Good afternoon. My name is Bill McDiarmid and I’m pleased to be here today to kick off the 5th William C. Friday Distinguished Lecture. We’re thrilled you’re all here, and thank you very much for coming. I haven’t had a chance to meet many of you; I’m the new dean in the School of Education. I have a good colleague, my faculty who are here have already heard this story, but, I have a good colleague who was a dean for a long time and did a lot of dean training. He says as dean you have three phases of your life, first you’re the new dean, then you’re the damn dean and then you’re the old dean. Thanks to the budget situation, I’ve skipped the first phase and I’m already into the second phase. It’s also great for me to be back at Carolina after a hiatus of about 40 years. I was an undergraduate here, and like a lot of people who come to this place, I never got it out of my system. It was probably the most important thing to happen to me in my young life, being sort of a country bumpkin, and coming to a place like this and being exposed to the people who were here, which radically changed the direction of my life and has everything to do with what I’ve done in my life, good and bad.

I going to be introducing Lynne Vernon-Feagans and I know Lynne shares this affection for this institution. We actually were here at the same time, probably creating trouble in the corporal place and that was an exciting time to be at Carolina, in that period from about ‘65 through ‘69. We’re honored that this lecture series is named as a tribute to the emeritus president William Clyde Friday who was the president of the university when I was an undergraduate, who was at the time, which I think was unusual at research one universities, was very approachable. I mean you could actually go up and talk to him and he was anxious to talk to students, and I think he was a great model for educational leaders in his openness and his openness to ideas. You, know, he has a lot of stories to tell around the Speaker Ban period in Carolina history when he was in actual fact subverting his own board of governors in collaboration with Paul Dixon who was then the president of the student body. So of course, President Friday is one of the rarest educational leaders the United States has ever produced, the longest serving tenured president at any university in the country. So it’s a great honor for us to be able to pay this tribute to a man who is not just a fabulous leader for North Carolina but for the country as a whole, and provided a model to a lot of other university presidents around the country. Our goal in hosting this public lecture is to bring internationally recognized scholars to campus to address issues related to early childhood and share their experiences with students, with faculty, with alumni, and with other scholars in North Carolina.
The lecture series enhances the work of our Early Childhood Intervention and Literacy program, led by our William C Friday Distinguished Professor, Lynne Vernon-Feagans. So I want to tell you a little about Lynne. Lynne has a life-long interest in young children at risk for school failure. She began her career as a developmental psychologist and linguist, and used that background to understand the school and home languages of children as they related to literacy and school success. A particular interest of hers is children who live in poverty, children with learning and language disabilities, and children with hearing loss due to otitis media. Lynne’s teaching focuses on the ecological and contextual framework of learning with emphasis on proximal and distal processes affecting the child at home, in child care settings, at school, and in the community. On our School of Education website, Lynne has as her personal mantra: “No one has yet realized the wealth of sympathy, the kindness and generosity hidden in the soul of a child. The effort of any true education should be to unlock that treasure.” A quotation from Emma Goldman. As I mentioned, Lynne received her BA here at Chapel Hill in 1967, and her Ph.D. from Ann Arbor from the University of Michigan in Developmental Psychology and Linguistics later, and she did post-doctoral training here at the University of North Carolina in the Child Development Institute. Her research foci include rural children and families in poverty, the transition to school for struggling learners, language and literacy at home and at school, literacy interventions for Kindergarten and first grade. So I’m going to stop there, and turn things over to Lynne, I want to say personally that when I was contemplating taking this job, I paid particular attention to Lynne’s work, and I knew that this was somebody that I wanted to be affiliated with and I wanted to learn with. And it’s actually an honor to be the dean of the school that has such a person as one of our key faculty. Lynne…

Lynne Vernon-Feagans:

Well thank you Bill, that’s kind of embarrassing! Now I have to introduce the speaker, so thanks, and thanks so much for coming, given that he has another place he’s supposed to be at the same time. We have a candidate in for a chaired position and he’s supposed to be there as well as here, so I really appreciate you coming and of course we’re really excited to have Bill as our new dean because he has the same passion that I do and a lot of the people in the School of Ed do, which is really to be most concerned about the kids who are the most vulnerable in this country, and so we’re so excited to have him and as he said, it is unfortunate that he came at this time, but we’re very glad that the economic downturn happened after you accepted the position. And I’ll just echo, we’re just thrilled that Bill Friday’s name is associated with the lectureship and I think, as you all read in the paper, that he had a successful valve replacement and hopefully will be home and on his North Carolina People probably in the next week or so.

So, I get the honor of introducing my friend, Dr. Kathleen McCartney. We’re especially pleased to have her today, not only because I’ve been trying to get her down here for a number of years, and she finally came, and she has these connections with North Carolina that she alluded to, but I didn’t realize that her husband, of course is a teacher, and went to Greensboro College,
and graduated from Greensboro College and got his master’s at UNCG. I’m just sorry we didn’t get him to UNC Chapel Hill to get his Ph.D. Apparently, he went to South Carolina, unfortunately, but anyways, we are very pleased because of her topic, and I will say a little bit about that in a minute. Dr. McCartney is the Dean of the School of Education at Harvard, but she is also the Gerald S. Lesser Professor of Early Childhood Development. She’s had a very illustrious career that I have followed since she was very young, and she is much younger than I am, but we’ve been kind of friends and it’s just amazing, I think the diversity of topics that she’s investigated, including of course child care and child care quality. She received her doctorate at Yale, and she taught at the University of New Hampshire and Harvard twice, and I think maybe this is it; she’s going to stay at Harvard. She was one of the lead investigators on the NICHD multisite project of early care and education and that’s produced I think really our most important evidence to date on the effects on early, non-maternal care on children’s development. Although she’s known as someone who does basic research in early childhood, she has also contributed to the wider literature on child policy that has kind of reflected her interest in child care and also children at risk. In addition, she has skills that very few scholars in Early Childhood possess, in both behavior genetics, which I knew her at that time when she was a student of Sandra Scarr's, who is both a behavior geneticist and someone interested in child care. Of course we were all envious that Kathleen McCartney did her dissertation on child care, but unfortunately she had to live in Bermuda for a few years to finish that. She’s also a developmental methodologist and I think we might see some of the influence of behavior genetics and her developmental methodology expertise today. In fact, I remember a conversation I had with Robert Ploughman about ten years ago; he’s one of the most famous behavior geneticists I think in the world. At the time we were both at Penn State, and he was trying to see if Kathy would come to Penn State, and he told me, I remember this, he said, “She’s the smartest behavior geneticist in the country.” So, Kathy’s published very widely and in the best journals, and most recently, she co-authored an SRCD Monograph with Peg Burchinal, I think most of you know on “Best Practices on Quantitative Methods for Developmentalists.” I really think it’s great. I don’t know of any if you have used it, but I use it a lot, it’s great. So, with this diversity of perspectives and skills, we’re really excited to welcome her to UNC, and I think it’s especially; the title of her presentation is timely because with this economic downturn, you know the most vulnerable families in the country and in North Carolina are really facing challenges and trying to raise their child in this kind of context, so we’re very excited to hear what you have to say. The title of her talk is “The Effects of Environment on Children from Low Income Families,” so welcome!

Kathleen:

Well, I’d like to begin, Lynne, … not only for inviting me, but for that wonderful introduction, and I just want to say what an honor it is to be asked to deliver the Friday Lecture. So I’m just very thrilled to be here, I have a lot of friends in the audience, professionally and
personally and that makes it a special event for me too. Lynne earlier referred to the fact that my dissertation advisor is a woman named Sandra Scarr. For those of you who are as old as Lynne and me, you might remember when she was president of the SRCD, the Society for Research in Child Development. She gave a presidential address in Seattle that took that organization by storm. She said a lot of controversial things about the environment, and when the published her presidential address, they published it with several rebuttals. It’s the first time in the society’s history that it did that. So what did she say and why did it make everybody so crazy? Well, here’s a quote. She said, “Environments within the normal range are, of course, required for special normal development, but research in modern societies suggests that individual variations among children reared in those environments arise primarily from genetic variation and from individually experienced environment, not from objectively measured environments.” And if you were at the talk, and I know many of you were, you might remember she put up a picture of triplets from People Magazine, they were all expert tennis players as evidence of this point of view. How else could you produce three outstanding tennis players if they didn’t share genetic predisposition to do so, of course they shared a rearing environment, and she knew that, she was just having fun with the audience. So this thesis of hers, that environments are functionally equivalent, that’s one of the ways she talked about it; environments within the normal range are functionally equivalent, meaning they don’t matter, they shouldn’t produce individual differences in children. This is a question that really always interested me, so about a year ago, I started working on a paper with a student of mine named Dan Vary that would really address her thesis.

What I’m going to try to do in this paper, as well as today, is to bring together some disparate literature including the literature on child care that I’ve contributed to try to answer the question that she really posed in wondering whether the environment matters more for poor children, because that’s essentially what she was saying: it matters for poor children, it matters for children who are reared in adverse circumstances, but for everybody else it doesn’t. If you look through that SRCD paper and actually there were rebuttals and she got to reply to the replies, I’m using those texts as really the definitive statement on her thesis. She is basically saying that below some threshold there are insufficient opportunities for adequate, species, normal development to occur, below some threshold. But again she’s saying that threshold is really, really low, and if you read her paper, she attempts to define it, but I have to say she doesn’t really define it very well. She sometimes talks about extremely poor environments, whatever that means, or violent, abusive, neglectful environments, or children born at social disadvantage or children in the lowest income quartile, and that’s the closest she gets to talking about poverty. She gives us some idea, but for the most part, for Sandra Scarr, it was really an empirical question, she didn’t know exactly where that threshold was. She did invoke this figure, from the paper of Turkheimer and Gottesman. If you look at this paper, here’s the environment, okay? From really bad to really good, and you can see that the asymptote is here, right? So the environment for here really only matters way, way down here in terms of what kind of
phenotype. What really produces differences in phenotype for her are differences in genotype. So that’s why you see great variations on the phenotype from here to here as a function of differences in genotype. She’s evoking this paper from these two behavior geneticists to explain what she means, so I guess more simply, individual differences are a function of the environment when the environment is below the threshold, which here is set at a low point. But above the threshold, the rank order, among individuals is, for her, is one hundred percent determined by genetic variability.

Now, hers is not the only model of gene environment process, I’m going to call her model the functionally equivalent model, and I’ve already described that. Heritability should be smaller below some environmental threshold, but large and rather stable above it. There’s also a social selection model that’s been most closely identified with Herrnstein. He thinks heritability should be comparable across all environments; shouldn’t range as a function of environments. Then, partly in response to Scarr, but also on their own, Bronfenbrenner and Ceci were working on their own bioecological model. Interestingly enough, they think heritability should increase as the environment increases because the child is able to select and make the most of his or her genetic potential as environmental constraints are taken away. So in some respects, what Scarr was saying and what Bronfenbrenner and Ceci are saying are similar except that Bronfenbrenner and Ceci have a linear model, and Scarr has a quadratic model with a very early asymptote, so that’s what differentiates them. So now I’m just going to tell you right now that I have looked at the literature pretty carefully, and I don’t think there’s enough methodological sophistication that’s going to allow us to differentiate between the kinds of predictions that Scarr would make and Bronfenbrenner and Ceci, if you think about it, for the most part, in most of our papers, we’re testing linear models and not quadratic models, so I’m not really going to be able to differentiate between the two, but we’re going to try to get an idea of whether or not there is a threshold.

So the hypothesis that I’m really beginning with is poverty. I’m going to use poverty because I’m interested in poverty because it is an important policy question as this distal indicator of experience, to see whether or not it denotes a threshold, such that environments above the threshold support development while those below do not. If this is the case, then I argue that the environment should matter more for poor children or low-SES children. Again in our literature, sometimes income is added with things like occupational prestige to sort of get a larger indicator of experience. But one of the things I know you know but it bears repeating is that poverty or income itself is not an environment per se. Poverty is a very distal indicator of experience, and so the idea is that poverty is associated or not associated with experiences that the children have that support development. So I’m going to talk a little bit about what I think those less distal, more proximal experiences are, but mostly looking at a poverty threshold.

All right, I know quite a few of you here know quite a bit about poverty research and many of you are interested in it, but let’s be clear about how we’re going to define poverty.
Poverty researchers define poverty as equivalent to the minimum income required to support a family’s financial needs. Poverty was actually created as a scientific index in the 1960s to correspond, I think, with Johnson’s “War on Poverty.” At that time, poverty was defined as three times the USDA Thrifty Food Budget for a given family size. It has changed a little bit, but not too much. In 2006, the federal poverty line was $20,000 for a family of four. I have a daughter trying to live on $33,000 per year, and she is struggling, and I told her recently that the poverty threshold for a family of four was $20,000. So what this means with respect to a metric, is if you made exactly $20,000 and you were supporting a family of four, your income to needs quotient would be 1.0. If you made $60,000, then your income to need quotient would be 3 to 1, or 3:1. So 3 is about middle class, and there are lots of problems with this poverty definition. Most people think it’s way too stringent, and in fact, 200% of the poverty threshold is probably what is reasonable for what it really costs to support a family of four in our country with just basic needs, it’s probably much closer to $40,000 than to $20,000. So, we’ll think about that as we go along.

Just a few statistics about poverty: The 1990’s were actually a pretty good time for poor children, there was a historic decline in childhood poverty rates, in fact we had the lowest rates for black children in the 1990’s, but since then the number of children living in poverty has increased dramatically. You can see some of the statistics there; we now have almost 1 in 5 children living in poverty, and 39% of our children living in low income status. Poverty rates are especially high among young children under 6 compared with children over 6; that appears to be a developmental phenomenon. As children age, their parents probably get more job training and are probably better able to support their families.

Poverty around the world is just as problematic. Again just a few statistics: No one really knows how to define poverty around the world, because it is hard to define it with respect to money, but the proportion of children living in poverty, defined as where there is less than a dollar a day supporting them, has risen in developed countries since the 1990s. We have between 40 and 50 million children in some of the world’s wealthiest countries growing up in poverty. More than one billion of children in developing countries are growing up in poverty. In developing countries, we tend to look at things like is there adequate food, adequate drinking water, decent sanitation facilities, and so on. Okay, so let’s take a little bit of time to think about how it is that poverty does have an impact on childhood outcomes.

As I read the literature, there are really three potential pathways that income affects childhood development. The first has sometimes been called the family investment model, and what the really means is that money enables families to buy things for their children that are good for them—resources in the home, like toys and books, educational materials, trips to museums, library cards, those kinds of things, and that’s what is represented by the top arrow, resources in the home.
But we also know that income affects parent mental health such that the less you make, the more mental health problems that you have. This is sometimes called the family stress model. We know that parent mental health affects parenting, depression does, anxiety does, and so on. So when parents can’t provide adequate care giving, we also see effects not only on children’s mental health, but also in their cognitive development, because no one is really talking to them or paying attention to them.

More recently, I think a third model has emerged; Gary Evans and other people have talked about the fact that the physical conditions that children were raised in has an impact on their development too. Toxins, air quality, noise level, crowding, neighborhood crime, all of these things that are associated with poverty have a negative effect on childhood development. So that’s where we’re going to begin.

With a little bit of homage to Sandra Scarr and Tom Buchard, I’m going to put up this one slide. This is a slide from the Hart and Risley’s wonderful, wonderful ethnographic study that is really, I think, embraced in education circles that shows the relationship between class and children’s vocabulary. In fact, if you read their book, which I really enjoy, they can track the correlation between the language inputs to children and children’s vocabulary development. But the problem with this study, and the problem with much of the literature in child development actually still to this day, is that you have a genotype environment compound. If you just look at data like this, you really have no idea whether or not it’s due to a pure genetic effect, which I doubt, a pure environmental effect, which I also doubt, or some kind of gene environment process, which has always seemed the most likely explanation to me. So, are children from low-SES backgrounds less likely to evoke language experiences from their parents? That kind of thing. I mean the answer is probably yes. So I started thinking about what kind of data, outside of the family’s socialization data, I could use to test Sandra Scarr’s thesis. This is an outline really of the rest of… There are genetically informed studies of SES and child outcomes, and there are a host of intervention studies from the adoption literature, from the early childhood intervention literature that many of us in the room have contributed to and to some income change studies. So I’m going to limit myself to this kind of evidence as we try to think about whether the environment matters more for poor children. I think you probably know some of the literatures, but I think you haven’t thought about putting them together this way, especially the behavior genetics literature, which is really quite provocative.

There are some very early studies and Sandra Scarr did some of them that seem to find that heritability was lower; heritability estimates were lower for children of low income families. It might seem weird, how could heritability be lower for some children versus other children? And it’s because environmental components are larger. So, for example, Sandra Scarr did a study very early in her career, 1971, where she looked at 992 twin pairs who were in the Philadelphia schools, and she computed heritability coefficients the old fashioned way, the difference between the mz correlation and the dz correlation, basically those were the metrics they were using then.
The heritability was lower for black children from low-SES backgrounds compared with middle class black and white children. It was indeterminate for white low-SES children; she probably didn’t have enough of them. But for her black low-SES children the heritability coefficients were lower for them than for middle class black children and white children. Fischbein in 1980 found the same thing looking at 203 12-year old twin pairs, looking at verbal ability and inductive reasoning. We have lower heritability coefficients for families with lower occupational prestige. So the inverse is true for more affluent families. When you look within the samples, heritability is higher in the more affluent families.

Then along came Eric Turkheimer, who did just a fabulous, fabulous paper. Here they’re using existing data sets like the NCPP, there’s a Veterans Study, there’s an Ad Health Study. So here are four different studies in which they use structural equation modeling not only to get a component for heritability, but also to get components for the shared environment, which is denoted by C here, and the non-shared environment, denoted by E, heritability is denoted by A. That’s just how behavior geneticists refer to these three different components. So what they can do with these structural equation models is actually compute an interaction between an SES indicator, it might be poverty, it might be occupational status and these heritability coefficients. So the check mark just means that they have found it, so you know, I don’t have a completely filled in grid here, but beginning in 2003, I think this was the Psychological Science Paper, Turkheimer is reporting for performance IQ but not for verbal IQ. Interactions with SES, and I’m going to show you what they look like right here. Okay, so again, it takes a while to sort of get used to these figures, I’m just going to help you get oriented. This is the proportion of variance accounted for from zero to one hundred, this is SES on some indicator, it doesn’t matter what, it gets higher the further you move to the right. And this is what the figure looks like, so you can see it’s almost linear, it’s somewhat curvilinear but that as SES increases the heritability coefficient increases.

So heritability for rich kids is higher than heritability for poor kids, which is what Bronfenbrenner and Ceci said, it’s what Sandra Scarr said. So, now again, Sandra Scarr thought there was going to be, you know, more of an asymptote, less linear. So looking at these data seems to be more support for Bronfenbrenner and Ceci, but again I know that if Eric Turkheimer were, and I’ve asked him, he would say the data aren’t really up to the task of testing for a true quadratic, so think of them more as linear. So here’s the shared environment and here again, it decreases over the time, well it has to because A plus C plus E, if E includes error, is 100%. So these environmental components are decreasing over time as a function of SES.

But for poor kids, the non-shared and the shared environment matter a lot, which is good news for interventionists, and I’ll say a lot more about that later. So no real threshold, but if you look at these behavior genetics studies taken together, at the very least, we would all conclude that there is a trend indicated that variance components, heritability, the non-shared environment, the shared environment, that these variance components for cognitive and language outcomes
vary across levels of income or SES. So there is very little support for Herrnstein, right? He thought it should be flat, that’s wrong. You know, I think these data are consistent with what Sandra Scarr is saying, what Bronfenbrenner and Ceci are saying.

Okay, so how about the intervention studies? Well I think there are three types of intervention studies that we can really talk about. The first are adoption studies, then early childhood intervention studies, and then income change studies. So I’m going to start with adoption, which Sandra Scarr argued was the most massive intervention she could think of, right? Take a child from one family and place that child with another family. Now, my advisor was known for her controversial work well before her SRCD talk—some of you might remember her trans-racial adoption study. This was conducted by her and Rich Weinberg when she was at University of Minnesota, and they were able to identify 101 black and interracial children who were adopted by white parents. It’s an incomplete adoption study. We know the test scores of the children, we know the test scores of the parents, but we don’t actually know the test scores of the biological parents who gave their child up for adoption. So that seems to be a little bit of a problem, and also there seems to be a bit of selective placement in this study, such that children that came from more advantaged biological backgrounds probably got placed with parents of higher SES. That actually works against what she’s trying to do here. But like all of the studies I’m going to talk about today, this one is problematic. Every single study, including the ones that have my name on them, we can pick apart methodology, maybe not the Abecedarian study, which I will also talk about. That one’s pretty good.

Okay, so here’s just a little bit of data: because they didn’t have the IQ of the biological parents, they found another study that was done by Kaufman and Doppelt of African-American children from the same geographic area where they pulled these kids, and the IQ of these parents was 90. Now whether or not you want to accept this as a comparison group, I’ll leave it up to you, but the IQ of the African-American adopted children was equal to 106, and the IQ of the adoptive parents was 119. So the adopted children are somewhere between where we think their biological parents are and somewhere where we know their adoptive parents are. This study was published in Science, among other places, to just put it into context. I’m trying to remember when they published it, but some of these papers were in the seventies. I mean, there were still raging debates about whether or not there were heritable differences as a function of ethnicity and intelligence, and I think this study went a long way to proving that was unlikely. Instead if you read what Scarr had to say, if you rear children in the culture of these tests, they tend to do well on the tests. In fact it looks like the adoptive children are scoring one standard deviation higher than the comparison group, right? Because the difference between 106 and 90 is 16 IQ points; that’s a standard deviation, so that’s a big, big effect, and it might very well set an upper limit for the kind of change we should expect to find from a massive intervention. So, that’s one adoption study, but no middle class comparison group, so it shows that you can move children from low SES backgrounds, you can move the IQ, but again, I want to say you can move it more
than you can move middle class kids, this study doesn’t speak to that. This one speaks a little bit to it.

This is a study that was done in France by Capron and Duyme, I hope I’m pronouncing it right, published in 1989. They call it a cross-fostering adoption study. They were trying to fill four cells, they didn’t do an experiment or random assignment, but they were trying to look at children from high and low biological parents, whose biological children were placed with high and low SES adoptive parents, and what I’m interested in here, I mean there are lots of different ways you can look at these data, but what I’m interested in here is the difference between high SES families versus low SES families, and again, you see almost a 13 point difference in IQ, which suggests that the culture of the rearing environment makes a big difference with respect to how children perform on these standardized tests. Now another thing that’s interesting about this, with respect to Scarr’s thesis, is that before you adopt a child, you need to go through some pretty rigorous home studies, and that’s the same as in France. You would think that these adoptive parents, whether or not they are high or low-SES, are providing good enough environments, right? Nothing you would call abusive, nothing you would call below a threshold, and still you see differences as a function of these environment, at least as indexed by SES. So I think that these data show that if there is a threshold, it’s probably above a poverty threshold, because we’ve got a pretty big difference between high and low-SES parents, which must be good enough parents or they wouldn’t be allow to adopt children.

Okay, so that’s it for the adoption studies, although there are more that we can talk about. How about the early childhood intervention studies, let’s talk about them next. I’m not going to talk about them in any detail, because again, just like the adoption studies, mostly there aren’t middle class controls. So again, they don’t help me in my quest to figure out whether the environment matters more for children in poverty, but I think these data are important because they show us that environmental interventions work. So the Rand Group did a report that was published in 2005 that I think is a pretty nice synthesis of these data. I bet some of you in the audience were involved in the Abecedarian study, which it really is a wonderful experimental study. They were reviewing these kinds of experimental and very high quality quasi-experimental studies. There are about 20 of them, and you see significant effects for about two-thirds of them. The effects for cognitive outcomes range from very small to quite large. Point ten (.10) is a tenth of a standard deviation, .97 is almost a full standard deviation, which is a big, big effect. And they tried to determine what really figured out the size of the effect, it’s better trained teachers, smaller child to staff ratios, and more intensive programs, exactly the kinds of things that you would expect. There is one study among the 20, the Nurse Family Partnership Study, that did contain higher risk and less high risk families and they do find a treatment difference, a very big one, as a function of family risk. In a high risk sample, for every dollar they got back 5.7, so they did a cost-benefit analysis, and for the lower risk family for every dollar you invest you get back about 1.26, so that’s a factor of 5; the difference in the cost benefit
ratio. It really does suggest exactly what we’re talking about here; that the environment matters more for low income kids, and another way of saying that is that interventions are less effective for middle class kids than they are for kids at risk, so that’s another way of thinking about it.

Okay, well how about other studies that aren’t technically interventions, but the kind of studies that a number of people in this room, including me, have contributed to: What about child care studies? Well, the nice thing about child care studies is they often run the gamut from low-class to middle-class to even upper-class, and the bad thing about them is they’re non-experimental. Families get to choose what kind of child care arrangement they select for their child, and the goal of the researcher is to try to do something about that statistically, and there are lots of different things we can do, and I’ll talk more about that in a minute. What do those studies show, taken as a whole? Michael Lamb reviewed them for the last *Handbook of Child Psychology*, and I must say that I agree with his conclusion, although perhaps not all of us in this room would. He concluded that children from low income families benefit when they attend stimulating child care centers, while children from more advantaged backgrounds do not consistently profit from child care in this way. Now if he’s right, this is consistent again with Sandra Scarr and with Bronfenbrenner and Ceci. I was surprised when I read this conclusion in that *Handbook* chapter because there are many, many studies in the child care literature that look for treatment interaction with income or poverty status that failed to find them. But I think there are enough there that convinced Michael Lamb and me that there is a child care quality by income interaction, and to the extent that we don’t identify it, it probably has to do with the fact that it’s really hard to identify any kind of interaction when you have a non-experimental study, when you have continuous data. There’s a *Psych Bulletin* paper by McClelland and Judd that I’d be happy to give to any of you. I’ve used it in almost all my papers where I’ve failed to find treatment interactions; you need to have big, big sample sizes to find it and even then you tend not to always find them.

Okay, so let’s go back to this vexing question of the fact that children are non-randomly assigned to child care centers. What do we do about that? Well mostly, what child care researchers have done is to control statistically for a host of family background variables like income, like mother’s education, maybe even mother’s depression, the number of hours mothers work. You put all of these variables into a model and then you see whether or not differences in child care qualities predict outcomes above and beyond those family background variables. I think developmentalists used to think that was a pretty good way of going about it. There are economists who have been working really hard to convince us we’re wrong, and frankly, they’ve convinced me. So we’re going to have to get more sophisticated about the way that we approach our non-experimental studies. That’s one of the things that motivated Peg and me to do that monograph, to help developmentalists understand that there are some stronger methods that we can use, like maybe propensity score analysis—I’m not sure how much better I really think that is—or maybe fixed-effects analysis where we’re looking at differences in predictors and
differences in outcomes and whether or not they’re related that way. All of these are an effort to get rid of omitted variables bias, which by the way can involve genes too, and by that it’s really predispositions within the child.

So how do we get rid of omitted variables bias that might threaten the causal conclusions we want to make? In this case I want to say, I certainly want to say the child care quality makes a difference for the child outcomes, and to the extent that I can, I think there are really important policy implications that follow from that work. Okay, but for the purposes of this talk, is child care quality, does it have an effect for children from low income families? I’m going to talk about a few papers before I talk about my own. The first person that I know that identified this is Caughy using the NSLY data set. She published a paper, she and her colleagues in 1994, and they link years in child care and center-based experience, per se, as protective factors for low income children on reading, but not for middle class children. Katherine Magnuson did a really nice study using the ECLS in 2004, and she has pre-kindergarten effects for reading and math and she finds that they’re greater for children from disadvantaged groups as indexed by poverty status, low maternal education, single-partner status and non-English speaking mothers.

Bill Gormley did a beautiful study in Oklahoma, some of you probably know about this Oklahoma Pre-K study, they have universal Pre-K there and thing about universal Pre-K is there’s an age at which you qualify or don’t qualify. So if you look at the young kids who went into Pre-K and compare them with the kids who just missed, you have what’s called a regression discontinuity deadline. It’s one of the strongest methods we have for non-experimental data to assess causality. He’s got Pre-kindergarten effects for reading, spelling and math, and they’re larger for low income children. I put Suzanna Loeb’s 2007 study up here, she’s also using the ECLS, the same as Katherine Magnuson, and she fails to find effects of Preschool center effects on reading and math. She finds that they are equivalent across the income distribution. Isn’t it fascinating when you have people using the same data set find different things? Jay Belski and I both used the NLSY data set to model maternal employment effects many, many moons ago, he finds them, I don’t. It’s probably an experimenter effect in that case. I wouldn’t blame that on Katherine Magnuson and Suzanna Loeb, it has to do with what kinds of assumptions you make in the models, and some of these interactions are really pretty fragile.

So now I want to tell you about some of the work I’ve been doing using the NICHD data set. Martha Cox, who is in this room, is one of the principal investigators of this study as I am, and there are eight others of us. Peg Burchinal has been involved as the lead data analyst for about 15 years. I thought I’d just tell you a little bit about this study, in case you don’t know about it. In the 1980s child care researchers like me and Allison Clark Stewart and Jay Belski were arguing about whether or not infant day care disturbed the mother-child bond. We were arguing about it because there weren’t any really good data to answer the question, most of the data that existed were really pretty terrible. So NICHD put out a request for proposals and everyone who is a child care researcher sent one including Martha and me. They funded 10 of us,
it was kind of an arranged marriage, wasn’t it, Martha? In May of 1989 we met the investigators and the NICHD folks said to us, you could do 10 studies, or you could do one big study together, and they left the room and we chatted about it and we realized that we would have a lot more power if we combined our efforts. It was a tough decision though, we had each written these grant proposals, we knew exactly what study we wanted to do, so instead it was as if the grant proposals were essay contests, we more or less threw them away and redesigned the study from scratch.

So I’m going to kind of show you an overview here of our assessment protocol. (And I’m going to sit on this chair because I have a bad back, so please forgive me.) Each of these dots represents, except for the phone interviews, represent anywhere from 2 to 5 hours of observation time. When these children were 15 months of age, we were in their homes for about three hours, we went to their child care centers, or settings I should say, wherever they were, for two days actually and did our observations of child care quality, they came into the lab, we administered the strange situation to assess attachment, administered the Bailey scale for infant development. We thought we were designing a study through the first three years of life, and I think if we had known we were designing a study through age 15 years, I think we probably would have made some different decisions. But as it turns out, we wrote some provocative papers and we were successful in obtaining funding through age 15, but that funding ended last December, and some of the investigators are trying to get money to continue, many of us are interested in at least knowing did these kids graduate from high school, did they go on to college? So with a little bit of luck and some foundation support, I suspect we’ll be able to answer those questions, but it’s just a mammoth study and if there are any graduate students in the audience, I recommend that you go look at this data set to see if there are data that you can mine to ask a question that you’re interested in because there are extensive data, not only on the child care setting, but on the family setting.

All right, so I’m going to say just a little bit about how we measured quality because we needed to come up with a new way of measuring quality that would work just as well at grandmother’s house as in a day care center, and this is what we came up with. We developed these qualitative scales to measure constructs like: Does the care giver foster exploration? Is the care giver sensitive to the child’s distress? Is the care giver intrusive? and so on. We were in these child care settings, literally observing for 30 seconds and recording for 30 seconds other behaviors, and then at the end of 40 minutes, we made ratings using these qualitative scales. We did it about five times over the course of two days, not surprisingly, these made a very nice cluster and we were able to make a variable that I’ll just call total quality. In case you’re interested, we had a lot of spread on child care quality, we published very early on, just a descriptive paper and about 12% of the settings were what we would characterize very high quality, 32% somewhat characteristic, a full half we said quality was uncharacteristic and 6% of
places were just really dismal. So, good spread, I mean as a developmentalist you want to see variability on your predictor variable, and we certainly have it.

One of the first studies we published, we published as a network of investigators so no names on these papers. NICHD network is the author and we all contributed to them and I guess I’m going to show you a little bit about this. We did regression equations with controls for family background, but I remember that the reviewer of Child Development wanted to know specifically, as quality goes up, do test scores go up? And they do, so we’ve got these bars representing quality, this last blue bar is mother care, and you know, you can see mother care is kind of right in the middle and that’s what you would expect, right? Because just as care givers vary in the quality of stimulation they offer to children, so do mothers, so we’ve got a quality effect there. And then what I really wanted to know, we did in fact look to see whether or not there was an interaction with income. We didn’t find it but we entered that interaction with a block of interactions, and I didn’t like that, I was always worried that we didn’t have enough power to detect, you know, six interactions simultaneously. So as soon as the data became available to the public, it sounds kind of crazy but we were the public too, we were able to do some studies on our own.

I recruited a doctoral student of mine, Eric Dearing, who is now at Boston College, and a young economist named Beck Taylor to work with me on a study to see whether or not the effective quality mattered more for children in poverty. So as we started thinking about it, we said, well, how do we want to test this? We can test it continually, or we can look at poverty as a threshold, which is what we did. So we dummy coded, we had a series of dummy codes: Were you in high quality child care? (yes/no). Were you in low quality child care? (yes/no)., And the omitted groups were the children who didn’t have any child care experience per se, to speak of, at all. And that third group without child care experience is really important because, otherwise you can’t tell whether or not high quality child care buffers children from the negative effects of poverty, or whether or not poverty and low quality child care are bad for children.

So here’s what we find, and again I think I’ll lead you through this first table, I’m going to figure out, I’m going to show you a lot more like it. This is the income to needs threshold, this is school readiness, okay? And you see regression lines that represent the children who are in high quality care, that’s the blue one, low quality care, that’s the dotted green one, and no care, that’s the dotted red one. One of the first things you might notice is the kids in low quality care and no care the regression lines are quite similar. If you look at the regression line for the kids in high quality care, it’s not flat, but it’s close. What that means, if you just think about the kids in high quality care, their test scores are not that different than middle class kids who are right here at income to needs equal to three. So we get a statistical interaction even after controlling for a host of family background variables, and then, you know how doctoral students are so much smarter than you are? Well, Eric Dearing said I just found this obscure test to find out where the interaction is statistically significant, and so we used this obscure test to find the range of
reaction, and it’s here. So this interaction is significant between very low income to needs and income to needs at about two and a half, that’s where it’s significant. No differences among the three groups like at income to needs equal to four. In other words, if your family is sort of middle class or above, it doesn’t matter if you’re in high quality child care, low quality child care or no child care, for this variable. If you’re a child at the poverty line, which is right here, big difference, in fact we computed effect size, and the effect size, you know here is about .10 and here it’s about .40, so at the poverty threshold, the effect is about four times the size of where it is here. So you know, 4/10 of a standard deviation, you know, I’m getting excited when I get those.

I’m going to show you the same figure from the same paper, this one is receptive language at 36 months, the pattern looks familiar to you now right? Except the low income kids actually look a little bit better than the kids at home, at least at the poverty threshold that makes sense to me. If you’re in a low quality child care center or family day care center, people are still talking at you, you know you’re getting probably more verbal interaction than you are at home if you’re born into a family that’s in poverty. But it’s the same basic pattern and again, this regression line for the kids in high quality child care, almost flat, not completely, but we are leveling the playing field for poor children when we put them in high quality child care, and even low quality child care on come variable seems to make a difference. This is for expressive language, again the same exact pattern.

So, Eric Dearing goes to Boston College and says, “I want to do an upward extension of this.” By this time, I guess I’m the “Damned Dean” at Harvard with no time to do research, so I say, “Yeah, you go for it!” He does this wonderful study actually where he used multi-level growth monitoring to track, you know the older the kids get, the more longitudinal data you have. So we have longitudinal data on the Woodcock Johnson Achievement Test from 54 months through 5th grade, so he computes these beautiful growth models, he looks at linear change, he looks at quadratic change and he does this modeling a couple of different ways, regression with controls and propensity score analysis, and we get the same findings which is really, really nice. There are, I guess, six dependent variables we looked at, we looked at broad reading, we looked at broad math and then within broad reading we also looked at letter word identification and picture completion, for broad math, we looked at applied problems plus calculations and for four of those six dependent variables, we get the treatment interaction that we’re interested in quality by income. And what Eric did—I looked at average quality across the first three years of life for that first paper—what he did is he said, “Gee, you measured quality at 6, 15, 24, 36 and 54 months. How many times was the child in high quality child care, and we just defined it as greater than the median? So how many times?” A child could have a score from 0 to 5, and let me show you what we find. This paper is in press in Child Development. He gets a statistical interaction for broad reading, but there’s no reaction range so you don’t see any blue spread here. So with it sometimes you get statistical interactions but you can’t really interpret
them, this is one of them, so we’re not going to make anything about that. Here it is for broad math, so again, we’ve plotted it, you can plot it however you want it. We plotted it for kids who were in no episodes of higher quality child care, and for kids who were just in two, two of the five times they were in higher quality child care. So those are those two regression lines, here is the reaction range, this is our mean on income to needs, this is minus one standard deviation, plus one standard deviation. So you can see our sample is skewed a little bit toward the high income range and that’s something we’ve been criticized for fairly, but we still have enough low income kids to be able to detect this statistical interaction. We’ve got a nice effect here on broad math.

I’m going to show you the same thing for average applied problems, same exact interaction, kids who were in higher quality child care. We get a statistical difference here as a function of higher quality child care at the low income range but not at the high income range. That’s why it’s shaded down here, and one more, this is for applied letter word. (Excuse me, what was the age range where they happen to have two…?) This is preschool, but we are looking at effects that are actually averaged between third and fifth grade. (But the child care itself was first to three?) No, to 54 months, age four and a half, so it’s a pretty easy, that’s just how we graphed it, so if they had three, you’d see more of a difference, four. In this paper, we’re using preschool experience from 0 to 4 to predict how they’re doing in third and fifth grade, so that’s what were plotting here, is the mean of third and fifth grade, and we don’t find differences with age, so it seems to be, you know usually you seem washout effects, we’re not finding it here, it seems to be a pretty stable effect and I think that was counter-intuitive for us.

Okay, let me just tell you, I’m almost reaching my conclusion here. Let me tell you about these income change studies. I think these studies are fascinating. I’m going to tell you about three of them, one Eric Dearing, Beck Taylor and I did using the NICHD data set. This was published in *Child Development* in 2001. We looked to see whether or not a family’s income changed between one month and 16 months, you know, did they start making money, and if they did, was there an interaction such that for poor versus non-poor kids? In other words, does gaining a little bit of money matter more for poor kids than for non-poor kids? So this is not an experiment, but again we find that it does and I hope by now you’re getting used to seeing these tables that we like. So this is at 36 months, school readiness, okay this is for poor kids, flat line for non-poor kids. So what we’re seeing is a change in income really matters for poor kids with respect to school readiness tests. Now we’re assuming that they’re using the money to buy the kinds of things that make a difference and maybe they’re less stressed, and we’re not really looking at the mechanisms, we’re just finding that it matters, it also matters for receptive language. I mean look at this, for non-poor kids it’s flat, you know? If your parents aren’t poor and someone gets a raise of $5,000, it’s a great thing, but it probably isn’t going to translate into better test scores; for poor kids, it does, and it’s rather dramatic.
There’s a second study I want to talk to you about. This study is a wonderful study, it’s done by, let me see who, Dahl and Lochner, published in 2005. They used the NSLY data set, and what they did was a fixed effects analysis, where they look at change in income and relate it to change in test scores. They also have an instrument that they use, the earned income tax credit, so they’re using state of the art econometric methods to try to make a causal statement. And what they find is small reliable effects that a $1,000 increase in income raises math scores by 2.1% standard deviation and reading test scores by 3.6% standard deviation. They are small, but I am impressed by the fact that they were able to detect these differences.

The last income change story I want to tell you about was done right here in North Carolina, I think, by Costello and her colleagues. I don’t know if she’s here, but if she is, I want to meet her because I love this study. For those of you who don’t know about this study, there were a group of researchers studying rural children, 1,400 of them, and about a quarter of the sample was American Indian, the rest of them were predominately white. While they are doing this study, as luck would have it for them, a casino opens and suddenly these poor rural children are getting a $6,000 per family member income supplement. So it’s a quasi-experiment, it’s a beautiful quasi-experiment, now for some of the families. Now I’ve got three sets of bars there. Some of them were poor before the intervention and they were poor after the intervention, those are the persistently poor. Some of them were never poor, but then we have a group of children who were formerly poor and then moved out of poverty as a result of this income supplement. So, no difference here, poor is poor; no difference here, not being poor is not being poor; but when you see this change, look what happens to the kids’ total psychiatric symptoms, they dramatically drop. But look at this: they look very much like these kids who were never poor, almost complete recovery because their parents have enough money to support them. It’s just a fabulous, fabulous study and I think if you look at these papers together, I think we really are starting to see a different kind of intervention study on the distal variable.

Again, I’ve tended to do intervention studies that are more on the proximal classroom level, but if you look at these intervention studies together, this is what I would conclude: that those early cross-fostering adoption studies show a substantial impact of child rearing environment on children from low-SES biological families. The experimental intervention studies, like the Abecedarian study document the effectiveness of programs for low income children generally, although again we don’t know if there is a treatment interaction. The child care effects are larger for low income children I think, even though we certainly have many examples of studies that fail to replicate that. And these newer studies looking at increases in income show that increases in income are associated with better cognitive outcomes and fewer behavior problems, with big effects for low income children.

So just a few methodological caveats. You know I don’t think, as I said at the beginning of the talk, that any argument of poverty as a threshold can be made with any kind of precision of measurement. You know, some of these studies I’ve used, some use income, some have used
income to needs, some of them have used SES and the measures of SES that people have used have varied. I say this because I think we can only address Sandra Scarr’s claim in a very general sense. Most of the studies use linear modeling, and that limits us, we can’t really figure out to what extent Sandra Scarr was right about there being this quadratic function, and of course the non-random assignment intervention studies, including my own, suffer potentially by omitted variables bias, including genes. So if you want, we can talk about some of the methodological limitations of these studies, as I said, they all have them including mine. But I think the take-home message is: Does the environment matter more for children in poverty? I’ve tried to convince you this afternoon that the answer to that question is yes. Is poverty a threshold functionally equivalent environments? I think the answer to that is no, poverty appears to be too low to be called any kind of threshold and just to take you back through…