to get to pre-pregnancy weight if they had normal BMI before pregnancy. So the intervention during pregnancy started soon after the GDM diagnosis. Women were advised to comply with guidelines for gestational weight gain, to follow the American diabetes association diet. The postpartum interventions at the six-week postpartum, women were advised to reach the postpartum weight goal, to reduce to less than 25% of calories, to engage in more direct physical activity each week. Intervention was delivered by one person, seven to ten telephone calls. One additional person visit was done before the women were entering. They received a newsletter focused on issues related, made no reference to weight loss or diet or exercise. This slide shows participant. I want to focus that among the eligible women we were able to contact, 84% participated at the baseline examination, signed an informed consent, and in the 12 months postpartum 80% of women in intervention group were still in

the study, while 90% of the women in the other group were still in the study. Women were overweight, but we can see 50% of them at the normal weight. This was probably due to the fact that almost 50% of them were (inaudible). This slide shows the proportional women meeting the postpartum weight goal in intervention group, in the light blue, and the control group in purple. So the proportional women, the postpartum goal was higher among women assigned into an intervention group. The absolute difference between women receiving the -- r reaching the postpartum weight goal was 16%. Because women have different goal based on their BMI, we analyze women according to their BMI, normal weight or overweight and obese. We can see here that the effect of intervention was similar in women with BMI less than 25. Since the rationale for intervention during pregnancy was that we were able to have women not exceed the gestational weight gain recommendation during pregnancy would be easier for them to lose weight during the postpartum. Here we can see, as we expected, that intervention was more effective among women who did not exceed the recommendation for gestational weight gain. At four months postpartum difference in the proportion of women that reached the weight goal between the intervention and the other group was 22%. So intervention was also effective in helping women to reduce the intake, was not effective in asking women to increase exercise. You also can see here women were assigned into the intervention group were more likely to breast-feed their infant seven months postpartum. So in conclusion these results are just the lifestyle intervention for women with gestational diabetes. They start during pregnancy and continue postpartum. May prevent gestational weight retention. May help woman lose weight. Reduce fat intake. May help women to breast-feed their infants for longer time. Strategy to increase physical activity in postpartum women is still needed. There are also several questions that remain such as intervention may be more effective in helping young mothers increase physical activity. Do difficult diabetes prevention strategies have different effect on the control of obesity, diabetes, hypertension and depression? Do they have the opportunity to reduce the risk of obesity and diabetes in the office spring. May be able to change the behavior of the family. And prevention efforts cost effective? We hope to address some of these questions through randomized trial that have been recently funded. But the most important issue here is that we have to be sure that the access and the quality of care for women with gestational diabetes postpartum may be more available and with diet quality. Thank you very much for your attention. [ Applause ]

SHADI CHAMANY: Good morning. In the next 15 to 20 minutes I'm going to tell you about a program that we started in 2006 and it was focusing on reaching women with gestational diabetes. I'm going to take you back five years to tell you a little bit of the story and why we did it, talk about the time line, two evaluations that we did, challenges that we have faced and future direction. So back in 2005 this is the

information we had. This is not surprising. We were looking at diabetes prevalence. It had more than doubled, just like everybody has seen across the country. And we said, well, is the same thing happening with gestational diabetes. As the other presenters have already told you, we know that gestational diabetes is increasing throughout the country. We know that it's important to pay attention to this. The risk to the mother, the fetus and then postpartum. We said we should really be taking a look at this. We looked at data from 1990 to 2001. That was just what we had. We didn't do linkage to discharge data. Among all live births in 1990, 2.6% had gestational diabetes checked off on the medical report. It had increased to 3.8% in 2001. This is a 46% increase. Then when you look at this by race and then within the Asian and Hispanic race groups, we broke it down by country, some populations had much larger increases. I circled these in orange. Non-Hispanic, Blacks, all Asian subgroups and Mexican women. If you look at the 2001 column, you actually see the south and central Asian women had the highest prevalence at 11%. When you're comparing that to 3.8%, it's much, much higher so. We said what should we do? This is 2005. We hadn't yet had the translational studies published. There hasn't been a lot of funding looking at women with GDM. We didn't have an intensive resource to give these women. We know who these women are. We have to do something. We didn't have a lot of money. Resources are always an issue. What can we do low cost? We came up with print intervention. So these are educational mailings that we send to women with gestational diabetes. The goals of the mailings focused on what we knew. These were discussed wonderfully by all the previous speakers, so it's making my job much easier. But we knew that the connection to having gestational diabetes and then the long-term risk for type 2, the connection is not being made. Making sure that women had the prevention messages for themselves and their new babies for type two prevention. Making sure women are getting postpartum screening and giving them a tool they can give to their doctors. This is working by giving the individual something to take to their physician or nurse, whoever is seeing them. So this is actually quite an overwhelming slide. The mailings we had decided that we wanted to put everything we had in these packets. So the way it works is there's an envelope, there's a folder, and it has 11 pieces. This is what we started with in 2006. Very busy slide. Two letters. One was a letter to the mother letting her know that she had this diagnosis, what the risks are to her and her new baby, steps to prevent obesity and diabetes and it was in four languages that correlated to where our high prevalence was. The letter also tells the woman take this letter to your doctor that's also in this packet to get the postpartum screening. So then number two is the letter to the doctor. It says this woman has gestational diabetes. You need to do postpartum tests. Three through ten were all our educational pamphlets, one-pagers. We even had a booklet, I think it's eight tips for how to have your children

reach a healthy weight. Those were also included. For those that lived in our high-need neighborhoods, we have three of them defined in New York city, they're characterized by having a high prevalence of chronic diseases, hospitalizations, higher death rates than others in the city, they're in South Bronx, east and central Harlem and north and central Brooklyn. So if you lived in those neighborhoods we had a fitness and resource guide created specifically for them, so those women had them also in their packets. The office of vital statistics creates a file for us. We get the information. It's transferred securely. It's identifiable information. Our program staff would create the labels, put them on the envelopes and we would mail them three to four months postpartum. We had hoped they would go out one to two months, but we couldn't get the list any quicker than that in the beginning. The cost of each packet being mailed is \$6. So that includes administrative costs, data management, cost of materials and postage. So we're sending somewhere between 4,000 and 5,000 of these a year. So it's about a \$30,000 a year program. We started in March of 2006. So at that point probably about a year and a half we said we should look to see what's going on. What's happening to women who are getting these. We went back to what the original goals of the packet were to come up with these questions. So are we providing women with any new information? Are the packets helping them make any changes? Are they getting postpartum screening? Are they take the letter to their doctor? Okay. So what we did was I had picked 80 as a number of people I wanted to interview. I assumed we would have to call ten people for every one person we would get to go through the interview. I had asked for a sample of 800 people who had gestational diabetes on the birth certificate in the last three months of 2007. We made phone calls until we interviewed approximately 100 women. It turned out we didn't have to call all 800, only about 350. We had a higher response rate. The list was randomly sorted, so there was still some randomness to it. We conducted the interviews. Took about 10 to 15 minutes. They were done in English or Spanish by phone by somebody who hadn't worked in the health department and they were done six to eight months postpartum because we wanted to make sure they had gotten the packets and we had time to interview them about that. It was a 22-item survey, which was designed by us. We interviewed 97 women. The mean age was 32, which was exactly the same age as all the women who had gestational diabetes in that three-month period. I don't have race and ethnicity for this presentation, but I can link it back to the OBS data. We asked what language was spoken at home. Half were speaking English, quarter Spanish, 14% was a mix of other. Most women said they had been told they had gestational diabetes or diabetes in pregnancy, which was good. I was happy to see that. I'm glad that that wasn't 50% and they were finding out about it some other way. Now, this next question you have to take it with a grain of salt. About half of them said that they had had their blood sugar

checked after they had the baby. But that's exactly how we had asked it. When we looked at those 54%, it wasn't an insignificant number that said they had had it done in the hospital. Some of this could have been immediately after the delivery. 44% had remembered the packet, which I thought was pretty good. That's actually 43 women. We asked more detailed questions of those 43 women. We asked them if it was helpful and then said how was it helpful. The majority said it was. A quarter said it was because the information was new. A quarter said because it had information of prevention, exercise and diet. Not quite 20% said they gave the letter to their doctor. So among the 81%, more than half said that they didn't recall the doctor's letter or they hadn't been to the doctor. One-third said they had already had a glucose test. Through a conversation that our interviewer had with one of the women we discovered that one of the reasons why one woman did not take the letter was she said she didn't recognize it in the packet. So the letter to the mother was in four languages, but the letter to the doctor was only in one. So she didn't recognize that was something that I was actually supposed to take to someone. It sounds very obvious when I tell you, but a very easy oversight on our part. Then we asked about did anything change after you got the packet? This is very difficult to do by telephone. The majority said they did change some aspect of their life. But when we talked to our interviewer, she said from her subjective interpretation of the conversation she was having with the women, they were having a very hard time tying things that they had done postpartum specifically to the packet. They were talking about what did I do after I had the child and it was consuming a lot of the conversation and they communicated a lot of trying to make attempts, but not reaching the optimal goal of changing what they were doing as far as lifestyle. But whether it was related to the packet or not, it was good to see that 80% were trying to do something, add more fruits and vegetables or watching more of what they ate. Okay. So what we did was we made changes to the packet. They were small changes, but I think that they were important. Because of the issue with the letter to the doctor, we put that in an envelope and the envelope had the outside had instructions in four languages, so a very simple change. Then we removed material that a low proportion of the women said that they remembered that they thought was useful or new information. And there were I think about five pieces that we removed. We actually now have six pieces. This is about the end of 2008 that we actually modified this. So we had six pieces going, letter to the mother, the envelope that now had the letter to the doctor, two health bulletins, from four to two. We kept the tips for the parents for keeping a healthy weight. A lot of people said they really liked that. It was very practical. It was probably an eight or nine-page booklet. We kept the resource guide. But of course being a clinician and an epidemiologist, I said I still have many questions, and so are we still effectively communicating risk? We made the packet better, a little clearer and less

large, but how do we know that we're still getting across the important messages and what's the best way to do it and what are the challenges that women are facing when they get the diagnosis and what happens to them postpartum? Yesterday it was discussed shifting from I think it was the problem focused research solutions focused research, so you have to know what the issues are because if you're conveying something that nobody is going to be able to adopt you're not going to solve the problem. We decided in-depth interviews were the way to do it. We had somebody at our health department who worked in one of the offices who did have experience and was very interested in doing this. So we used information that we had from newborn home visiting program, which I think there's some states that do that, correct? What we had asked about a year and a half prior to this was do you have GDM? Anybody who was 18 and had said that they had gestational diabetes was eligible to be included in this study. There were 98 of those women. 12 of them were interested and consented. The majority of the others actually could not be contacted. The interviewer did a very long semi structured interviews, was trained in qualitative research method says. We did this a year after the telephone survey. There were two parts to the interview. The first was asking them to respond to the packet because we knew on the telephone it was hard to get all the details from the packet from the women that we wanted. Even though almost all of these women would have gotten the packet already, we asked them to look through it and then went through a series of questions. The second part was asking general things about GDM and the experience that women had, so it fell under what happened when they were diagnosed and how did they handle the treatment requirements that the doctors were giving them, so things that they had to do to change their lifestyle, medications and blood sugar monitoring. We asked about their postpartum experience and generally perceptions of gestational diabetes and type 2 diabetes. So of the 12 women we interviewed, eight were part-time or fully employed. This was talked about yesterday, right? Women have competing priorities. They have to work. They have to take care of their children. They were age 27 to 38. The majority were black or Hispanic. Number of children ranged from one to four. Ten had completed high school or above. Generally speaking they had said that they would have preferred to have gotten the packet from their doctor. Their doctor was a trusted source of medical information. They thought that they should get it before they had the delivery. And this is connected to the second item, which is a lot of the women said I don't understand why I'm getting this. Why am I getting this after I had the baby? I don't have GDM anymore. This doesn't apply to me. Which I think is a very interesting issue. Dr. Seely brought up about the risk is heightened during pregnancy. Once the baby is born, it sort of dissipates. Some of them had said the actual steps were not clear. They were a little bit lost in all the material. And that some of the actual content of the

material was too dense and they couldn't interpret what was in there. Then we asked about the experience they had having gestational diabetes and the things he had to do. They said there were competing priorities. So that within that they said the diet requirements were the hardest things to change. They knew it was really important to take their medication. So that was a struggle for them. They talked about competing priorities. I've got to work. I have to take care of my family. I have to make sure there's food on the table. I can't worry about what I'm eating. I have to make sure everyone else is okay. Very common. This is not new information. What was also really interesting is they said the information they got from doctors and friends and families were very contradictory. So the doctors would say you need to watch what you're eating, don't eat so much. Friends and family were saying you have to eat. You're going to harm the baby. You can imagine the tension that creates. You don't know how to put these two pieces of information together and come up with something that you think makes sense. And this was brought up many, many times by many of the women. And then, again, this was a common theme. It was related to the packet but it was also to the women. They said I really don't see that I have these risks. This went away. My baby was one that I was worried about and I'm not worried about myself. This is I think a really huge issue. We're going to have to figure out a way to deal with it in a way that's sensitive. So these were the recommendations. We need to communicate the long-term risks more clearly. We need to clearly delineate the actionable steps. We have to make sure the literacy level is appropriate. A lot of the materials were from several years ago. I think everybody across the board in New York City but also across the country were all very sensitive to this now. The literacy level is changing. We should consider disseminating the materials through maybe the ob/gyns so they can distribute it before delivery. We should think about tools that will help more with this dialogue so patients can tailor the advice in a way they can do something with. Hearing conflicting information, something from doctors, something from friends, having from family. What we did was we took that information, said let's take that letter from the mom, a full page of text. Now it's only about two paragraphs. It's very clear. Read this enclosed brochure, learn how to prevent diabetes and take this card to your doctor. It's not even a letter anymore. We're going to change it to a card. We decided to get rid of all the individual pieces and just create one document. It's actually going to fold. It has three main sections. So it helps visually the woman go through what are the issues. Overview of gestational diabetes, what can happen to me and my baby. We've said this is what happens during pregnancy. This is what happens after childbirth. I know this sounds really obvious, but when you look at a lot of the materials we don't visually lay this out in a way that's so clear, all in one paragraph. People don't process information that way. What do I do next. It goes through the different categories. Okay. So

challenges. We know the mailings may not be reaching all women with gestational diabetes. Under underreporting on birth certificates. Intervention is low in intensity. We have limited resources. And I can't really tell you what the true impact is. The evaluation we did both of them were process evaluations. They were informative. They were exploratory. But I don't have outcome data. So next step. This is a long list. There's five items on here. The mailings are on hold. We're trying to finalize the materials, thinking about do we want to change the way we're disseminating them. The brochure that we've replaced can be used before or after pregnancy. We modified it so that it was multipurpose. We have to think about if there's additional information we need to gather. We didn't interview women who were Mexican or women that were Asian in the qualitative study. We need to go back and look at our birth certificate data and see what's going on with the gestational diabetes trend, see if there's any change we need to do with our target population. Taking a step back from the individual and the data, as Dr. Seely had mentioned, we need to start thinking about systems in the health care setting where we can make sure postpartum they're getting screened. Could it be at three months, six months? Whenever they hit the medical care system. Then thinking about all the evidence-based research that's out there, our role is to make sure that these things get scaled out, whether it's facilitating getting it done, doing it or creating policy and reimbursement models. Then the bigger picture was changing social and environmental factors so that while we're improving the health for everyone, also this target population will be impacted and benefited as well. That's it. [ Applause ]

PATRICIA DIETZ: Thank you all for those great talks. I would invite those of you who have any questions to come. Are there mics back there? I can't see. Oh. They're coming now. While we're waiting -- is someone going? Okay. Question : it's more of a comment. I was thinking about the importance of hormonal profiles. You mentioned about women with polycystic syndrome. They would have insulin resistance. Perhaps there could be different strategies. The question is if ever we'll plan to look at the hormonal profile. I know it's difficult and costly, but it would be something to categorize women having this issue that you just mentioned, including gestational diabetes.

QUESTION: {NOT CAPTURED}

ELLEN SEELY: I think that it raises a very interesting question about how much overlap there is between groups. So we know that women with polycystic ovarian syndrome are more likely to develop gestational diabetes, and preeclampsia as well. And I think there's that issue of why those people with cardio metabolic homeostasis problems manifest in one way versus another. I think we need to get a better idea of understanding why it is, for example, in this study, less than 20% of women who had

preeclampsia had gestational diabetes. So probably a genetic or environmental influence that makes us manifest different ways, even though some of the signals inside our bodies are actually very similar. In terms of hormonal profiling, one of the big issues in terms of doing that is which hormones are you going to profile. So certainly in polycystic ovarian syndrome there's a lot of profiling that's been done on androgens. Whether that's the hormone we have to focus on I don't think we know because most of the conditions are syndromes, not diseases, so we don't know which are the hormones that are target hormones. Certainly about androgens there's a lot of research now going on looking at resistance, relationship to future disease. I don't think we're at a point now where we know which hormones we should profile.

QUESTION: I have more of a comment than a question here. I just want to say that a lot of what you're talking about implies a functional health care delivery system. 50% of women don't get postpartum care in Illinois. Ob care can be primary care and they are very disconnected from the primary care system. Someone made the comment about OBS being trained in general medicine. We just finished a study in Chicago where women had all kinds of risks and identified themselves as having acute and chronic illnesses, but thought of themselves day-to-day as completely healthy and were not at all interested in getting medical care. We have lots of challenges to get people to think of themselves -- like you're saying, why am I getting this pamphlet? There's nobody talking to them about the fact that they're at future risk. A lot of them are not getting care. All of this is great if we had a system that functioned. Postpartum care is critical, the interface. So just a point of us sort of next step.

>> Thank you. Very good comments.

QUESTION: Hello. This is a question for Dr. Catalano. Since we know from data that obese and overweight women are significantly less likely to have spontaneous preterm birth and we know that add \*\*\* is associated with increased markers for systematic inflammation and we know that a lot of preterm births are at least in part caused by inflammation, infection, why is that? Why do obese and heavier women have significantly reduced rates of preterm birth compared to their counterparts?

PATRICK CATALANO: Well, you mentioned many different dots. The trouble is no one's been able to connect them. And I think that you're correct in that obese women in general may have a decreased risk of spontaneous preterm birth, but they may have as high an incidence of preterm birth because of the complications of diabetes and preeclampsia. What is the difference in those two types of inflammation? I don't think we know the answer to that. What we've been talking about is called met

at that inflammation. The inflammation that is related to premature birth or preeclampsia may be related to different factors. For example, a lot of discussion leading to the issue of spontaneous preterm labor is called fetal inflammatory response syndrome at first. That may be related to organisms in the birth canal that cause inflammation. Again, this is everyone's hypothesis. The inflammation we're talking about may relate to add possess tissue, cytokines. So it may be different types of inflammation, the route of inflammation and then the underlying factors in the mother. Issues related to prematurity, we know that women who are under weight and don't gain weight are at increased risk. That may be one of the classic nutritional type of an issue, that they go into premature labor. Even though we think a lot of it is related to inflammation, we don't have a real good answer because cultures and no matter how you look at it, a lot of these studies, we still don't know. You bring up a very good point. It is a kind of dichotomy that we don't know the answer. Those are just a couple of thoughts, but certainly not an answer.

PATRICIA DIETZ: Thank you. We have time for one more question. Over here.

QUESTION: My name is John, San Antonio health department. My question is how public health works with medical schools. A few months ago I was approached by a doctor who works with our medical school and a lot of NIH brands. He wanted aggregate data by hospitals for mothers that had chronic disease from birth certificate data. Seems like a simple request. But he was told no because this was dealing with confidential information. How are we supposed to address this issue without being able to work with researchers to address it?

SHADI CHAMANY: I don't know what the specifics were to that situation. I do know that whenever there's confidential data and people want to work together on a project and there's people outside of the system and there's people inside of the system, the best approach that I've seen work is a real collaboration where everyone sits down and says what are the goals and both groups should be involved. I think there's always these issues about pushing data out and never hearing about what happens, how it gets analyzed, and I think that that's sort of a way to get through it. I can't address that specifically. But it probably should be done more, because what I've learned, there's a lot of smart people in public health. A lot of us are highly trained in scientific methods. But we often don't have the time to do some of the more structured research. So thinking more creatively about collaborating. Who said it yesterday? Times are tough. They're probably going to get tougher. We need to work together more on things.

ELLEN SEELY: I wanted to make a comment. I think that's a really great question. We have a study right now that we're trying to partner with the department of health on in Boston where we're trying to do a validation of GDM discharge diagnoses and see how if we validate that internally, how does it actually correlate with what the department of health serves. We're at a standstill because the department of health can't release their data and our hospitals can't release the data to the department of health. So I think it's something we really need to raise as an issue, that to change some things that we're doing for research on a local level to effect public policy, we need to say, it's a group that's sharing the information, that we're not in separate groups. But right now that's an example where it's approved by the department of health, by partners health care, and we can't link the data. Where's the society or governmental support agency that actually is allowed to link confidential data? We're very interested for our patients at protecting their data. But when you think about what we're doing in public health, we're limited because of the fact that we need to protect data so much.

PATRICIA DIETZ: It's a real big issue because we want to use that data to effect the policy and programs. Well, I know there are a number of you who still have questions. Our speakers will stay for a few minutes. Please stick around if your question was not addressed. I want to thank all of you for coming, and I want to thank all of the speakers for their great talk and have a great rest of your day.