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Dr. Ziliak: This morning we begin with Session Six, the Health and Developmental Correlates of Child Food Insecurity from Pregnancy to Adolescence. Our moderator for sessions six and seven is Deborah Frank, who is the Founder and Principle Investigator of Children’s HealthWatch. Her research interest include examining cumulative risk factors in children's household such as food, energy, housing, security, and their impact on children’s health and development. She is currently the Director of the Grow Clinic for Children at the Boston Medical Center and is Professor of Child Health and Wellbeing at Boston University School of Medicine and without further ado, I turn this session over to Deborah.

DR. FRANK: Thank you. Unlike me, our presenters are so distinguished that they do not need extended introductions, which is good because they are not going to get one, we have not got the time, but their credentials are all in your hand-outs.

The first speaker will be Dr. Laraia, who will talk about food insecurity and child outcomes, followed by
Dr. Perez-Escamilla, who is going to talk about household food insecurity and child’s psycho emotional, social, and academic. Finally, by Dr. Jacknowitz, who is going to talk about further areas for research. When they are done, I will come galumphing up here and introduce the next lot, so thank you.

DR. LARAIA: Good morning, I am excited to be here today among all of my esteemed colleagues and I want to thank the National Academy of Sciences for working with USDA to put on this workshop. It has been really exciting. I want to acknowledge my co-authors on this presentation who are with me, Dr. Cindy Leung, who is a post doc at UCSF and UC Berkley and Mandy Murphy, who is in our graduate program.

What I want to do today is talk a little bit about food insecurity and the impact on pregnancy and childhood outcomes, mostly dietary and chronic disease outcomes. I want to start with pregnancy and we put this slide together using NHANES data, and we find that reflective of the general population, about nine percent of pregnant women in NHANES are marginally food insecure. I am very interested in this group as well as about 15 percent are food insecure. This is over an 11-year period.
Food insecurity in at least one study has been associated with low birth weight and this has major implications. Because low birth weight is associated with insulin-resistance and glucose intolerance later in life. So it is really setting the fetus up for possibly a trajectory to be more at risk for chronic disease later in life.

Food insecurity is, as we know, a chronic stress and this is an overview, a nice review article by Cal Halbo, who is down at UCLA. This is the hypothalamus pituitary adrenal axis, your chronic stress feedback system that has been very well characterized and in non-pregnant women the hypothalamus secretes corticotrophin releasing hormone that influences the pituitary. The pituitary secretes ACTH which acts on the adrenal glands and the kidneys and secretes cortisol, the stress response is launched and then in normal conditions it can cut off feedback and stop stress. But under chronic stress conditions, cortisol levels stay high. In pregnancy it’s altered, cortisol levels are high anyway, but under stress the pregnant woman – this cascade occurs and cortisol can act on the placenta and the placenta can launch its own stress attack releasing corticotrophin releasing hormone.
This pathway ends up being implicated in preterm birth and low birth weight.

So stress condition, which we believe food insecurity is a major stress. In animal models -- that is the way in which you do stress in animals -- you subject them to food restrictions and specifically food scarcity. I just wanted to point this out.

So here is my overarching framework that I think about that food insecurity really has a role in metabolic disturbances, specifically not just possibly weight gain, but the accumulation of visceral adiposity and insulin resistance, but we are seeing again and again is the strong interactions with these moderators that are really important. Moderators such as acculturation genetic factors, where someone is in the life course, but specifically pregnancy and very critical moments of development. So infancy, that first year of life during the adiposity rebound, which is between four and seven years, and pre-adolescence.

These are all periods where growth is occurring rapidly but also fat tissue is being laid down. There is a strong interaction we see again and again with stress and dietary restraint and then also the interaction with the food environment. These interactions, I think, are what we
should be focusing on as we move forward specifically looking at food insecurity in the life course framework. So we know that this visceral adiposity and insulin resistance can all lead to these other health outcomes such as early pubertal onset, diabetes, chronic conditions, and other complications.

This is a nice paper by Chris Olson, a few years ago, that looked at during pregnancy where the food insecurity was associated with significant weight gain. She actually found that food insecurity was not associated with developing obesity but it was the strong interaction between food insecurity, and entering pregnancy obese, that lead to significant weight gain at two years. So 4.55 kilograms, it is about 10 or 11 pounds, and the magnitude of association was really large.

I worked on the pregnancy infection and nutrition study for years, which is a perspective cohort study. We enrolled over 2,000 women and asked them a number of sociodemographic questions, household food insecurity, and a number of psychosocial factors, and we found that about eight percent of the women were marginally food secure and another five percent were food insecure. But focusing on this group of 400 percent of poverty or less, 15 percent
were marginally food secure and another 10 percent were food insecure.

As been born out in the literature, food insecurity we found was associated with higher scores of stress, anxiety, depression, locus of control given to chance, and locus of control given to powerful others, which are fatalistic constructs. This has also been found within Raphael’s group, with Hromi-Fiedler, among Puerto Rican women that food insecurity was strongly associated with depression. Not surprising, food insecurity is also associated with much lower scores of self-esteem and mastery. So women are set-up to gain significant weight possibly during pregnancy and also have possibly lower coping skills.

I am going to review again the stress response. I am not going to spend a lot of time but if anyone wants to ask me later. It has been really well documented that stress leads to either in about 40 percent of animals and humans, eating less, and another 40 percent will eat more. But in a food abundant environment, we have more people overeating. So the stress response and here we have this high-level cortisol being produced which also activates metabolism. All these hormones that are regulating metabolism so there is increase of insulin, increase of
leptin, and an increase of neuropeptide Y. These all regulate metabolism, regulate energy intake, but more importantly they regulate where energy is stored.

So eating under a stress condition actually metabolizes food differently and food and energy is shunted to visceral adiposity. We really see significant abdominal weight gain during stress conditions. We are hypothesizing that food insecurity is that kind of threat that can trigger this HPA axis, trigger hunger, and increase drive for feeding.

Going a little bit more into detail, under stress conditions we have this activation of the limbic system that I have talked about, so this is the HPA axis. What we usually rely on is the prefrontal cortex to oversee decision-making and reasoning. Under stress conditions, the limbic system is going to override that prefrontal cortex. It taps them to the reward system and influences the nucleus accumbens and to really help us reach for that cookie to help dampen the stress response because it is a pleasure. I think it is a benign pleasure if we are going to reach for the cookie instead of some other risky behavior that might be rewarding. So it is evolutionarily adaptive to be under stress and reach for more calories.
In addition to activating the stress pathway and the reward pathway, we also have the basal ganglia, the part of the brain that really is involved in habit formation and memory. So not only under stress do we reach for the cookie but we learn quickly and it is biologically driven that the next time we are under stress, even a much lower level of stress, we are going to reach for that cookie. As I have already mentioned, eating that cookie in the presence of stress is really going to drive the store of fat tissues and specifically in the central abdominal region. So food insecurity really has a pathway that can set people up for metabolic disturbances and chronic disease.

Continuing with this pregnancy study, we found that food insecurity was associated with greater weight gain, greater risk for gaining outside in the excess of the IOM guidelines for weight gain during pregnancy also much higher risk for developing gestational diabetes. Gestational diabetes again is another condition that leads to insulin resistance and glucose intolerance later in life. So with the fetus living in this environment of gestational diabetes is being set-up for developing chronic disease.
We found a strong interaction between food insecurity and dietary restraint. Here this measure of dietary restraint is about weight cycling and dieting so it is a measure that captures dietary restraint followed by disinhibited eating. So it is really a measure of failed past dieting. Women who scored low on dietary restraint, ate pretty well and were food secure, they gained significantly less weight than food insecure women and they were more likely to gain within the IOM guidelines. So it is not that they were gaining less weight and underweight, they were more likely to gain adequate weight. Whereas women who were food insecure and scored high on dietary restraint, these are kilograms, so they gained 10 or 11 pounds more than food secure women and they were more likely to gain in access of these IOM guidelines which again has great implications for the mother and the baby. The mother is then more likely to retain that weight gain and possibly go on to retain significant weight gain and then the baby is more likely to be set-up, for either being born large, or developing chronic diseases later.

We found that food insecurity in the postpartum period was associated with a significant increase in stress so the baseline level of stress was already clinically significant and during the postpartum period, they were
scoring seven points higher on Cohen's perceived stress. They scored higher on this Eating Attitudes test, which is a measure of eating behavior, and they ate 4 percent more calories from fat compared to their baseline intake. At 12 months, they retained almost a whole BMI unit higher. Again, like Chris Olson we found a significant interaction between baseline and pre-pregnancy BMI. So women who entered pregnancy overweight or obese and were food insecure, were more likely to retain significant weight at three months on the whole BMI Unit higher and at 12 months almost two BMI Units higher.

We really need to do something about this and actually I was not going to talk about this much but we have an NIH study that we are conducting a mindfulness based stress reduction, healthy eating, and physical activity intervention with obese pregnant women that are low income. I have peeked at the baseline data and I was surprised to see that of the 200 women that we have enrolled in the study the intervention or the controlled situation, almost all of them scored at least one question on food insecurity. Only one woman was not food insecure at all, so I found that a little shocking.

Anecdotally I am surprised at hearing the women's stories during our pilot intervention, eight women out of
23 had significant life events happened. Three lost their partners, one's apartment burned, one became homeless, and another one went to a party where there was a stabbing, so these women are living very stressful lives. I just wanted to throw that out because of what Mariana was talking about yesterday. We actually have no idea the stress that is going on in women's lives.

I am going to turn very quickly to child outcomes. I wanted to mention that food insecurity is consistently associated with anemia in childhood. I wanted to talk about food insecurity and diet. I laid out this hypothesis, under stress, it makes sense, and it is well described in animal and human literature that we are going to reach for that cookie. We are going to be really attracted to the highly palatable food. I do not think that this is really born out in the cross-sectional data that we have looked at. I think it is very consistent that food insecurity is associated with poor dietary intake but it is not consistent what the food is or what the nutrient is.

So what we have tried to do is look at the number of models that each of these papers ran, many are running age by gender models for different foods and nutrients which I think is fabulous because of the differences by age
and gender. But we have many models that are run between 8 to 20 percent of those models show a significant association and it is not always significant in the same way. It is not necessarily a decrease in food and vegetable intake or an increase in those highly palatable foods. So I think we could do a little bit more work in forming a priority hypotheses about how food insecurity is really associated with dietary intake and look at temporality as well. I think there is some challenges when we are asking about food insecurity over the past year for example NHANES but diet over the day before. So it would be nice to see food insecurity over the past year associated with dietary intake using maybe a food frequency questionnaire that is over that same time period or asking food insecurity over the past 30 days and asking about dietary intake the day before so that there is a little bit of concordance between those measures.

In the literature that looks at Hispanic children, I think they have done a great job. These are small samples, they are not representative samples, but they are mostly focused on whole food intake and not necessarily on nutrients and there is a little bit more consistency with food insecurity be associated with less meat, fruit and vegetable intake, and more possibly sweets,
and those highly palatable foods. Again, it is inconsistent but at least food insecurity is associated and when it is associated in the direction that we would hypothesize.

Just one example of food insecurity and dietary intake, this is a recent publication by Cunningham using the Oregon PRAMS data. It is a brief dietary questionnaire but they looked at several foods and found that food insecurity is associated with less fruit and vegetable intake but was not associated with cookies, candies, French fries, and fast food.

I think this can inform if we find some consistency in the data about should we be focusing on incentives or restrictions. This will lead us to believe that we should be focusing on incentives. We need families and toddlers to be consuming more fruits and vegetables. However, they also looked at drink intake and among the different beverages, fruit juice, water, milk, sports drinks, food insecurity was only associated with an increase likelihood of drinking soda on four to seven days of the week.

So this would lead us to believe that we need to do something about restricting possibly beverage intake.
It would be nice to have some more consistency in the literature to help us inform interventions in policies.

I am going to turn a little bit to this chronic disease pathway. There is this elegant protocol in the animal literature, this variable foraging protocol, that was developed in the early 90's. What psychologists wanted to do was create a situation to study attachment disorder so they created this paradigm where the bonnet macaque monkey, this great world monkey, was subjected to three conditions. Either adlib food or high foraging demands where the mother macaque had to forage for a food cart somewhere in their environment but there was plenty of calories and always could be found, or a third condition where it was variable. So for two weeks they got adlib food, followed by two weeks where the bonnet macaque monkey had to forage in her environment, and this was alternated for 16 weeks.

When the mother macaque was subjected to this when her baby was only weeks old, she had no stress response so the corticotropin releasing factor did not change, but when the baby was three to five months old, this is considered late variable foraging, the mother's corticotropin releasing factor went up so she had a stress response.
But at both time periods the infant's corticotropin releasing factor increased so there was a stress response. The bonnet macaque subjected to this variable foraging demand shows more aggressive behavior, antisocial behavior, and less attentiveness in grooming to the baby and the baby response to that. This study was followed by a study by Coffman, that looked at late infancy variable foraging demands and found that that was associated with at 4-year-olds, that is adolescence in bonnet macaque life course, increased weight, BMI, abdominal circumference. They conclude that our data suggests that early life stress during critical periods of neuro-development can result in the paramutable emergence of obesity and insulin resistance.

I think Ed Frongillo's, Sonya's group, have done a little bit of qualitative analysis looking at the response of children to their household food security situation. We know that children even if parents are trying to hide the stress, are responsive to that. At least this dynamic is occurring in households that are subjected to food insecurity, so children are stressed even though they might get enough food.

This is a nice study looking at food insecurity among homeless youth in Minnesota and looking at different
coping behaviors. As one would predict one of the most common coping behavior is eating those snacks like chips and candy and pop and overeating at mealtimes. If they are hungry, they will eat anything or they will find food somewhere else. So it is about overeating, eating what's highly palatable, and finding food. But what was a less common response was eating food that they did not like or going to a friend’s home.

So on the plane over, I picked up a Scientific American Mind edition. A nice study was just published recently, and reviewed, in this magazine about rational snacking. They take the old marshmallow paradigm that was developed in the late 60's or early 70's, where they really wanted to look at delayed gratification and self-control among 4-year-olds. So the child is given a marshmallow and said if you wait I will come back and give you another marshmallow and then they time and look at how long the child can wait for that second marshmallow.

Over the past 30, 40 years this cohort and then other investigators who have implemented this now classic paradigm, found that delayed gratification and self-control. That amount of time that they can wait is associated with higher confidence, higher academics, social and emotional scores, higher SAT scores, the decrease
likelihood of substance abuse. The poor delay
gratification and shorter amount of time is associated with
being at risk of overweight at 11. But what Celeste Kidd
was questioning is what determines delayed gratification?
Because initially in the 60's they were thinking it was a
personality trait, it was something possibly innate, and
she observed working in a homeless shelter, in food banks
in California that children were not going to wait for
food. She wanted to really tip this paradigm on its head
so she created the situation where the children were given
very poor art supplies and were told if you wait, I am
going to come back and give you better art supplies.

The children were randomized into two groups, an
unreliable situation, or a reliable. Children who were in
the reliable situation, she came right back and gave them
the better art supplies. When they were subjected to the
marshmallow test, they could wait much longer.

Children who were subjected to the unreliable
test, she came back and said, I'm sorry, I do not have any
better art supplies, and they were also subjected to a
second test and really shown that it was an unreliable
situation. When they were subjected to the marshmallow
paradigm, they waited on average three minutes compared to
12 minutes, and the study was stopped at 15 minutes so they
do not know how much longer some of the children in the reliable situation would have waited.

They also looked at the percentage of children who could wait the whole 15 minutes. Only one child in the unreliable paradigm waited the whole 15 minutes, whereas nine of 14 children waited the whole 15 minutes in the reliable group. We are learning that we learn as children and during these really critical periods eating behaviors are laid, it is not just about understanding how to eat but it is biologically driven.

I am going to skip over that – it says it is a nice review paper on the life course in obesity but I wanted to mention what is the evidence between food insecurity and child weight status? In the cross-sectional studies, we have basically concluded that there is no relationship. I think we really need to turn to longitudinal studies.

There are several longitudinal studies that are out. They have used the ECLS and other longitudinal data, and I think, I am not sure if this shows an inconsistent pattern, or if it is showing that when children are very young before 2-years-old, we are not seeing food insecurity associated with weight change. But when they move into that adiposity rebound period, the four to seven-year-old
period we start seeing some associations. Children subjected to food insecurity during infancy and the food insecurity persisted, it was associated with higher weight gain. The change between 1 1/2 and 4 1/2 here is a study that the change is only between fall and spring of kindergarten and there is no change. I think we need to look to the longitudinal studies to help tease some of this out.

I wanted to end on some studies that are looking at food insecurity in populations of children that already have chronic disease and it looks like food insecurity is associated within the cohort that is from Nova Scotia with poor diabetes management in childhood. Another small study that is a pilot study out of Texas looking at food insecurity and markers of HIV and HIV is associated with poor CD4 counts and increased viral suppression. So I think we are going to see more studies in seeing that food insecurity really has a role in chronic disease management and we need to pay attention to that.

In conclusion, I wanted to answer some of these questions. The first question is, is existing evidence sufficient to make causal claims? No, we really do not have evidence to make those causal claims. Many of the studies are cross-sectional. We have some inkling that
there might be a strong association. In the pregnancy studies, at least we have temporality but they are not necessarily population based. There is consistency with the story around anemia, with diet there is significance among some foods and nutrients and in the expected direction but there is really inconsistency as to what foods. There is inconsistency with weight gain and disease management. We really need to focus more attention on understanding causation.

Does how we measure food insecurity matter? I think it depends on the research question and I have already talked about temporality between food insecurity and diet. I think we need less studies funded using cross-sectional data and much more focus on the longitudinal but also taking advantage of linked administrative data. Big data is a big buzzword at Berkley and everyone is excited about super learner and really trying to apply non-parametric models to understand these interactions. So I think that is the wave of the future we will see.

I had some recommendation about what we might do but I think we really need to take a life course perspective and the earlier the better.

Speaker 2: Rafael Perez-Escamilla, Yale School of Public Health
DR. PEREZ-ESCAMILLA: I want to thank the National Academy of Sciences and James Ziliak for inviting me to be a member of the committee that planned and organized the scientific content of the workshop and for inviting me to be a member of this distinguished panel.

The conceptual framework for my brief presentation posits that household food insecurity mediates the relationship of poverty, livelihood strategies, and sub-optimal mental health among household members with maternal mental health and child psycho emotional and cognitive outcomes. The association between household food insecurity and poor maternal mental health and child development outcomes is in turn, mediated by nutrition and non-nutritional stress related pathways.

We recently conducted a systematic review that lead to the identification of 26 studies examining household food insecurity on child development outcomes. By design, all studies measured household food insecurity using an experience based scale such as the US household food security survey model. With only one exception, all studies adjusted for socioeconomic and demographic confounders. I will now briefly summarize the empirical evidence examining the association between household food insecurity and child development outcomes.
Cross-sectional studies conducted in the US have consistently documented direct associations between household food insecurity and child development outcomes including problem internalization and externalization and less ability to concentrate. This evidence indicates that the association has been detected starting very early on in childhood and subsequently during the preschool and school age periods. The analysis of enhanced data documents an association between household food insecurity and schoolers' hyperactivity, school absenteeism or tardiness, as well as optimal academic performance.

A third analysis of enhanced data documents an association between household food insecurity and suicidal thoughts and attempts among adolescents. Likewise, a three state study found that household food insecurity was associated sub-optimal psychosocial function. Of the five longitudinal studies only one was conducted outside the US that is the study by Belsky and colleagues from the UK. Analyses of ECLS data have found an association between household food insecurity exposure in infancy and sub-optimal maternal attachment and parental attention, then an association between household food insecurity exposure in kindergarten and sub-optimal social and academic development in third grade. The remaining three
longitudinal studies have found associations between exposure to household food insecurity at different ages after kindergarten, on child problem internalization and externalization as well as lower IQ, in the case of the UK study.

I will now move on to quickly summarize the maternal mental health evidence. Four cross-sectional studies have consistently documented associations between household food insecurity and maternal stress, anxiety, depression, as well as problem internalization and externalization. This has been confirmed by a longitudinal study conducted in rural areas in the US. An important question is if parental personality mediates our relationship between household food insecurity and child development outcomes.

Two longitudinal studies indeed support this possible mediation based on the maternal personality traits shown in the slide, openness to experience, conscientious, extraversion, agreeableness, and neuroticism.

To sum up, different bodies of literature provide strong support for different segments or pathways in the conceptual framework with which I started the presentation. However, very few attempted to actually test a model such as this one using path analysis that allow for the
identification of mediating factors based on sound conceptual models.

An exception is a study by Zaslow and colleagues based on ECLS birth cohort longitudinal data. By following the theory based mediation analysis approach they were able to discover that the relationship between exposure to household food insecurity at nine months, and insecure attachment at 24-months, was medicated by maternal depression and parenting practices. Similar findings were documented with regards to mental development at two years of age.

A major knowledge gap identified in our systematic review is the absence of mediation analysis studies via the dietary intake pathway of the framework. Decades of research have clearly documented the negative impact of malnutrition on child development. However, the vast majority of these studies have been conducted under conditions of protein calorie malnutrition and multiple micronutrient deficiencies and they were not based on experience-based household food insecurity measures.

Another important gap is that studies have not been designed to find out if there is a critical period of initial exposure to household food insecurity in terms of child development outcomes. The answer to this question
has major relevance for policy decisions regarding how to allocate food assistance and health reforms and how to design or improve existing programs across the life course.

Speaking about policy, an integration of findings from the literature clearly support the need to figure if and how parental mental health and child development remedial programs can be better linked with food assistance programs. Specifically should food assistance programs link better with parental mental health services? Should these programs link better also with child development remedial programs? On the other hand, should maternal child health care services screen routinely for household food insecurity and provide referrals for food assistance and child development evaluations?

At the end of the day, the proper development of children is what we are talking about, isn't it. Thank you very much.

**Discussant: Allison Jacknowitz, American University**

**DR. JACKNOWITZ:** I would like to start off by thanking the Steering Committee for inviting me to be part of this panel. As we just heard there is a large literature that investigates whether food insecurity influences children's wellbeing. I am not going to
summarize this literature but I want to talk about how we could move this literature forward.

Most of this literature focuses on food insecurity as measured as a binary variable. Does the child live in a household that experiences food insecurity or not? I would like to suggest in research questions, that moves the literature beyond this.

The two things that I am going to talk about are first, what are the gaps in knowledge with a focus on asking questions that move beyond this binary variable of food insecurity. I am going to talk about differential effects of food insecurity on children's wellbeing, the duration of food insecurity, transitions in and out of food insecurity, the pathways through which food insecurity influences children's wellbeing, and then causal relationships. The second question I am going to ask is could current data sources address some of these research gaps that I have identified?

The first gap that I want to talk about is the differential effects. Do the effects of food insecurity on children's wellbeing vary by some child or household characteristics? If you look at the literature, you see that gender is one of the characteristics that are studied a lot. Do we see that boys experience worse effects of
food insecurity, or do we see that girls experience worse effects? I would like to suggest pushing that forward and looking at some other variables.

The age of the child, is it likely that younger children experience worse effects of children's wellbeing than older children. The language spoken at home, so if the language spoken at home is not English does the child in that household experience worse effects of children's food insecurity because maybe the parents have a harder time maneuvering through the system. Also urban versus rural status, as we talked about yesterday there are pockets of social services and so that might vary by whether the household is in an urban or rural area.

These are just a couple of examples of ways that we might want to think about how the effects of food insecurity on children's wellbeing might vary.

Another question that I would like to propose is how the effects of food insecurity on children's wellbeing varies by the length of time that a child spends in food insecurity. For the most part, with a few exceptions of paper that I have with on Daphne Hernandez and the Zaslow article that was mentioned, people look at, were you in food insecurity, what were the effects, and not the length of time that children spent in food insecurity. I propose
that we start looking at are there cumulative effects, does duration matter? I think that we should address this question over multiple years which is what some of current studies do, so did you experience food insecurity for two years versus no years, or three years versus one year, look at that but also look at within the year time period as well. That might require some different types of food insecurity questions or using a 30-day measure.

One might hypothesize that there are cumulative effects of food insecurity so the longer a child experiences food insecurity the worse that effects might be. However, this paper that I have with Daphne Hernandez suggests that this might not be the case. Let me briefly talk about that, as I think it is pertinent to some other things that I am going to say.

In this paper we look at what is the influence of persistent and transitional food insecurity on the development of toddlers. We used the 9-month and to 2-year data from the early childhood longitudinal study birth cohort ECLS-B, and we code food insecurity into four categories. Did the child experience food insecurity in both the 9-month and 2-year wave, we call this persistent food insecurity. In just the 9-month wave, in just the 2-
year wave, we call this transitional food insecurity, and we code the fourth group as, never food insecure.

The outcomes that we look at are cognitive and motor development as measured by the Bayley scores, weight for age z-scores, and health status. Given the hypothesis that I mentioned on the previous slide, we would expect that if a child who resides in the household that is food insecure in both waves, you would have worse outcomes than the other categories.

However, what we find is that experiencing temporary food insecurity at 2-years is related to lower cognitive scores and health status. There are actually no negative effects of experiencing persistent food insecurity. That led us to posit that potentially those who experience persistent food insecurity have developed strong coping mechanisms such as the ones I talked about yesterday, to address the situation.

I am mentioning this because it is worth thinking about maybe it is not so obvious as I thought, that being in food insecurity was worse if you were in it for a longer time than maybe for a shorter time and that more studies are needed.

Another question that I would like to raise also related to the time of food insecurity is to think about
how do the effects of transitioning in and out of food insecurity, influence children's well-being. Not just how long the spell of food insecurity is but the number of spells that a child might experience.

As mentioned yesterday, food insecurity is a transitory concept that people tend to move in and out of. I wanted to show this slide from a project that I worked on with Taryn Morrissey, who is here today, that was funded by the Child Hunger Research Program. The question asked in this paper is how does the influence of changes of demographic characteristics or household factors influence changes or movements into an out of food insecurity? The key thing to remember about this is that our study, the unit of analysis is the transition.

What this slide shows is the percent of transitions that we look at that are movements into very low food security among children, into low or very low food security, and then out of very low, and out of low or very low food security. The red bars represent household level food insecurity. So anyone in the household is experiencing food insecurity and child level food insecurity which means that a child in the household is experiencing food insecurity.
What you see here is there are a sizable number of transitions that we see and these are specifically concentrated among those who are moving into low or very low or out of low or very low food security. Then you also see that the numbers of transitions are higher among the household level rather than the child level.

That is just to say that it is important to understand how this churning or movement in and out of food insecurity can influence children's well-being. Again, I suggest that we look at this not as just movements from one year to the next, but movements with any year. Again, I would hypothesize that constant food insecurity is worse than transitioning in and out but as the previous study of mine mentioned, maybe that is not the case and so another reason why further research is necessary.

Another gap in the literature that people have mentioned that I would like to highlight is that it is important to understand the pathway through which food insecurity influences children's outcomes. How is it? Is it if a child is living in a household experiencing food insecurity? Is it the child's outcome, whether it's academic or socio-emotional, is that influenced through maternal depression or maternal stress? It is important to understand this because we can think about policies that
target these pathways. I think someone mentioned yesterday that we should not just focus on policies that look at food but policies that address other issues.

It is important to understand these pathways and I would argue that these pathways vary by three things. One, who is experiencing the food insecurity in the households. Is it an adult? Is it a child? Is it the child that we are studying? This is a point that Craig has made a lot in his work is that often times we do not know whether the child in the study is directly experiencing food insecurity. Whether the age of the child, so is it a younger child or a school age child? Then the outcome of interest is it academic, is it a health outcome, et cetera.

The last question that I would like to bring up regarding the gap in knowledge and this is probably obvious to everyone but I felt compelled to mention it, is that for most of this literature we are not able to establish causal relationships. We do not know if there is either reverse causation or endogeneity that are biasing our facts. That is another gap that hopefully one day, we can fill.

Moving onto my next question is -- can these questions that I mentioned be addressed using existing data? When I think about food insecurity research and I think about children's wellbeing the four data sets that
come to mind are the two early childhood studies that ECLS-B and the K, where the B focuses on children from birth to kindergarten. The K focuses on children from kindergarten through eighth grade. Both of these are panel data sets and then also cross-sectional data. I think about the NHANES or the SIPP, and there are probably more that others think about, but when I was reviewing this literature these were the ones that popped up over and over again.

I would argue that the questions that I posed cannot be answered using these data. For the cross-sectional data, I think it is pretty obvious most of the questions I have talked about relate to time. But I would also argue that we cannot answer these questions well using the ECLS-B and ECLS-K. Since I have used the B for many studies, I thought I would explain why I think the B cannot be used to answer these questions well.

To provide some background, the ECLS-B is a nationally representative sample of approximately 10,700 children born in 2001. Data are collected when children are 9-months, 2-years, at preschool, and there is two kindergarten waves at 2006 and 2007. It includes the 18-item core food security module and there is a rich set of children's well-being measures that we might be interested
in; birth weight, weight in each wave, height or length, cognitive test scores, socio-emotional outcomes.

In the papers that I have done, I found the difficulties with the ECLS-B in answering some of the questions that I pose, that there is long intervals between waves. So because of that there is often missing information on key time periods. So because it goes from 9-months to 2-years to 4-years, and a lot of the questions, particularly those on food security ask about the previous year, we are missing information.

Also the timing of the food security question does not match outcomes of interest or possible mechanisms. So for example, maternal depression, if you use the maternal depression data from the ECLS-B it is not clear which came first, maternal depression or the food insecurity.

I mentioned that it would be interesting not to just look at food insecurity from year-to-year but within the year, and so the 30-day food insecurity questions are not in the ECLS-B and nor does it ask about past food insecurity experiences. It does not identify if the survey child is experiencing food insecurity so even though there is measure of food insecurity for the child or the child level food insecurity, we do not know if it is the survey
child or another child in the household that is experiencing the food insecurity. That makes it difficult to determine the effects of food insecurity on well-being. And also few children in this age group, which is a good thing, experienced very low food insecurity and even food insecurity among this age group. That is highlighted in this chart that I showed you in the transitions. I am talking about I cannot say the exact amount, but less than 50 kids so it makes it very hard to do statistical analysis.

If I were to put together a wish list of what data do we need, I would say more longitudinal data with more frequent data collection that follow children from birth, over a longer period of time, that allow us to better establish the timing of food insecurity and other events.

More questions that can capture the duration and transitions into or out of food insecurity. More questions similar to the Three City Study that provide information on which child experiences food insecurity. Then data sets with larger sample sizes, especially for infants and toddlers so we can have some statistical power. Thank you.
Session 7: Health and Developmental Correlates of Child Food Insecurity from Pregnancy to Adolescence Part 2
Moderator Deborah A. Frank, Boston University

DR. FRANK: I am going to make an editorial comment. As a clinician, which is the trouble is, at least from my perspective, if you identify food insecurity with this young child, you have to intervene. You have to make a referral but maybe that is not true for other kinds of research.

Our first speaker is Dr. John Cook who will talk about food insecurity in child health. Dr. Schanzenbach will comment on Dr. Cook's comment and Dr. Seligman will talk about food insecurity and cardiometabolic risk in adolescence. They are highly distinguished and I refer you to their bios.

Speaker: John Cook, Boston University

DR. COOK: Thank you Debbie. It is an honor to be here and I am grateful to all of you for setting the stage for this to happen and for the Academy and the USDA, for making this happen and for inviting me here.

I am going to talk about impacts of child food insecurity and hunger in a pretty general way. The good thing about being one of the last presenters is that there have been a lot of very interesting presentations that have
come before me, and the bad thing about being the last presenters is that there have been a lot of very interesting presentations that have come before me. I will necessarily repeat some things, and I think I am going to give a somewhat more general presentation because so much ground has already been covered.

I work with a group called Children's HealthWatch. We are a non-partisan pediatric research and policy center and we collect data on children under the age of four. We are especially interested in food insecurity, housing insecurity, and energy insecurity, and their effects on the family, and particularly on the child, their health, and development. We hope that we can provide policy makers with evidence to develop policies that protect young children's health and development.

Our interest in measuring and studying child food insecurity and hunger, and their causes and consequences, derives from an urgent sense of the need to treat and eliminate what we see as a totally unnecessary and imminently solvable threat to public health, to the public good, and to our future prosperity. Our priority is to do and encourage research that can inform and motivate policies that prevent, reduce, and eliminate child food insecurity and hunger and support child health.
Why are we interested in that early childhood period? The answer is obvious to all of you but just to review, the first three years of life are very vulnerable period for children. There is a lot going on in terms of cognitive development, brain development, especially within the first three years after birth. Centric pathways are being developed for hearing and vision, language, higher cognitive function also is being developed rapidly. This is a period where exposure to trauma but also exposure to chronic stress, can be very harmful to children's cognitive development and can also harm their trajectory toward success in life. It does that partly as Mariana covered, by affecting brain architecture, which includes systems and subsystems, but it also includes networks.

There are about a 100 billion cells in the brain we think, and they are interconnected or many of them are interconnected, in neural networks that store information and are involved in memory and learning in ways that we really do not fully understand. But we are gaining an understanding about how stress and trauma can affect that process and actually reduce in some cases dendritic arborization and reduce the complexity of the neural networks. That can in turn affect the trajectory of a child's cognitive development, academic school readiness,
academic achievement, and educational attainment, and determine where they fall as an adult on the chart like this.

Will they be chronically unemployed at really low income or will they be fully employed at livable wages or higher income? That has profound effects on us as a society and as a population, and the more children who end up on the lower left part of this chart, the lower our possibilities for our prosperous future become. It also determines where the child might end up on projections of child poverty like these. Then whether or not we repeatedly go through situations like the great recession that we went through, and almost four years later we still have recovered only about half the jobs that were lost during that recession. All of those things are affected very profoundly by the first three years of a child's life, and that in turn is affected very profoundly by food insecurity.

I was tasked with talking about issues of measurement, thresholds, food insecurity categories, use of the scales, child only items, and reduced scales as they relate to the impacts of childhood food insecurity and hunger on health, obesity, cognitive, academic, and emotional behavioral outcomes. They asked me to address
mechanisms, pathways of influence, including biological, psycho-emotional via caregivers, nutritional, and non-nutritional with reference to prenatal influences, and other windows of vulnerability, and almost all of that has been addressed. I do not have to do such a tremendous job in order for you to get some fuller understanding of it.

But basically, the scale itself was mandated by law in the National Nutrition Monitoring and Related Research Act and it was developed under the Food Security Measurement Project which was a multi objective activity. I stress that because it was not just a scientific activity. It was an activity that was sponsored and carried on under government oversight and with government interest in mind. We were charged with developing the best scientific measures of food insecurity, food security, and hunger and implicitly we understood those were to be consistent with the goals and policies of the US government. That was important because we were given a measurement framework by the government. We used it to develop those measures and it influenced to some extent the products.

About thresholds, the food security module and its associated scales were developed using item response theory (IRT), many of you are very familiar with those
techniques and use the IRT methods can also be used to score responses to the scale items based on each item's psychometric and statistical characteristics and the pattern of responses. IRT methods can guide and inform decisions about thresholds and categories but they cannot make those decisions. Those decisions where to set the thresholds have to be made by people and they require knowledge of the phenomenon or condition being measured and they involve a lot of human judgment. There was no mechanical process for deciding where the thresholds were set, but there was a lot of consideration and thought that went into it.

The categories themselves are constructs, they were not created by the IRT methods, they were created by people and they are based on human understanding and judgment of the condition. What that means is then, that the IRT methods can tell you a lot about the items in the scale, how they fit together, if there is space in the conceptual dimension that you are measuring that is not covered by the items in the scale. It can give you a lot of other information but it cannot tell you where to draw these horizontal lines. Those come from our understanding of food insecurity and hunger itself and they require judgment. I can tell you that deciding where to put the
heavy line with the double arrows was a very difficult decision, very contentious among the team and we may not have put it in the right place but we hope we did.

The scales, there are a handful, pocketful of scales, there is the 18 item scale you are all familiar with these but I will run through them quickly. You can use that scale in a 12-month or 30-day reference period, there is a six-sided abbreviated scale, the 10-item adult scale, and the one we are most interested in here, the 8-item child food security scale. There is also a self-administered version for kids 12 years and older and the Spanish translation. The scale has been translated into other languages by other researchers, and used in other parts of the world. All of that information is available on ERS website and I am sure we have used that information, it is a wonderful trove of treasure of information about the scale and about how to use it.

This is the household scale you are all familiar with that and then the child scale. The eight items in the child scale and there is one thing to note about the child scale, which Martin points out in the reports, is that it does not include a question about the affective component of food insecurity or the anxiety or worry that food would run out. It begins right away with low cost foods so it
starts right in talking about the quality of the food and then moves toward questions that indicate reduction in food intake.

The scoring the scales, you all know this as well, the four categories are determined by a discreet method which essentially on the basis of the number of questions affirmed in the scale. In the household scale you have high food security, marginal food security, low, and very low. For the adult scale similarly and then for the child scale we have higher marginal food security, low food security, and very low food security in children. This is just to show you where those cut-offs occur in terms of the questions in the scale itself.

What have we learned in the 15 years or so, since we developed the scale and the research that has been done on it? You have heard a lot of that already and I will refer you several reviews, very good reviews. Craig, and a colleague, produced one that was published in Applied Economic Perspectives. Mark reviewed a number of studies, in his report on Food Insecurity in Households with Children and Debbie and I have a review that was published in the Annals of New York Academy of Sciences. I also want to mention some newer reviews that were published from a symposium at the 2012 EB Meetings. Barbara did one of
them, Craig did one of them, and I did one of them. There was another in the symposium but it applied to adults. These reviews are all available and I am not going to try to summarize all of the research that they include.

In terms of pathways through which food insecurity influences child health and development we have heard a lot about that already. The many ways you could think about the pathways that are involved but probably the most simple and straightforward is nutritional and non-nutritional pathways. Some examples of the nutritional pathways are perinatal nutrition of the mother and the child and I include the internatal period. The period before reference to pregnancy the mother's nutrition in that period also influences the referenced child.

Brain and cognitive development in the child, there are very sensitive and vulnerable periods as I mentioned earlier in the first three years of a child's life and prenatally. There are periods in which if the proper level of nutrients are not available things that should happen, will not happen, or they will happen sub-optimally. They can be made up later on, under the right conditions but making that up later on is like pushing open a rusty steel door as opposed to pushing open a finely lubricated door on ball bearings. It is much more
difficult and much more expensive to make up those deficits later.

The growth impacts, there are still growth impacts of food insecurity and hunger in the US. The stunting, wasting, structural, and system anomalies, inconsistent anomalies, and we have heard about those obesity and oral health issues. We are just starting to learn how food insecurity is associated with oral health issues in both children and adults that needs a lot more study. It could also lead to compromise in immune system functions and put a child into what is referred to as an infection malnutrition cycle where the child gets sick with a compromised immune system. Then their nutrition is sub-optimal, takes them longer to recover, they recover at a lower rate of health and this cycle can repeat in a child's life and lead to very strong effects on their overall health.

Also energy deficits are relevant, they can lead to compromised body temperature and regulation, particularly with regard to the heat or eat phenomenon. Babies cannot shiver and raise their body temperature so they really need to be protected, they need optimal nutrition and it can lead to reduced environmental exploration and learning. Children who hunger are not that
attentive to their environment, they want to find food so they are not exploring and learning in the way that we want them to be.

Examples of the non-nutritional pathways include adverse impacts from the child and the mother's mental health. We have heard a lot about depression, depression is one of those key elements I think in this picture, which is hard to get a handle on both in terms of its manifestation but also in terms of policy. It is hard to conceive of policies that can address that issue with respect to food insecurity in an effective way. But it leads to very strong effects on the mother-child interactions and adult-child interaction which is one of the primary ways that children learn. That learning is critical for their development in early years. It impairs the responsiveness of both the mother and the child and interrupts the serve and return process of interaction.

Then we have heard about toxic stress, repetitive, persistent, or inescapable chronic stress, but also acute stress like child abuse, domestic violence, recurrent or persistent hunger. The question that has been raised here is are poverty and food insecurity a form of toxic stress? I think that is an open question that needs to be clarified. It also involves delays in or deterrence
of needed medical care, which over time can have a profound effect on the child's health and non-compliance with treatment. We found both of those occurring in food insecure families in hard data.

Of food insecurity’s impact on child health and development, you have probably already heard every study that I am going to mention talked about. I will go through them quickly anyway. There is a study by Borders et al in 2007, which found food insecurity positively associated with low birthweight births. Barbara's work on psychosocial factors and socioeconomic indicators, they found food insecurity positively associated with psychosocial indicators a perceived stress, trained anxiety, depression symptoms in pregnant women. There were indications of a dose response relationship with greater effects in more severe levels of food insecurity.

A number of studies have been done on breastfeeding. Zubieta found food insecurity negatively associated with both initiation and continuation of breastfeeding, if it was initiated.

I want to back in history a bit. There are two scales which provided input and components for the 18-item scale which provided a great deal of research before this scale was officially sanctioned and we began to use it.
That was work by Cathy Radamer and Ed and Chris Olson at Cornell, and the work of Cheryl Wehler and her colleagues on the Community Childhood Hunger Identification Project. Those scales provided some of the earliest and most important information about relationships between food insecurity and especially hunger, and child health. Lucia Kaiser and her group did a study on food insecurity and nutritional outcomes of preschool age Mexican American children and they used data from the Radamer scale. They found that limited education, lack of English proficiency, low income, and they were all negative correlated with food security and controlling for acculturation. Children in severely food insecure households were less likely to meet the food guide pyramid guidelines. The percent of overweight tended to peak among children from households with household level food insecurity, but she did not find specific significant differences with weight and height in the children.

We did a study at Children's HealthWatch, it was one of the earlier studies that we did in which we just looked at the association between food insecurity and health and a centennial sample of young children. We found to not anyone's surprise that food insecurity is positively associated with fair to poor health in the health status
question. Also with hospitalizations, there was a dose response relationship with the severity of food insecurity and likelihood of fair to poor health. We also found that receiving food stamps attenuated the effects of food insecurity on health status but did not eliminate them.

Pat Casey from our group did a study looking at maternal depression. He found that maternal depressive symptoms possibly associated with household food insecurity, fair to poor child health, and child hospitalizations, and positively associated with reductions or loss of welfare and food stamps benefits. Maureen Black, who is here, led a study on WIC participation and infants, and using our data and she found that infants under the age of 12 that did not receive WIC benefits because of access problems were more likely to be underweight, short, and perceived as having fair to poor health than were WIC recipients. Both infants receiving WIC and those eligible but not receiving WIC benefits because of access problems were more likely to be food insecure than infant whose caregivers perceived no need for WIC. Ann Skalicky using some of our earlier data, the C-SNAP data, looked at iron deficiency anemia and related it to child food insecurity and she found child food insecurity positively associated with iron deficiency
anemia in children six to 36-months but not associated with iron deficiency absent anemia. Nicole Knott did another breastfeeding study on children of immigrant mothers and found that families of US born breastfed infants of immigrant mothers had greater odds of being food secure than those of non-breastfed infants of immigrant mothers. Breastfed infants had lower odds of having fair to poor health versus excellent to good, of having a chronic health condition, and having been previously been hospitalized than non-breastfed infants of immigrant mothers.

Then turning to early childhood Whitaker et. al. used the food security scale in looking at risk of depression and anxiety. We have heard about this study already but I think it is an important one. They found significant behavioral problems, aggressive, anxious, depressed, inattention, hyperactivity, in the mothers but also in the child similar statistically significant associations. Recently Ruth Rose Jacobs at Children's HealthWatch looked at associations between food insecurity and at risk child development problems using the PREDs scale, Parent Reported Pediatric Development Symptoms. She found that food insecurity is positively associated with parental reports of developmental issues on the PREDs after controlling for confounders.
Back in history again these studies have been mentioned but again they are important because they use a scale that was specifically designed to identify hunger. You may question whether or not it actually did that but Ron Kleinman and his group used the CHIP scale to look at hunger in children in the United States with focus on behavioral and emotional correlates. Children who were categorized as hungry by the CHIP scale were more likely to have clinical levels of psychosocial disfunction on the pediatric checklist than either at risk or non-hungry children. The analysis of individual checklist items found that most behavioral, emotional, academic problems were more prevalent in hungry children. That aggression anxiety had the strongest degree of association with hunger.

Michael Murphy and Kleinman and others used the same data from the same scale to look at relationships between hunger and psychosocial functioning in low-income children and they also found significant associations. Then also from that group using the same data Weinreb looked at hunger, its impacts on children's health and mental health. Severe hunger was a statistically significant predictor of chronic illness among both preschool age and school age children was statistically significantly associated with internalizing behavior.
problems whereas moderate hunger was statistically significantly predicted. A predictor of health conditions in preschool aged children, severe hunger was also associated with higher reported anxiety depression among school age children. Then there are these three important studies that Katherine Alaimo did with the NHANES data and the USDA food sufficiency question, those provided a lot of very important information for our earlier work on associating food insecurity measured by the food insecurity scales with child health. Those three studies I am not going to discuss them specifically but they are very important earlier work.

This study has been I think one of the most influential and important yet using the food security scale data and it has been discussed here at some length already. It was important because it used longitudinal data and it was able to show a prior and subsequent relationship between food insecurity and some adverse outcomes. It also looked at both learning and health outcomes so I think that study probably is one of the models that we can look at. I am not going to read off the details but now I want to talk about four studies, one of which has been mentioned here already that, address a dimension of child health and also a dimension of the scale that has not had a lot of
attention. That is how can we understand children's experience of food insecurity?

Connell and colleagues in 2005 in a study in Mississippi found that children ages 11 to 16 described food insecurity in terms of quantity -- that is eating less than usual or eating fast when food is available. Also quality, having only a few low cost foods. They expressed it as in affective states or reports of affective states, worry, anxiety, or sadness about the family's food situation and shame and fear of being labeled poor. Feelings of having no choice about what they had to eat also they expressed an understanding of adults trying to shield children from food insecurity. They described food insecurity in terms of social dynamics of using social networks to get food or being socially excluded. That study indicates that children have their own understanding of food insecurity. They do not exist in the family separate from the parents and the parents understanding of food insecurity and its effects on them. They have their own experience of it.

Then the study that has been mentioned, Fran and Ed Frangillo and others in South Carolina found that children 9 to 16 years experienced food insecurity distinct from parents experience and reported the condition and have
cognitive, emotional, and physical awareness of food insecurity themselves. They also report that adults are not always aware of children's experience of food insecurity. There are two other studies along these same lines, one by Bernal that looked at children in Miranda state in Venezuela with very similar outcomes and then another by Fairbrother and colleagues in UK which had some interesting outcomes. Children incorporate a lot of media information in their expressions about food insecurity and about eating healthily. The bold item there I think is important. These children nine to 10-years-old prioritized state and corporate responsibility in insuring that eating healthily is affordable.

So we have these scales and we have cut points, levels of threshold, and levels of severity. Most of our studies at Children's HealthWatch use the dichotomous household food insecurity indicator and we found it very highly predictive of a number of child health and development outcomes. I do want to say that we are currently engaged in a study funded by the University of Kentucky Center for Poverty Research and USDA to test how mothers foreign born status together with risk and protective factors are related to very low food security in children. We have some preliminary results that we will be
presenting at experimental biology meetings at the end of this month.

Now 1.4 percent of the children in the Children's HealthWatch data have very low food security compared to 1.1 percent in the CPS data. Barbara and others talked about marginal food security. In my review of marginal food security I will just say that the studies that I reviewed found that marginal food security was very highly correlated with a lot of the same health outcomes that food insecurity is related to. Erin Haggar in our Baltimore site used that information to develop a two-item food security scale to be used in clinical context. She found that in examining the validity and reliability of that two-item scale, she found that endorsing question one only had sensitivity 93 percent and specificity 85 percent. Then the other question kind of reversed and then endorsing them both had sensitivity of only 78 percent so we decided to use endorsing question one and/or two that gave sensitivity of 97 percent and specificity of 83 percent.

I want to pose a question that I would like to include in the research, which is there are 6.8 million households of very low food security in the US and that 16.9 million people live in those households, 4.8 million, which are children. But there are only 845,000 children
measured as having very low food security in children. I want to know what is going on with those other 4 million children in households where the adults are experiencing very low food security or identified as such but not the children. What is their experience of this issue?

My time is up and I think that is probably a good a place as any to stop. Thank you very much.

**Discussant: Diane Whitmore Schanzenbach,**

**Northwestern University**

**DR. SCHANZENBACH:** I am a food security researcher. I study food stamps, school meals, things like that mostly. As Craig mentioned yesterday this is one of my first forays into really measuring particularly child food security.

I wanted to just start out by making a pitch about how important the food stamp program is especially today. In our post-welfare reform era food stamp programs are currently the largest cash or near cash anti-poverty program in the United States. The numbers are 1 out or 7, 1 out of every 6.5 people are receiving food stamps. It is the only US universal safety net program that there is. People are eligible based only on economic need and not some sort of other categorical eligibility.
I am going to show you a little bit about how the food stamp program has really done the bulk of the work in mediating the great recession damage. The new supplementary poverty measure shows that the food stamp program raises about 5 million people out of poverty. This is a very important program. So just let me show you how the landscape for providing assistance to low income families with children has changed since 1980. The top line is the cash welfare and as we know cash welfare has really bottomed out over the last 20 or so years. It is a very small amount of spending. On the other hand we have seen rises in the blue line here is the food stamp program and the black line is the Earned Income Tax Credit. So we have really moved from a system of cash assistance to one that is worked-based and then this in-kind transfer of the food stamp program.

One other piece of background and that is showing us how much the food stamp program has become the fundamental safety net program compared to TANF. What you have over here is the relationship between the change in the unemployment rate at the state level and the change in the food stamp program caseload during the great recession. You can see as a safety net program is supposed to do; food stamps have really increased in places that have seen the
deepest recession. On the other hand this is what the TANF caseload looks like in the same time period. This is not a counter cyclical program anymore so food stamps is doing the bulk of the work.

That has really changed over time so over here is the great recession and this is the same type of picture in the early 1980's recession. You can see that food stamps were much less responsive at that time. So today when we think of the safety net we really want to think about the importance of the food stamp program.

I wanted to transition to highlight two of my papers that fit well into this research session right now. I have been working along with Hilary Hoynes and sometimes with Doug Almond. We are looking at the introduction of the food stamp program that happened on a county-by-county basis over a long period of time between 1961 and 1975. In the food security business we have a lot of trouble teasing out cause and effect because there is just not a lot of variation. This has been a federal program, it has been a federal program for a long time but when we go back to these early days when it was originally rolled out we can do things like compare counties that receive the program earlier compared to who received it later. I only have 15 minutes so I am not going to go into the gory details of
how exactly we identified those and how exactly we kicked the tires. But suffice is to say since I have been working on the series of papers for the last seven years we have done a lot of that and things are extremely robust.

The picture over here, the darker shaded counties came onboard to the food stamp program later in time, the lighter shaded counties came on earlier. So that is the variation that we used and do not forget what we are looking at in this whole series of papers is sort of thinking about the experiment where food stamps were given where they did not use to be. So this shifts out the budget constraint. Our first paper here was published a few years ago in the Review of Economics and Statistics where we looked to see whether if the mom was treated with food stamps if the baby was born healthier.

In this case the mom is treated during pregnancy if the food stamp program is introduced in her county while she is pregnant. We bring to this vital statistics from the US from the full census of births and we do things, event study models, difference, and different types of approaches. Here is what we find.

We find that the availability of food stamps in the county in the 1960's and 70's increases birthweight and reduces the incidences of low birthweight. We also find
the effects of this are concentrated at the bottom end of the birthweight distribution. So what this graph shows and it is one of many graphs in the paper is that there is a 2 percent decline in the number of births born under 1500 grams. And essentially a zero percent change of births born under 4,000 grams, so all of the action seems to be coming at the bottom of the distribution.

This sort of led us to realize that food stamps have an important and quantifiable effects on health outcomes. This paper on infant health is a contemporaneous health effect but we thought the people were young children when food stamps were introduced are now 40 and 50. So we would like to know if whether this access to the safety net in utero and during early life can lead to longer term impacts in adulthood.

We have two guiding theories the one made popular by Heckman, which is that investment during early childhood leads to higher returns later in life. Our prediction here would be that having access to the safety net, food stamps are going to improve the acquisition of human capital during childhood because you are going to go to school and you are not going to be starving anymore and so you are going to be able to concentrate.
The second on health outcomes there is a large fetal origins literature that teases this out and what a summary of that very extensive literature is that we would expect better early life health to improve adult health outcomes. In particular we should see potentially overall health and also reduced obesity and we can talk more about that and Rudy's metabolic syndrome.

We also tied to a larger literature which looks at early life shocks that happen but all that literature to date has been based on extreme, horrible negative shocks like war and famine and the flu pandemic. On the other hand we want to know how generalizable is this to public policy. What we have here instead is a positive shock it is sort of moderate in size, it is not the same thing as war or famine. It is about a 10, 15 percent increase in the resources available. I think one of the things that is exciting about this is we are one of the first to look at the long-term impacts of a positive and policy driven change in resources which is the provision of food stamp benefits.

We can also tease that a little bit about when the treatment matters. Some people were treated in early life, some in utero, some later on in life and we can do some teasing out of that. In the paper we used variation
in the exposure during your childhood to the food stamp program in your county of birth. Note that fortunately so far we have not taken away the food stamp program so once it turns on it is always on. We used the Panel Study of Income Dynamics, which gives us data on economic outcomes and also health outcomes. Note that we do not have direct measures of food insecurity and one of the important pathways goes from more resources to better nutrition to these outcomes.

Following the current literature because we do not have that much data in the PSID, we take our various outcomes and we combine them into two different indices and this has been very popular in literature recently. Our first is a metabolic syndrome index, which comprises whether a person in adulthood is obese, has high blood pressure, has diabetes, has had a heart attack, or heart disease. The second is an economic self-sufficiency index, which measures whether you graduated from high school, whether you are currently employed, whether you are not poor, not on TANF, not on food stamps, what your earnings are, and your family income.

Here is what we find. I am going to show you the results for children who grew up in families with low head education although I can refer you to the paper for the
rest of it. In a model that is pretty saturated with fixed effects and all sorts of other characteristics although those do not make much of a difference because of our identification. What we find is change from no exposure to the food stamp program in early life to what we call full exposure here from in utero through age five, reduces the incidence of metabolic syndrome by 0.3 standard deviations in adulthood. This is highly statistically significant and important.

You can see the component pieces here. Only obesity itself individually reaches statistical significance but you can see that everything goes the right way. Then once we aggregate it together into this index we get enough precision that we have the statistical power to determine this. We can also look at other health outcomes like if you were reported to be in good health or whether you were disabled. The only one that individually comes in statistically significant is the reduction in stunting -- which is the height is less than the fifth percentile -- but again everything else goes through the right direction indicating that better health in early life leads to better health in adulthood.

A little bit on the economic self-sufficiency index. What we find is access to food stamps leads to
statistically not significant but 0.2 standard deviations and so that is an important magnitude increase in economic self-sufficiency. You can see the component pieces across here, high school graduation or higher is the one that comes in statistically significant. Something else that I think is very interesting from the literature's perspective is the point estimates on adult welfare receipt are all negative which indicates that access to the safety net during childhood, actually reduces dependency on the safety net in adulthood. Which is opposite of the correlational research that is out there.

Something puzzling that we find and this if found in a lot of other studies as well as strikingly heterogeneous effects across men and women. What we still see is a strong statistically significant positive impact of early life access to the safety net on economic self-sufficiency only among women and not among men and that is sufficient here. This is the paper it is currently being peer reviewed but it is available and is going to be our working paper.

What we find is this exiguous shock to resources during early life improves adult health and for women improves economic outcomes and this is consistent with our predictions. This is new evidence considering the
important role of this program and importantly it is a positive and policy driven shock. I did not get a chance to talk about it but we can investigate the timing. What we find is the impacts on health really load on to the early life from zero to age five and the impacts on human capital actually span across the whole period of time. I think that makes sense because again if we think the part of the mechanism is you go to school and you are not starving, you can concentrate, that makes sense.

Importantly we argue that this shows that the benefits of the safety net are broader than we previously thought. There are positive external benefits to taxpayers and if we fail to account for these positive externalities in terms of reduced welfare use later in life, better health, et cetera, we are going to under invest in provision of the safety net. Another way to say that is SNAP is an investment in children it is not simply charity. I think that is important to keep in mind.

My overview recommendations I do want to caution the money spenders or the drivers here against focusing us too narrowly. There is a broader literature about shocks that happen in low income families that I think gives us important insights even though those have not been directly tied to food insecurity. But I think the broader way to
think about how low income families cope with different shocks the better we are going to be.

I know we are going to talk about measurement soon but this is important especially under reporting of benefits and the fact that the measurement of food insecurity is so vastly different in the PSID, in the CPS, and ECLS-K. I think that is the first order of question that this room has to get to the bottom of very quickly. I would also encourage us to remember to keep at least one half of an eye on policy relevance of this research. I do not need everybody to do program evaluation but we need some broad agreement that we have to keep an eye on policy. I would put forward the Department of Education's Institute for Education Sciences Initiative during the Bush Administration actually as an important case study of how they have used federal stick or the carrot, I am not sure which it is to improve research in that area. I would say an important piece of this is the funding of graduate students. Thanks.

**Discussant: Hilary Seligman, UC San Francisco**

**DR. SELIGMAN:** So thanks very much for inviting me to be here. I think that there was a little bit of concern that we would give inadequate emphasis to the
adolescents and their health outcomes and so I have been charged with covering the adolescent period. I am going to try to give you a summary of the adolescent period in terms of cardiometabolic risk factors, which I will define later on. A lot of this has already been said so I will run through it quite quickly and then give you my vision for where we really need to go in understanding food insecurity and health outcomes among adolescents but among adults as well. Because I think, the important thing here might be less the adolescents and more the transition from adolescence to adulthood.

As a brief review, these are the hypotheses around the relationship between food insecurity and obesity. I do not think any one of these is right. I think they all probably have some component of rightness to them and in the end is going to end up being something very complicated. But I think this has a lot of relevance for how we think about the transition from adolescence to adulthood visa vie food insecurity. First of all, there is the nutritional outcome of food affordability particularly that healthy foods cost more calorie per calorie, changes in dietary intake, and of course we all know that the easiest way to conceptualize the increase risk of obesity.
There is also these disordered eating practices, the food hording, the bingeing when food is available, these preferences for calorically dense foods, which we see in adults, and we will talk a little bit about that transition to adulthood. The stress pathways have been discussed very eloquently by Barbara and others today. The inflammatory mediators I think are particularly important here and to me as a physician and this really focuses on what is happening physiologically when you are under a lot of stress. Again, we are talking about food insecurity being a major stressor during that adolescent period.

Then finally something that we have talked only a little bit about today and that is how the pregnant mother may transmit this risk to the next generation by making the baby avid for nutrients. Baby wants to suck up nutrients if they expect that they are going to be born into an environment that is a famine environment and whether we predisposed children later on in life to obesity risk just because of the environment they experienced in utero. I think this is hugely important particularly because we all know that your risk of transmitting poverty to the next generation is even stronger than your risk of transmitting any of these other diseases that I am going talk about
today. It is hard to get out of poverty in the US and I think that is what is driving a lot of this.

A lot of the studies that I am going to show in the next couple of slides looked at all different age groups and I am going to pull out just the adolescents so that I focus on the charge that I was given for these 15 minutes. On adjusted associations between Body Mass Index and food insecurity among boys and girls in the adolescent age period you see here. This mimics quite closely, what you see among women that the BMI is the highest in this marginal food security category echoing what John and Barbara said about really needing to focus on this area.

This is statistically significant again, an unadjusted association for this family of comparisons. The unassociated association in this study also NHANES data 12 to 17-year-olds, the odds of having a BMI in these overweight categories, BMI 25 to 30 was about 45 percent higher if you were in a highly insecure family. This did not reach statistical significance for the obese category of BMI greater than 30.

Here is a summary of pulling out again that adolescent category, cross-sectional data all from NHANES, all using a little bit of a different methodology but for the most part you can pretty much consistently that there
is no relationship between food insecurity and Body Mass Index in the adolescent time period. With the exception of this one paper using NHANES data and one of the things about many of these papers that I think makes problematic is not limiting to a low-income cohort. So it is difficult for me to know what to do with this. I will say that NHANES is nice because you have measured height and weight. So you have a measured BMI but there is problems here it is cross-sectional.

These are the only data I know using NHANES for this outcome and then these are the other cross-sectional studies that have been done in adolescence and again the take home message here is no difference in weight status of adolescents who are food insecure versus food secure. As we said before the lack of longitudinal data is a big problem and the lack of measurement of the child's food security status rather than the household's food security status is a problem. We have talked about that before.

What I conclude from this is that food insecurity and obesity may be associated with each other. We see this in the unadjusted models but that probably food insecurity is a risk factor for something else in the adolescent period that is increasing obesity risk. Which is not to say that this is unimportant at all, but I think at some
point we have to say we are not seeing this association in adolescence. That may be poverty in general, it may be stress, it may be eating behaviors, it may be one of many, many things but probably the relationship at least in cross-sectional studies just does not exist. Then the question is are we looking at the wrong problem and I am going to argue that this is the wrong problem at least and so far as long term outcomes in adults goes.

So if there is a food insecurity obesity relationship and again I do not think there is but if you are really attached to that then we need mechanisms and we need longitudinal studies looking from childhood to adolescence. That is really the question but I do not think that this is really the salient issue. The reason is because obesity, diabetes, high blood pressure, high cholesterol, and metabolic syndrome do not generally develop over the course of a week or a month or a year. They develop over decades and our failure to see them in adolescence does not mean that they are not there we just potentially are not detecting that substrate early enough.

The question really is, is food insecurity during adolescence or even childhood or even in utero associated with cardiometabolic risk factors when you are 40, 50, 60-years-old. That I think is the really important question
for us to understand and it is important not only because we have the nutritional outcomes associated with food insecurity that could drive some of these cardiometabolic diseases but also because of these coping strategies are laid down in childhood. It may be the coping strategies that are leading to these adverse health outcomes over time and it could be the eating patterns that are established during childhood that are resulting in these cardiometabolic diseases many decades later.

I just liked this quote from a Christine Olson article because it really hits this home. “I have this phobia about food and remembering that experience of having no food, now I constantly have to have food in the house, we start getting low and I start freaking.” This brings up a bunch of different points. First of all, this mom's eating patterns were established when she was a kid and she was food insecure. Also that she has all kinds of different coping strategies implicit here that might be increasing her risk of chronic disease today. So even if her food insecurity when she was a two- or four-year-old had no impact on her risk of diabetes today, the way she is responding now probably does have an impact.

I am going to step outside what I was asked to do and give you a review of food insecurity in adult
cardiometabolic risk factors because again I think this is relevant. We know food insecurities, at least mild food insecurity is consistently associated with obesity among women. Among women and men we see associations with diabetes, high blood pressure, metabolic syndrome, probably not high cholesterol although there have been a number of torturous articles that find sub stratifications of cholesterol that are associated with food insecurity.

Very importantly and I think this gets very much too little research is the association between food insecurity and tobacco. Because of course, tobacco takes up a lot of your disposable income but even more importantly is when people tell me I smoke because it makes me not hungry. I do not have food in the house and so therefore, I smoke a cigarette instead. Very important as a risk factor for poor health outcomes obviously.

Now as a physician, I have to tell you that these diseases for the most part do not matter. Truthfully, they do not because they do not cause symptoms, the problem is that they increase your risk of these diseases. They increase your risk of disability, they increase your out-of-pocket health care expenditures, which puts additional stress on your food budget, and they cause heart attacks and strokes. Heart attacks and strokes make people
miserable, they make people unemployed, and they make people die earlier. These we care about and these intermediate outcomes put you at high risk of these.

Then I am going to add here among adults that we do increasingly have studies showing that food insecurity increases your risk of inflammatory markers and these inflammatory markers are important because they increase your risk of many of these diseases. But also if they increased during childhood we see that they may have sustained impact on your future development of cardiometabolic disease.

No data on most of these in adolescence but again I think it is silly to look because people do not for the most part this is changing but in 2013, there is not a lot of high blood pressure and diabetes in the 12 to 17-year-old group. It is rising at epidemic proportions but there is not a lot of it. What does exist? This data again 12 to 17-year-olds NHANES data looked at the components of the metabolic syndrome and of all the components of the metabolic syndrome of which there are many. The only difference in anthropomorphic measurements was in waist circumference in the marginal food insecurity group. I think this is interesting just because again this pattern mimics what we see in adults but no differences in these
other components of the metabolic syndrome or in meeting three or more criteria for the metabolic syndrome.

In this very recent article that came out in AJPH looking at food insecurity and C-reactive proteins -- C-reactive protein is an inflammatory marker which is associated with elevated risk of developing cardiovascular disease over time. We like it because we can look at it now and predict what your cardiovascular risk may be 20 or 30 years from now. Or at least that is what the promise is. We would like to believe that is really true. No association between food insecurity and CRP among adolescents although we do see it in kids.

Here is the research gap from my perspective. What are the long-term health implications of childhood food insecurity? To do that we need longitudinal studies but from my perspective to get this data the longitudinal studies need to start in adolescence or maybe younger, but they need to cover that transition from adolescence to adulthood. That really is the important thing for me and the primary focus has to be on understanding the health implications of food insecurity. I do not think that you can do this with existing longitudinal data and I will get to that on the next slide as to why that is.
What we need I think to make this a reality is we need repeated measures of food insecurity, as many people have talked about in this room over the last 36 hours. But we also need a good way to quantify the dose of food insecurity over time and we need to have a better understanding of what it is about food insecurity over time that confers the greatest risk. Is it the most profound depth of food insecurity that you experienced during your life and is that a single very severe episode of food insecurity enough to change your coping strategies and your eating behaviors? There is some evidence from the VA and from Veterans who have a single food insecurity experience during active service, that this may be enough to change eating behaviors and that is important to know. Or do we need to concentrate on the total duration of food insecurity as other people have talked about.

The reason I think a lot of this is not possible without dedicated studies is that we need robust measurement of health data and robust measurement of all those issues relevant to food insecurity that we do not have in existing studies. The health measures do a terrible job of measuring economic variables and the economic studies do a terrible job of measuring health, they are worthless.
What do we need?  We need health data that is not self-reported.  We need blood and I am sorry to say it but we do need it in order to understand this, urine, and blood pressure, and bone mineral density tests, which we can do.  We have the expertise to do this, it is simple to do, we just have to dedicate the time and resources.  We could do it just with the heads in this room.  Then if you want to get all fancy we could talk even about looking at telomeres which is the cap on the end of the chromosome that keeps yourselves young and makes you healthy into your 80's and 90's.  Which those of us in the middle and upper class tend to keep on our chromosomes and those of us in the lower class tend to lose. The question is why. How does this result in early mortality?

Finally, we need measurement of issues relevant to food insecurity because this is a highly confounded area. You have to make sure that you are measuring these things well or it does not make sense to go to all the effort to get the blood, and the urine, and all those other things. You guys know all of this because we have talked about all the economics of this yesterday. I will stop there.

DR. FRANK: We now have some time for discussion which could go on during the break and I'm told to be very
severe about watching the clock and everybody is probably exhausted anyway but please come up to the microphone and identify yourself if you would like to discuss.

CRAIG GUNDERSEN: This actually is for the previous so I apologize. I want to somewhat disagree with one of the things that you said, Barbara. The first thing is that I wanted to say at least that you could have used cross-sectional data to establish causality and in economics we would throw away a lot of what we do work on if we got rid of that. Conversely is even if you had longitudinal data you may or not be establishing causality so I would not dismiss the possibility that we could look at a lot of causal issues using cross-sectional data. I do not think we have fully exhausted some of the methods that we can use in things like this.

I mean longitudinal data definitely gives us some advantages in Diane's work. Clearly, it illustrates how you can do more stuff if you have cross-sectional variation and a variation over time. But so I wanted to emphasize that as the first point. Saying that though longitudinal data is great it is always wonderful to have that.

The second point not unrelated to the first point is that one of the things that we really have to think about what about food insecurity matters. Food insecurity
is a whole constellation of other things that are going on in these households. I think that figuring out ways that we can figure out what the effect of food insecurity is isolating that impact as opposed to all the other constellation is really an important thing in terms of these causal stories, which we can do with cross-sectional data.

DR. SELIGMAN: With regard to the cross-sectional data, I do not think that we can really get causality thinking about food insecurities influence in a life course framework. There is a baseline issue. When is time zero when we are seeing some cross-sectional relationships we really do not know what came first. I think it is just really challenging to tease out especially the health effects of food insecurity using cross-sectional data. I do not think that we are going to get a causality using cross-sectional data with regard to health.

RONETTE BRIEFEL: Ronette Briefel with Mathematical Policy Research. Thank you all very much for two interesting sessions. My comment relates more to measurement issue and I think the somewhat blurring of household level versus individual level measures. The 18-item tool is great, 20 years ago, we did not have that but the purpose was to have a good population based measurement
that could be measured and tracked over time. It is now widely used but it is being used in ways that I think are inappropriate when we are trying to link to individual level health and nutrition outcome data. I would put a lot of emphasis on for future research on not only the longitudinal studies but also really looking at the exposure variable in terms of severity and duration. Even for studies that are using the 30-day measure right now, we really do not have a good indication of the experience in the past and how well a 30-day measure tracks serially.

I think that I would just put a plea for all of us doing food security research to clearly think about the conceptual framework and the choice of variable and then articulate that better in research articles. Because I see a lot of blurring that really, a household level indicator is being used. But it is being talked about as if it is an individual level specific variable and it is not.

The question that I would have is are you aware of good studies that have coupled the 18-item household scale with very good individual level measures? Is the research that looks at serial measurement, 30-day measures over time and whether folks who have accommodated the situation respond differently to that first 30-day measure or not?
DR. SELIGMAN: The one thing that I will say, I think that your points are very well taken and I think they are very important. To me if you are living in a household that is food insecure you are at risk of being food insecure is very high whether the individual in that household is food insecure or not. The degree that this measurement and I agree with what you said, but I think we can take this too far and spend too much time worrying about this because invariably if you are in a food insecure household you are at high risk. I think that is probably good enough particularly when we know that the children in the household are probably being under reported in terms of their food insecurity status.

MS. BRIEFEL: I definitely agree with that but if you are doing an intervention study or a small study where you really want to compare across subgroups, we need to go a little bit further than the classification scheme that we currently use. I think try to identify and anchor or qualify the household level measure in terms of the global experience of the household. I am just kind of pushing us to think a little bit beyond the four categories that we are using.
DR. FRANK: The technical problem with young children is that they cannot tell you. They show you physiologically but they cannot tell you.

DR. COOK: There is one way that we could move in that direction which would be to have at least periodically a census of the households to ask about all the people in the households instead of just the household. We could do that with the child scale very easily. It would be a little more expensive I think but we are interviewing the adult in the household, why not just ask about all the people in the household?

DR. WEILL: Hilary's quote from Chris Olson of the women that kept food in the house reminded me of the significant number of people I knew growing up during the depression who kept food in the house 20, 30, 40 years later. It raises the question whether people in the current depression are going to be changing their long-term coping strategies and whether we are measuring that. Also whether the programs particularly SNAP are softening the need to adopt coping strategies that are dysfunctional in the long term. If you have the robust longitudinal study of adolescents that you are hoping for, whether we can measure whether our interventions are making coping
strategies less needed. Are they by producing long-term positive outcomes that way as well.

DR. RIBAR: Other countries routinely collect information from all members of the household including sensitive measures on hardships, many of the countries that contribute data to the European Community Household Panel, the Australian data also. There is a methodology where they go in and they talk to everybody that we would consider to be CPS adult so everybody that is 15 and over, they talk to them every single year, they collect incredible sensitive data. The difference between there and here, they pay for their data collection. They actually make data collection an effort rather than just phoning up one person's report on the entire household. It is not that expensive to collect it and again other countries do this routinely.

DR. FRONGILLO: A couple of seemingly random points in my mind. First of all Diane, the work you described is beautiful and one of the points you made is really worth highlighting which is that you found the effects in the lowest part of the distribution. I think that the more we look at that the more we realize that very often it is the people who are most disadvantaged that are the ones that are responsive to intervention. Another
point that I wanted to make is about the cross-sectional longitudinal data. As I observe how people use longitudinal data most of the time the major gain they are getting from using longitudinal data is by eliminating unmeasured confounders not because they are really taping the chronology of it and therefore getting causality that way.

I agree with Craig that sometimes cross-sectional data can really be helpful and I wanted to highlight a paper that Raphael and his colleagues published recently in a Brazilian Public Health Journal. That showed that if you look at different points in the life course you see a different picture, an expanded picture of how food insecurity is related to obesity. That is cross-sectional data but when you put a story together in the right way you can really infer what is going on.

The other point that I wanted to make and Barbara I liked your paper but one thing I just wanted to point out is there are other measures we have to be concerned about too. BMI in children is particularly a problem because it really does not get at fatness at all. For example, you referenced the adiposity rebound at age six, or seven, or so. In fact, it has now been shown that conclusively that
there is no adiposity rebound, it is a lean mass rebound. But BMI cannot pick up the difference.

DR. SELIGMAN: I agree with you. The one thing that I am concerned about here is using cross-sectional data to ask people what their food insecurity experiences were in childhood. Because I think there is so much bias here around the way that your family coped with that food insecurity experience that I do not like asking adults whether they were food insecure as a child and using that to determine health outcomes. From that perspective, I think the longitudinal data is critical.

DR. SHORE-SHEPPARD: Lara Shore-Sheppard, Williams College. I wanted to reiterate something that Hilary touched on briefly but I think it actually applies to the first panel that we saw this morning. It has to do with cross-sectional versus longitudinal data. It seems to me that neither one will do a really good job if you do not really measure what you are interested in. What I worry about especially from hearing a lot of the first panel sort of summary of existing literature is that we really do not know is it food insecurity, or is it the thing that was triggering food insecurity, or some kind of a shock. We are not doing a very good job of actually measuring of what it is that is causing the problem and that matters for
policy. I think Diane's focus on policy was really well taken because if you want to think of it, what is the best way to target. If you are thinking about it, is food insecurity, and we know it is food insecurity that suggests the whole set of policies but if it is economic insecurity or some other kind of family issue then giving food stamps is maybe not the best approach to that particular thing. So if you want to think about the accurate targeting of policy to problem so just saying we observed food insecurity but we observed lots of other things too. I think we need to do a lot better job in our data and this is where we think about experimentation as a potential solution to this.

DR. HIRSCHMAN: Jay Hirshman, USDA. Great presentations thank you folks it is great to be here. I think it is helpful to focus in on the measurement question because we have all used the 18-item question or different variations of it. But it really stems from work long ago by Betty Peterkin to work on food sufficiency on a simple question for the NFCF building on work that went on by the Cornell folks, some of whom are in the room here today. The CHIPS work that went on that Cheryl Wehler did back then. But it was in an era of trying to come up with a way to measure hunger in some way yes or no. We have evolved
to the point now where it seems that we also need the concept of the existence of it or whether 30-days versus 12-months has been brought up, and duration. But the frequency of bouts of having this occur if you plot it out over time is critical and one of the measurement challenges I think that is before us is can we come up for cross-sectional surveys with the way of asking retrospectively over some period of time. For example, the past year as to how often has that occurred and can it be validated in some way simply so it can be asked and then fed into the research process. Is anybody working on that kind of thing do you know?

DR. COOK: No, I do not - sorry.

DR. FRANK: On that note let’s end and go get some coffee and take a break and thank you very much.

**Session 8: Measurement and Surveillance of Child Food Insecurity and Hunger, Moderator Judith Bartfeld, University of Wisconsin**

DR. BARTFELD: So I am going to just briefly introduce our larger than average panel so I do not take their time. Our main reference speaker is Ed Frangillo, Professor and Chair of the Department of Health Promotion Education and Behavior at the Arnold School of Health at the University of South Carolina. His areas of interest
include growth, development, and feeding of infants and young children, family stress and parenting, measurement and consequences of food insecurity for children, adults, elders, and people living with HIV, policy and programs from improving nutrition and development.

Following Ed we will have Mark Nord who I am sure does not need a lot of introduction from me serving as discussant. We all know Mark and I am very grateful for him. We then have Dr. Liz Adams, Assistant Professor in the Department of Public Health and Preventative Medicine at Oregon Health and Science University. Her current research applies epidemiology and the life course framework to study nutrition and health outcomes of children with special health needs particularly as related to determined ends that impact the food insecurity. We have a final discussant Maureen Black, Professor of the Department of Pediatrics and Department of Epidemiology and Public Health at University of Maryland Baltimore. Without further ado, I am going to turn it over to the panel.

Speaker: Ed Frongillo, University of South Carolina

DR. FRONGILLO: Good morning. This session is about measurement and surveillance. I have changed my title here to say assessment and surveillance, you will see
why shortly. This was developed with Eliza Fishbein, who
is here, and Maria Fram.

Here is an outline of what I am going to try to
do that I am going to go over what the aim was whether it
was the charge. Then we are going to talk a little bit
about the conceptualization of food insecurity and hunger,
the conceptualization of assessment and measurement itself.
Talk very briefly about the current assessment method and
then the assessment system and point out some issues there
and some questions there. Then talk about the direct
assessment in children and what we have learned about that
and then end with some thoughts about how we can improve
assessment of child food insecurity and hunger.

This was the aim, the first bullet to address
what we know about the adequacy of the current assessment
approach in terms of both conceptualization and
implementation. There is a series of questions there that
I will try to address but in the preparatory call someone
expressed that really the question is how should research
funds be invested that are available and should those be
directed towards enhancing the current surveillance system?
Or and/or is there a need to augment that with some other
system or systems?
Let me start with the conceptualization of food security itself. The basic definition is there in the first bullet but in the Life Sciences Research office report that started all of this, the conceptual thinking about all of this, it goes on to say includes at a minimum ready availability of foods, nutritionally adequate and safe foods, assured ability to acquire foods, social separation. There is a lot of things going on in that definition and a lot of different aspects that go into that.

Also in that report was this figure that shows primarily a nutritional pathway that was being thought about for food insecurity as it relates to poor outcomes. That is not a surprise because this emerged out of the need to try to develop the National Nutrition Monitoring System. In the way that this was approached from the beginning there was a prioritization of mothers' perspectives because mothers were thought to be the food decision makers and primary actors in acquiring and managing food. Also and as it has been confirmed they are more likely to be food insecure especially if they are a single mother. Most of what we think we know about child food insecurity is based on reports from others.
Two issues I want to highlight in particular are the food insecurity as a household issue involving a managed process which came directly out of Kathy Radamer’s qualitative work. Also the idea that parents sacrifice and try to buffer their children against the effects of suffering in general and food insecurity in particular. Radamer’s work and Andre Hamlin did a beautiful paper in Social Science and Medicine from her work in Quebec. Established the basic way we might think about the experiences of food insecurity and I am going to show some tables that came from the confirmation of work that we did with elders and published in 2003.

We can think of four domains of food insecurity. One is quantitative which ranges in severity from least to most in terms of food depletion, low food stocks but adequate calories, having to eat less food than usual, and then more severe in going without food. A qualitative domain also can be thought about in terms of range of severity from having to buy any less preferred foods which in the US we do not think about that as food insecurity. But in other places like Indonesia for example if you affirmed that you are doing that, that means that you are food insecure. In the middle is having to eat a nutritionally inadequate diet, poor quality diet, and then
the most would be not being able to eat the right foods and meals for your health.

There are two other domains. The psychological domain, which in our work we were not able to attach severity to things but there are two components of this. One is about the uncertainty of the food situation and not being able to get the right food for healthy eating then to feelings of worry and anxiety. Then the lack of choice and the need to make compromises leads to feelings of deprivation and depression. A social domain has to do with accessing foods in social unacceptable ways, accessing foods from food pantries, having to ask others for foods, borrowing money for food, and buying food on credit. We can imagine other things and we know about other things that people do. I wanted to point out that this is based on social norms. This is not what people told us was socially unacceptable, this was we as a society generally think about is not acceptable. Then also socially or culturally less normative patterns of eating, like eating peanut butter for dinner every day for weeks in a row.

The measure that resulted from this has spawned a lot of research that has been done and in particular I wanted to highlight and the previous speakers this morning have done a beautiful job of reviewing this. We know that
children in food insecure households do poorly in many different ways that are listed here. That has been pointed out by John and the paper he and his colleagues just recently published that children even in marginally food insecure household have these effects. That tells us given what gets you in that category that the uncertainty component that psychological component is particularly salient for children.

From this is a result of a couple of different things. One is this picture came from the National Committee on National Statistics’ previous review of the food insecurity in 2006. This picture which compared to the earlier one shows the nutritional pathway here but also shows that one of the consequences of food insecurity that part of the experience is physical hunger but also distress, adverse family and social interactions, worry, anxiety, deprivation, and alienation. My hypothesis would be that it is likely that these pathways are the ones that are detrimental for children.

The other thing that has come from this is Carol Connell has been pointed out, did some really nice work in Mississippi and we moved from that as we really thought about the fact that as I said before just about everything we think we know has come from other’s reports to go and
talk with children directly. A series of studies that have been done and this was funded by ERS through the RIDGE Program and what emerged in our paper in 2011 and then Jenny Bernal and her work in Venezuela confirmed this. We can think about broadly two domains, awareness and children taking responsibility and that awareness is cognitive, emotional, and physical so it has to do with knowing about food, how you feel about that and then the physical feelings of hunger. Then the responsibility part has to do with going along with adult strategies as opposed to fighting them, initiating things on your own to try to make existing food resources stretch or trying to augment those food resources by taking action.

We saw in our qualitative interviews many examples of all of these things including some that were disturbing. We also found that in the context of families that parents try to provide for the quality and quantity of food, they try to provide emotional support around eating so this is definitely occurring. But we also found that parents are not fully successful at this, that protection is attempted not just from parents to children but from parent to parent. Children also try to protect their parents particularly mothers and the children try to protect other children in the family particularly younger
children, younger siblings, and poorer children if they are in other families.

The last bullet is lots of evidence that children end up living in food insecure households end up often living adult roles. They are prematurely acting like adults doing activities that take away from the activities that they should be engaged in for their own development. It is important to try to put this in the context of the ideas of roles and myths. When we talk with families and in one particular study where we intentionally talked to children, fathers, and mothers what we hear is mothers talking about their social role as being a manager that it is their job to protect children. Fathers talk about being the provider trying to protect the wife and children. But children talk about how they actively contribute and how they act to protect other children and their parents and children even talk about how they know that it is important to their parents to feel like they are protecting the children. They want to make sure that they hide what they are doing so their parents will still feel good about themselves.

All of this is to say that we need to understand the myth, a very powerful myth, that there is in our society and in other societies that parents are protecting
their children from food insecurity. That the evidence that we have contradicts that it is not that they are not trying but they are not fully successful at that.

Let’s turn to some thoughts about how to think about assessment and measurement. In a technical sense if you go to a psychology literature where our ideas about this that have influenced us has come from or even the clinical chemistry literature where the richest thinking has been. That measurement is about assigning numbers to represent whether something is higher or lower on some characteristic and we get at that by using some kind of tool or instrument. An indicator is something that we use to demonstrate an aspect of a characteristic or we can think of it as identifying those that has some aspect of a characteristic. We would get indicators either by developing a measure and then making cut points to get indicator or we might develop construct the indicator directly from the things that we have assessed. So pictorially, this is a picture of what I just said. That we can have items on a questionnaire, we can combine them into a measure, say some kind of scale very often, and then we establish cut points to get indicators or we can use the items to directly get indicators.
As it was pointed out today very often in psychometrics we use item response theory. Think of the SAT or the GRE exam that is the technology that goes into that. We have a scale that is comprised of multiple items and we think that has greater reliability than any single item. If we assume a unidimensional scale as is often done, we do not have to but often that is done, where implicitly if not explicitly saying that there is one underlying construct there that it makes sense to think about and we typically assume. Again, we do not have to but we typically assume that the frequency of affirmation is a function of the severity. Think about the SAT, the items that students get wrong more often are the ones that we think about as being difficult. We brought that idea over to food insecurity.

Some options we have for constructing indicators are -- and this comes in the form of a technical manual we wrote some time ago for FANTA. We can create a scale and report the average. We can create a scale and construct ordinal categories by making cut points based on the distribution and sometimes people have done that. Third, we can create a scale and in construct ordinal categories that as John pointed out this morning was done in the US measure based on what we think the meanings of the items
are that involves judgment or we can construct nominal categories that are based on specific meanings of the items and bypass the scale idea completely.

So here is an example from Briceno Foso, Northern Briceno which has strong seasonality where here we are using the average of the scale to just document what everybody there already knows that pre-harvest food insecurity is really high, post-harvest it gets much better, and then it cycles like that. It also shows over the course of a Food for Peace Development Project things were getting better on average even though they were still cycling.

In this technical manual we showed the consequences as an example of different ways for constructing indicators and so in the assessment tool that we developed. Two items about uncertainty and worry, five about reduction of consumption or consuming undesirable foods, and four had to do with engagements and actions of compromised dignity or resilience. From the qualitative work there is no question what is more severe in that culture it is this, engaging in actions compromising the resilient is by far the worst thing that you could be doing much more severe than even overt strong hunger.
If you develop a scale and then make cut points you get these prevalence but if you go directly bypass the scale you get this prevalence. It just points out down here that whenever we create a scale and establish cut points we are always, relative to this alternative, going to underestimate severity. It is just going to happen because of the psychometrics works. When we are thinking about assessment Ronette made a comment about this earlier, just a little while ago. We need to think about what the purpose is so in the national nutritional monitoring system when the US measure was developed the purpose related to groups of households, the population level if you like, and in particular there was interest in estimating prevalence and being able to monitor how that is changing over time.

But there are other purposes at the group level. As it turns out the availability of this tool has had a major impact on research that we have done to look at determining some consequences. But some other purposes are potential early warning, targeting, or impact evaluation and there has been some examples of particularly impact evaluation using the US measure. Then there are also purposes potentially for separating individuals or households in terms of screening is somebody at risk, John talked about an example of that. Diagnosing the problem,
did they really have food insecurity? It could be diagnosing what the appropriate actions are, or it could be monitoring that over time. Some work which has been done shows that the food insecurity measurement tool as used in the US can accurately classify separate households for example.

The current assessment method started in 1995 in the Current Population Survey. The intended purposes, as I said, were to estimate prevalence and monitor. There are other purposes that it has been used for and we know from all work that has been done in the US and in Briceno that it can be used to screen and to diagnose households. The assumptions are that it focuses on households and we now have a subset of that which is the child portion of that. It focuses on access that is constrained by money not by other causes that we talked about yesterday. There is a mixture of items that refer to households, adults and children. The statements and questions are that way because of how it was put together from the components of the work that was done before and it covers some domains but not all. There are many items about the quantitative domain, there are a few items about the qualitative domain, and there is one item about the psychological domain on worry and anxiety and none about deprivation.
For the child measure it is the same except that it does not have even the psychological one so we have a tool but it is only getting at part of the story. It is a unit dimensional scale so it is assuming that frequency equals severity. It selected only the items that fit this unit dimensional scale so the other items that did not fit were left on the cutting room floor. The cut points were based on specific meaning as John points out although you can blame it on the previous report that was done here but the meaning is now suppressed.

The current assessment system will include in the paper more information about this but just wanted to point out a few things. We are concerned about do we have adequate coverage of those that are institutionalized, in the military, indigenous, the homeless and marginally housed. We know a lot now about how important food insecurity is for HIV and it has been pointed out this morning there is reason to think that it is important for other chronic diseases like diabetes. We could wonder about whether or not we are capturing it among the mentally ill and some ethnic groups and among immigrants, particularly on undocumented immigrants. We also have questions about the samples that we focused on for children in households with very low food security but we are not
sure about whether that is capturing everything that we want. As Alisha pointed out yesterday that even in the largest survey we end up with a really small sample size.

Someone pointed out this morning about discrepancies across the different surveys we have, and if that was easy to figure out Mark would have already figured it out, but it is not. Mark was kind enough to send me this very updated hot off the press figure but you have seen something like this before. I just put it up here to just reinforce that of all the households with children who report food insecurity. About half of those got that way by affirming some child items in addition to the adult items.

Now let’s turn to direct assessment. First of all, Carl did this work, some quantitative work as well as qualitative work that was based on assumptions about children and adults having similar experiences but needing to have different language. It reflects adults concerns, problems, and ways of thinking. We now have multiple examples of studies that point out that this poor agreement between adult and adolescent reports as Mark and Karla Hanson reported. That has been replicated in Ethiopia, Venezuela, and we have some data from South Carolina that
says something similar, that parent and child reports do not give the same information.

We have done several qualitative studies but this one in particular was one in which I mentioned we really tried to talk to both parents and to children. I just wanted to show you that the parents are not fully knowledgeable about child food insecurity experiences. We think that has to do with the lack of communication, maybe that is a good thing in some cases, maybe it is not, that is something we need to research. But there are also efforts to protect each other and so people are hiding things, they are not talking openly to each other about things.

Here are the six domains that I mentioned before and we simply wanted to tabulate here. Do parents know about the child’s experience? In terms of cognitive awareness, seven parents clearly were, four were aware of part of what their child was experiencing, and five others were not aware at all. For emotional awareness it was about half-and-half for physical awareness in this group two children were experiencing physical hunger. In neither case did the parents know about it. Participation is just really difficult to deal with because it is a subtle phenomenon but for initiation there were eight children
that were clearly initiating things on their own and in no case did the parents know that. For resource generation there was one child that was doing something to generate resources and the parents did not know about it.

Let me explain what we did next which is we did a mixed methods study that was funded by the RIDGE Program where we intentionally went and interviewed 100 children. In-depth interviews with 100 children where we asked the parents the US Household Food Security Survey Module and we asked the children a set of items that we had developed based on our prior qualitative work and gone through cognitive interviewing and all of that to refine the items. Then we used those items to ask the children. The reason that we did this is because we wanted to develop a definitive measure, a very accurate classification of what the children were experiencing, based on the in-depth interviews. We had shown previously in two different studies in the US, the study we did in Bircena and some earlier work we did about growth faltering that you can build an accurate measure by using in-depth interviews and carefully coding what you learned with multiple coders. We are quite confident that we have classified the children in terms of the six domains quite accurately.
Now I want to show you the results of making this comparison. Rows correspond with the different domains and the green ones have to do with child report and the red ones to adult to parent report, so it is color-coded. I will show you a picture of an ROC curve in a minute but for now think of it as a way of summarizing overall the sensitivity and specificity that is there for a measure. The sensitivity refers to how well you capture children who really have the problem. Specificity is how well you capture children who you know do not have the problem.

You can see here that for cognitive, emotional, physical, and then initiation that the numbers are 0.77, 0.785 and 0.780, all of which is considered good to excellent in terms of accuracy. The child report items that we had were able to accurately capture whether or not children had in fact these experiences in these four domains. For participation as I said which this is always going to be difficult because it is so subtle. For resource generation which is difficult for a different reason because children do so many different things to generate resources that it is really hard to have any finite set of items that is going to capture small set items that captures that, the accuracy there was worse.
The accuracy for the parent report was also poor, that for cognitive it was about 0.61 and for physical which is hunger what we have always talked about is hunger is 0.65. Particularly disturbing is that parents missed more than half of the incidents of hunger because the actual prevalence is 33 and parents only picked up 15 of those. Again evidence that parents do not know about all of the experiences that their children are having and therefore if we rely on parents report to assess what those experiences are we are going to get another estimate.

This is what actually an ROC curve looks like, this line here the diagonal line is the chance line, it is like flipping a coin. This curve out here is a single indicator developed from two items. This is about physical hunger, it is a single indicator developed by two items and you can see that it dominates. It is far more accurate than either the household food insecurity measure, the whole measure, or the component of that that has to do with the child. In other words relying on the child’s report is much more accurate than the parent's report. What I think we can say from this and Barb did a beautiful job this morning talking about the food insecurity is a powerful stressor and it is a marker of other stressors. I think we know this.
Children are accurate reporters of their own experiences but parents are inaccurate reporters of their children’s experiences. Fourth, the current system that we have based on parent’s report likely underestimates the prevalence of child food insecurity and hunger. The current system in the US, the fifth point is that it is valuable for the purposes for which it was developed which was to estimate the prevalence of household food insecurity and has been very powerful for that and to monitor how that has changed over time. But there are other purposes that we have and for those other purposes we need to have other systems that use an accurate instrumentation. We can assess the ways in which children experience food insecurity, how many children have those experiences, which children have those experiences, and then which of the actions that are going to moderate those experiences.

What do we know about those most salient for causes of child food insecurity? For causes we know lack of money is important and that is why we pay attention to that but we also know that is not by any means the whole story. Parent physical and mental health is crucial, transportation barriers to accessing food for example are crucial or accessing food assistance is important. We know that parent work demands and schedules, not being available
to cook is going to have an effect on children’s food insecurity. Stigma and other social issues like that are very important.

As I have discussed that we know that awareness in these three subdomains and responsibility in these are both important in terms of thinking about and then assessing child food insecurity. If we are going to respond to child food insecurity we need an assessment system that builds on existing systems. We do not have the funds or anything to start from scratch. We have been working in schools in the last year and a half or so testing out whether or not to what extent schools can be used as at least part of that. They really respond formally and informally, they do it typically in haphazard ways, these formal lunch, breakfast, and snack programs. About Share our Strength and a survey they did shows that over half of teachers report doing things to help their children cope with food insecurity. There are holiday food baskets in school food pantries, food backpacks, and all other kinds of things that have been invented.

Schools are a place -- from the work we have been doing in schools where food insecurity is seen -- it is a place where children, students get food but it is also a place where food insecurity is secret, where stigma is
important, where there is a whole set of issues around that. If we are going to potentiate schools as a system for food insecurity we have to have education and training of school personnel, a systematic attention to the problem responses, and meaningful assessment of holistic responses. By the way this has been funded by the Nord Family Foundation, which is as far as I know, is not related to Mark.

But schools cannot operate in a vacuum so we need to have communitywide systems that augment the schools because schools only reach school age children, they cannot operate effectively in a vacuum. As we have been seeing food augmentation and this has been learned and forgotten internationally for a long time, food augmentation is not only sometimes not the best response is actually overtly harmful so we need to have holistic community assessment and response and we have an example of that. The US PPP Population Trial implementing the Positive Parenting Program that was developed in Australia has shown us in a randomized study that if you train the existing workforce you can have large effects on reducing substantiating maltreatment out of home placements and child maltreatment injuries.
Finally, I think that to end child hunger we are going to have to have thinking that is based on systems, public health thinking that is realistic about resources, and is holistic in terms of thinking about child and families. We need assessment instruments and systems to directly and accurately identify child food insecurity. We need questionnaires that cover all domains and we need to make use of observation. We have begun to need to develop resources and protocols for the actions that can help when children’s food security is identified. As Deborah said before and that involves training school personnel, nurses, pediatricians, clergy, anybody we can think of that as we come in contact with a child so we can assess, identify, target, act, and then monitor what happens.

**Discussant: Mark Nord, Economic Research Service USDA**

**DR. NORD:** I appreciate Ed’s comment, his presentation. I think he has particularly useful things in pointing out that measurement when it fits into different purposes there are different pieces of it that are important. As he rightly pointed out the current measure is essentially a measure of almost completely economic access to enough food and there may be other parts of food insecurity or other adjuncts of food insecurity that are
important. I do not think that we should take that as a weakness of the current measuring. Certainly we should not try to add them on to the current measure but it could be that additional measures of some of those other dimensions and adjuncts could usefully be added.

I want to start with one of the pieces that is missing and that may point to some research that is needed. The greatest incident of food insecurity in children is in older children. The greatest impacts at least through nutritional channels of food insecurity and possibly of psychological and other parental stress impacts of food insecurity we think is on younger children. I am not sure that we know that for sure but there is certainly evidence from the previous couple of sessions today that early childhood really matters. We should be glad about that, those children appear to be more shielded from food insecurity but we have been able to look at how well parents report insecurity for older children but not for younger children because the younger children cannot speak for themselves.

I think this is an area that needs some further work. If parents are reasonably accurately reporting food insecurity of younger children then our overall monitoring estimates of food insecurity among children are not too
bad. Although we are not doing it perfectly for older children it is not so bad for them and then when you combine that with the younger children overall it might not be bad from a monitoring point of view which gets us here.

The purposes of monitoring which they lead to what kind of statistical tools you need or measurement tools you need for monitoring, then need to have some of these characteristics. The current measure does not do so bad at most of these but here is the key. You can take some measurement error in a monitoring tool as long as the error is not systematic across the categories that you are trying to parse out and report on. Because the samples are large enough that random measurement error does not matter so much but when you get into research applications and other applications then this changes. I think Ed’s point that it is useful to think about what a measure is being used for which aspect it is being used for is important here.

I want to expand a little bit on the Nord and Hanson article that Ed mentioned and then talk about another more recent one based on the same data that is forthcoming. As Ed correctly pointed out a major finding of the Nord and Hanson, which used the NHANES data, personal food insecurity reported by youth compared to what
their parents said about it in the family interview. He was generous is saying they did not report it very well. In some cases there was almost no statistically significant association between their reports.

However, the reason Karla Hanson got involved in this with me is that we took the Health Eating Index then for those youth and looked at who is telling the truth. Maybe the parents know more about the children than the children know about themselves. We do not think that is true, Ed’s work shows that is probably not true but here is what we found. If both the parent and the youth said they were food secure the average mean Health Eating Index for those youth was higher. If they both thought they were food insecure their Health Eating Index was lower. If they were in that in-between category where they disagreed one way or the other, one thought they were food insecure the other did not, their Health Eating Index was in the middle but there was not clear priority of one over the other.

Maybe this is just something that we measure with so much error that when you get into that intermediate error there is not so much systematic going on. There is a follow-up article. I have the conference paper on it if you are interested in it the article itself is forthcoming in the Journal of Hunger and Environmental Nutrition that
adds on confidential data that we have through a data sharing agreement with NCHS that allows us to look at adults and children in the same household.

The intent of this was to see to what extent do adults in the household appear to be actually shielding youth from food insecurity. The good news there is that it is based on their own self-reports, adult self-reports, youth self-reports in the same household. There is considerably less food insecurity among youth than among adults. It is about half as much a general food insecure level and maybe as small as 20 percent. That is 20 percent as food insecurity among youth as adults in the same household when you get up to the more severe levels. There does appear to be a lot of this protection mechanism does seem to be working to a considerable extent although perhaps certainly not completely and not maybe as much as we sometimes think.

If we are measuring for screening then we have a different purpose and a different set of needs. Now we care about sensitivity. We want to be sure to catch those that need help although we should always point out that if you are using food security type items for screening this is giving people an opportunity to tell you that they want help. This is not objective screening it is allowing
people to tell you they want help. Here we want high
sensitivity. We want reasonable specificity so you do not
send a lot of people to the SNAP office that did not need
to go there. We need low burden and as Ed was pointing out
one item, maybe two items. There has been quite a bit of
work done on screening in clinical situations using one or
two items of this series that seem to do a reasonably good
job of meeting these criteria and it has to be suitable for
the context.

Sometimes it is too awkward, it just does not fit
to ask certain types of questions in certain screening
situations. In the case of research if we are using a
measure in the context of research now we have a whole
different set of purposes and again Ed did a good job of
laying this out. I just want to take that to the next step
and say what does that mean about requirements for the
measure in that case. Now measurement error really matters
because if we have high measurement error we underestimate
associations in general and we may not find statistical
significance even though we have pretty large samples both
random and of course systematic measurement error matters
even more.

It has to be collectable from the population of
interest and this was true in monitoring as well. But I
think this is where the rubber meets the road and where Ed’s concerns about being able to collect these kind of data for research purposes and people who have done know that this is not easy to do. Yes, children can answer but is it easy to get institutional review board approval for surveys that ask children about their food security? It can be done and some parents will agree but this is difficult for youth and probably nearly impossible for younger children and we do not know. The idea of using some sort of school-based assessment is maybe that is one we should put up for how some of the $10 million can be used to find out if there is any way to use schools as some sampling of school nurses as a way of getting at this but this is untrodden landscape.

I want to talk about some current issues in measurement that I know about besides the one that I have already raised which is how accurately adults report food insecurity of younger children. This has been brought up already measuring frequent or persistent food insecurity within the survey year. In the CPS we have questions to do that. The information is there to do it and I have a paper forthcoming. Also in the Journal of Hunger and Environmental Nutrition, they are being very kind to me on
this very subject. We have to be careful because we are using the word frequency in a different sense.

When Ed said frequency, he was really talking about the number of items whether the number of items that are reported is the right indicator for the latent trait. When I am talking about frequency, I am talking how often it happened. Did it happen almost every month, some months, often, sometimes and so it is the same measurement concept as the 10-item adult scale except that it only codes as affirmative if they said yes it happened often. If frequency of occurrence is perfectly collinear with maximum severity during the year then that measure is not going to tell us anything that the existing measure does not tell us already. Although it could shed some light on what level of severity means in terms of frequency. But it turns out they not quite perfectly collinear and the waves where the lack of agreement happens make some sense. So you see there is one that just seemed to have one really bad spike but it did not last very long.

There are some that had a moderate level of food insecurity all year long, but it never got serious and the types of households that experience those things are different. Just to say that is one of the things that we
are working on in measurement and you can contact me if you want a copy of the paper.

Improving the household level measure in households with children, the assumption of the single dimension, which underlies the statistical method that we use to validate and classify households, is not met in the US data. There are two dimensions in there, one child item, one adult item, this has been known about for a long time, we have not done anything about it because it is not horribly, badly out of line but for research purposes this really matters. The difference between the two is largely mediated by the age of children in the household. We are considering -- based on the work we did following the last C-SNAP panel on measuring food security -- we are considering changing the methodology so we will use the child scale, use the adult scale, if either one of them is food insecure, household is food insecure. If either one of them has very low food security the household has very low food security.

This is a relatively simple way of solving a problem which otherwise could get very messy to try to solve in terms of being able to explain it to anybody. I have not written this paper yet but I have written the background on it. Understanding the differences, why those
differ and looking at some biomarkers of nutritional status again to help us understand the difference the child self-report versus adult self-report. Anyone can do this, this is NHANES and they have some of those kinds of markers.

In qualitative studies when possible, also get at the first before it is tainted by the qualitative interview. Get at least the 10-item adult scale or the child scale depending on what you are working on. The qualitative work informs the monitoring tool better.

**Speaker:** Elizabeth Adams, Oregon Health Sciences University

**DR. ADAMS:** I am very happy to be here today to talk about our Childhood Hunger Coalition Screen and Intervene Project but first I want to thank the organizing committee for including this project in this workshop. I also want to take this opportunity to thank all of the participants in this workshop are people that have informed the work we have done. I want to thank everybody either through the papers or through talking.

As an overview of what I will be talking about this morning, I will start with some background on the Childhood Hunger Coalition because I think that informs the context of the study that we are doing both of where we started and of where we hope to end up. I will talk about
our pilot screening project that will really be an update on work in progress. We are about halfway through the study, we have been enrolling people but we have more to go. I will talk about lesson learned to date from in that and then I will shift gears and go into my discussant role and talk a little bit about knowledge gaps and research.

The Childhood Hunger Coalition formed in 2007 and it really came about a couple of years following a workshop that Oregon Food Bank had to raise awareness about the problem of food insecurity among children and the impact on health. From that we came together with an interdisciplinary collaborative that includes health care professionals, public health professionals, educators, and anti-hunger advocates. We have a steering committee that is made up of people from all those different types of institutions.

We really focus on hunger as a public health concern and we are trying to work to eliminate problems that may come about because of food insecurity. We have also recognized that health care providers can play a critical role in identifying children who are food insecure and helping to link their families to resources. At the same time, we will work to provide research and education
to the health care providers and the community to help address needs.

In 2008, we finished a survey of health care providers in Oregon and this was the first piece of work that we accomplished as a coalition. In that survey we asked providers what they knew about food insecurity, if they screen for food insecurity, and how they did it. Providers told us that they were overwhelmingly willing to screen for food insecurity. Actually, we found out they know a lot about food insecurity and its impact on children but they do have a lot of barriers that limit their ability to screen. They said they would be willing to screen but they needed to know what question to ask and how to ask a family such a sensitive issue. They would do that if there was a question provided and they do not want to ask a question about food insecurity if they do not have the solution and if they do not have something they can do for families.

As a result of this survey we came away thinking that the pediatric clinical setting would be a good place to screen and intervene for food insecurity but we knew that we needed to address the barriers that health care providers were facing in their time and discomfort. So we began working on that to address the concerns that were
raised and to also provide a tool that providers could use and the model of how they could work with families to address food insecurity.

We developed some educational materials for providers, we developed a screen and intervene algorithm that uses the two-question screen already discussed by Haggar. We had some online continuing education materials that have been used by providers all over the state and actually, it is used around the world. It looks like an outbreak of disease that shows up in one place and then another and keeps going. We have educational tool kits that we have mailed to about as many providers as we could in Oregon. We have a quarterly digest that reports on the current news and findings and you can find all that at our website. When we sent off the tool kits, we sent it out in hard copy because a lot of providers do not necessarily have access to good email so now we have it online too.

This is our screening and intervention algorithm and you see the two-question screen and what flows from that are recommendations or actions that providers can take to access the impacts of the food insecurity and then to help to link families to resources. We collected a variety of information about the food assistance programs and other resources. We are now carrying out a pilot of how this
screening and intervention works because we know in this time of constrained resources health care providers are not going to add one more responsibility to their clinic day unless they want to know that it works. We feel a commitment to make it as streamlined as we can for them to use the time well.

We are piloting this in collaboration with Oregon Food Bank to test how well it works and whether it is feasible in the clinic setting. We are doing this in two pediatric clinic sites and will be quantifying what we find out about food insecurity and changes in use of resources before and after screening. We will assess the impact on families and on providers and see how they think it is working through qualitative studies. We will then develop best practices and lessons learned and we will share that with other types of resources. We will share that information with providers in other places and then with schools, schools are very interested in this too.

Our protocol then is that the institutions we are working in -- the pediatric providers -- have adopted food security screening as routine clinical practice. That happened before this study so the physicians screen as routine clinical care and link families to services according to their own clinical judgment. We do not have
any standard protocol of what physicians need to do but we did provide guidelines of what could be done.

As far as recruitment and enrollment, families of children who are under 18 who screen positive for the food security screen between December and March of this year are eligible. We will end up following the first child for 6-months later and research or review the protocol with the family gets informed consent from the parent or guardian. This is an after visit summary that is embedded in our electronic medical record because we want to make this as easy as possible for providers to implement. So when a provider sees a family that screens positive -- say they know the family lives in Multnomah County and speaks English -- there is a four page after visit summary that will come out and provide information about all the resources in the community.

Cooperative Extension is the organization that developed this tool, the information, because in our coalition, we worked together and we now have that embedded in our electronic medical record. I think that has been important for providers.

We are going to have families who enroll in the study will be asked to complete a baseline questionnaire that covers these issues of health, household situation,
and food security over the last six months. Then at six months we will have them complete a follow-up survey focusing on the first child that was seen and it includes changes in child health, changes in demographic characteristics, changes in employment status for example over the last six months. So far, we have 996 patients that have screened positive in the four months that we have been enrolling patients. They have been screened and 143 have screened positive for food insecurity although I did get an email last night that there is another batch of information about participants who have screened positive coming in to be included.

We were not sure how this was going to go over with providers or with families. But providers have been very enthusiastic about wanting to know the food security status of their families and help link them to resources. Families surprisingly to me have also seemed to appreciate that this issue was brought up for them to talk about. Because they know they are living in the situation of food insecurity and they like to be able to have someone else recognize that.

This shows the flow of our study. All families are screened at well child checks and this goes through and shows the numbers who have screened positive and the people
for different reasons who have not chosen to participate. We think that this pilot program will help to inform an evidenced-based model that can be used in a variety of settings. We were pleased in how engaged the families and providers seem to be but it is a sensitive topic and that has sometimes led to problems in documentation in the medical record. Families and clinicians are facing time constraints and so we know that we need to make this process as streamlined as possible and has been talked about quite a lot before. We know that the families that are in our study are all in difficult social situations, complex social situations and that is an added factor that they are dealing with.

This is on a point that I can shift over to the more discussant section and I just want to say I really appreciated Ed’s talk because I like hearing the overview of the child’s screening and assessment tools. I think that it is important that we can work towards a better system to assess and monitor children’s experiences of food insecurity. I appreciate your issue of parent-child discrepancy in food insecurity reporting. This is just anecdotal but I see this in the clinic, you may hear two different things completely coming from the child and they are not in the room at the same moment but it is striking
to me. I also appreciated hearing about the interest in the public health approach to address childhood food insecurity and your coordinating efforts of public health, medical of all the different disciplines that focus on children. Everyone wants kids to do well and they are putting in a lot of energy so if we could get everybody working in the same direction I think that makes a lot of sense.

The knowledge gaps, one that stands out to me is with the special needs population. It would be good to better understand the experiences of food insecurity. What are the triggers and outcomes in that population and what does it mean for assessment and monitoring needs. As was mentioned yesterday in any work we do with children or adults we need to consider the root causes of hunger in children. It is not just for children with special health care needs or just for children that do not have special health needs. It would be great to have the information about the generation patterns of food insecurity and what happens over the life course.

What are the determinants and experiences that need to be taken into consideration? That can all have implications for policy and program planning. Finally, I wanted to say the community-based resource systems I think
are really important because we can link the families to the programs that we know about and that is great. We have heard how food stamps for example are such an important safety net for many reasons. But I think probably in communities there are even more resources that we do not know about that communities may be able to tap into. There are models for community-based resource systems. Development and recognition -- I think of the Feast Model that comes out of Oregon but now it is spreading around the country -- so I think that would be great to pursue.

Data to address gaps, this will be very quick. There are a lot of potential sources for data to address the gaps that we have identified. It could be Head Start in schools as Ed mentioned some of these. There are also surveillance systems existing that already collect data about food insecurity and health outcomes of parents and children. With a little bit of attention to what they are collecting I think they can be very useful. There are regional clinical health information networks that also could be a source of data. We have a lot of research opportunities to collaborate with existing programs like schools and Head Start to see what we need to be doing next. I think it is also important that we can integrate food security research with emerging health care and
education transformations that are happening nationally. They are happening -- probably, in each State -- and to quantify the impact of program and policy changes. Thank you.

**Discussant: Maureen Black, University of Maryland – Baltimore**

DR. BLACK: I have the distinct distinction of being the very last speaker so I will thank you for hanging in there and I will try not to repeat too much of what you have already heard, and I will also try to keep you awake. Thank you very much. I am indeed honored to be included and my charge is to be a discussant and to talk a bit about measurement issues.

I thought I would talk a little bit about global measures of food insecurity and why did I decide to do that. When we think about it over 90 percent of the world’s children actually live in low and middle-income countries and food insecurity is an enormous concern in the rest of this world. As part of being a global community, I thought that perhaps we could talk about it and maybe we could actually learn something about measurement in the rest of the world.
I will talk a little bit about food security, insecurity screener that you have heard a bit about. Ed talked about parent’s ability to recognize food insecurity among their children and I thought I would talk a bit about parent’s assessment of their child’s body size. I will end by giving you a few thoughts as to where some of the research may go in the future.

If we look at household access and children’s growth from a global perspective, food insecurity is often looked at, at three levels. The first is an availability of food and that is at a population level so when we listen to the news and hear about some of the countries that are war ridden or that are having extreme economic problems then the food insecurity is something that can be addressed at the entire population level. Beyond that there is access -- which is usually looked at at the household level -- and then the utilization -- which is usually looked at at an individual level.

If we think about the issue of malnutrition then what the evidence will show us is that over 50 percent of children's deaths are associated with malnutrition. It is an enormous problem. It is typically looked at from a chronic perspective we look at stunting so that is when children’s linear growth slows down and when does this tend
to happen. Not surprisingly, it happens during the time of rapid growth and that is during the first two years of life.

If we look at acute under nutrition then we see wasting. We will look a little bit at both of those and we will look at how food insecurity then relates to childhood stunting and wasting. Most of the data that I will show you come from a study that is called the MAL-ED Study. That stands for malnutrition, an enteric disease, and how they relate to children’s development. So I am a consultant on this project obviously on the child development piece. It takes place in eight countries as you can see and the initial look at food insecurity included 800 families, that is 100 per site and the children were between 24 and 60 months. The mean age was 41, so that means that these were children who were about 3 1/2 years of age.

This is a picture of the global estimate of stunting throughout the world and the dark blue countries are those countries where the rates of stunting are at 40 percent or above. This is serious malnutrition and you can see most of them tend to be in South Asia and in Sub Saharan Africa. What is this? This is one country showing up in the Western Hemisphere so that country is Guatemala.
It certainly is a concern that is closer to home than we might recognize.

This is a portrayal of what stunting looks like, it is a short guy, and the outcome, the consequences of stunting are quite severe. Not only is a child’s growth then hampered but their development, their academic performance, their work productivity. It is really a lifespan intergenerational concern. Stunting is a major impact for us as being part of a global community. This shows where the MAL-ED countries are and you can see that they are concentrated, four of them are in South Asia, Bangladesh, Nepal, India, and then two in Africa, and two in South America. But they are in low-income communities within those countries so let me show you some of the data.

What is used is the household food insecurity and access scale. This was developed by, I think Ed mentioned this, by FANTA and it is part of US AID. It looks as you can see very much like the household food security scale that we all know and love but it reflects the past four weeks so there are nine questions and if you endorse any one of those questions then there is a frequency question. These are the occurrence questions and then there is a frequency question.
They are organized so that there is one question on anxiety, three questions on quality, and then five questions on food intake and consequences, and sometimes the last three questions are used as a household hunger set. If we look at the countries that I mentioned and see how they did on this food security scale you can see that there is some skewness in the response so it starts at zero on the left and goes on. For some reason Tanzania and Nepal did not report much food insecurity but if we look across the countries what we see is that two-thirds reported food, this is food access insecurity, or one-third reported no food access insecurity.

The question now is how does that relate to children’s growths? First, we will look at children’s growth so this is height for age across these countries. The way that you read this, these are Z scores so the black line represents a Z score of zero. That is the median, that is the ideal and then there are standard deviations. The red line is two standard deviations below the Z score so anything below the red line is stunting. You can see some countries, like on the left we have Bangladesh, the whole distribution is below zero so they are all negative numbers. This is certainly a concern throughout so
stunting is an enormous issue and in fact the overall rate of stunting in this sample is about 43 percent.

If we look at weight for height, so this is now wasting and you read it the same way. The black is zero, the red is minus two, then it is not so bad in that there are not so many who are wasted along here but they are certainly stunted. Now if we look at how they are related, how the food insecurity is related to either stunting or wasting, what we see is that there is a relationship with height for age and it is a clear relationship. This is adjusting for socioeconomic status so what we see from that is that food insecurity is associated with a negative shift in the distribution but you can see as the food insecurity score goes up then children are more likely to have a low height for age.

You see a shift in the distribution that is associated with food insecurity and it is adjusting for socioeconomic status. There is a consistent relationship across countries, I showed you the data for all eight but it is consistent across countries. There is no relationship with weight for height so that is the indicator of acute status and there was no relationship with hunger. What we learned from that is there are some cultural aspects to responding to the questionnaire and we
could see that by the data from Nepal and Tanzania. But we could see that food insecurity does relate to poor growth and that is height beyond socioeconomic status. There are multiple factors that contribute to children’s growth but this questionnaire that we have works in a global sense or a modification of it.

You have heard about the screeners so I will do this as developed as part of Children’s HealthWatch. We chose the first two questions in the screener, one on purpose, one addresses anxiety, one addresses food intake, if either one of those or both would be endorsed, then you are at risk for food insecurity. When we looked at the sensitivity and specificity and this is showing you the data you find that sensitivity is 97 percent, meaning with the screener you captured 97 percent of food insecure families. The specificity is 83, meaning that you may have classified 17 percent of food secure families as insecure although they are certainly still at risk.

This is the convergent validity of the screener, these are using Children’s HealthWatch data, these are odds ratios. You can see using the screener the odds ratios are slightly attenuated from using the whole scale. But they are certainly still significantly associated with children’s health, with hospitalizations, developmental
risk, caregiver health, and caregiver depressive symptoms.
The screener has been used -- as you heard -- is being used in Oregon and it enables providers to be able to look at food insecurity and then to move on and to provide something to the families. As part of Children’s HealthWatch study food insecurity in the context of a medical center. Each site also includes a clinic so that we are able then to reach out to families who are food insecure and provide them medical services or whatever other services they may need.

What we learned though is that when we look at food insecurity in this country with young children we do not have the kind of relationship that I just showed you from a global perspective so we do not have the association with children’s height or with children’s weight. That tells us then in some ways food insecurity is often invisible and if you do not ask you will not know, so you have to ask or sort out a way to identify. In our youngest children you cannot ask them in a way that Ed talked about, so we need other ways to be able to identify them or radical thought. We need some more universal interventions to ensure that our children have the nutrition and the food patterns that will help them grow.
I thought that I would show you briefly how parents do. You have heard that parents are not always aware of their children’s food insecurity but I thought that I would show you how they do in terms of reporting their child’s size. These are four friends and if you look at them you can see how you would judge whether they are underweight, overweight, or within normal. Do you have this in your mind? Okay let’s see how you are. The bookends are children who are certainly underweight, the second child on the left is overweight, and the 56 percentile is just fine. These are weight for height that we are looking at. We use this to develop toddler silhouette scales going from thin to not thin and then use this to access parent’s ability to judge their child’s size not only how accurately they could judge their child’s size but how satisfied they are.

If we look at the parent’s ability to judge their child’s size what we see is that if the child’s body size is low, is at the below 15 percentile parents are very accurate at judging it. If their body size is high parents are not accurate so they are much more likely to recognize underweight than overweight. This is in toddlers. Now how happy are they, how satisfied are they? If their child’s body size is above the 85th centile they are pleased as
punch. They are really happy if their child is small they are not quite so happy so we see they have a preference for a large body size and they are concerned with a body size.

What it tells us is that parents are coming into this with a sense of their desire for how they would like their children to look. Just in case you think that that only applies during toddlers, I will show you a little peek at what happens during adolescence and essentially, it is a similar phenomenon. If we ask adolescents and parents to judge both how the adolescents body size is and how they would like it to be. They agree that if the adolescent is within the normal range or the adolescent is, this is now obese at the end. But if the adolescent is what is now overweight the parent thinks it is fine and the adolescent thinks it is not so fine, they would like to be not so heavy. Parents have a different perception of not only their child’s body size but as you heard earlier their food insecurity so all this gets wrapped together so they are not very sensitive to overweight.

I wanted to talk a bit about how we go about measuring food insecurity and how it fits within a larger perspective of our children’s early nutritional health and growth. If we look at how children are doing in terms of the dietary guidelines, they are terrible. They are not
doing well at all and while food insecurity may have an impact on that, that is not the whole story so fixing food insecurity does not necessarily fix our ability as a society to help our children in terms of meeting what we think are the optimal dietary guidelines. They also do not do well in terms of feeding patterns, that means how we use food, when we eat, they do not do well eating breakfast. We as parents often use food to manage behavior and so we teach our children to use food to manage stress and manage behavior. I guess that I would say is I think that in working on food insecurity we should also look at a larger perspective in terms of what we can do to insure our children’s health and our children’s early eating patterns not only thinking about the problem of food insecurity and not having enough food.

As I say there is one more thing and that is take care of me, I am your future. That is what our children tell us and I thank you very much.

DR. BARTFELD: We are just going to do a very short maybe five minute Q&A now I think and then maybe some more general time at the end after Jim’s wrap-up, if possible.

DR. SELIGMAN: Hilary Seligman, from the University of California San Francisco. That was so
interesting and I just wanted to thank all of you panelists, but follow-up on something that you said Ed, really concentrated on the lack of concordance between parent and child’s report of food insecurity. Implicitly what came out was that this was a knowledge issue. I do not really know what is going on in my kid’s head, I do not know what is going on with my kid’s behaviors. I think if we pushed that further and build on some of the stuff that was said yesterday that it might be a little bit about knowledge but just as much about what a threat to your identity as a parent it is to not be able to feed your children. Because it causes so much cognitive dissonance that does not even come out in context of the qualitative interview meaning that at some level parents might understand this but are not able to communicate it to an interviewer or even sometimes communicate it to themselves. I think we just need to conceptualize it that way sometimes because it really helps us hone in on what a really stressful experience it is to be a parent who is unable to feed their kid.

DR. NORD: I could not agree more, absolutely. There is one small problem with that and that is when we look at NHANES where we had what the parent said about the child, what the child said about themselves, it was not
that it was very strongly systematically biased one way or the other. The marginal were not greatly different, they were somewhat different but not hugely different. It is just like they were living in different worlds.

DR. SELIGMAN: When we were working with the NHANES data, I had families that answered a household’s measure in the home at the mobile examination center and it was temporally the same time period. I remember there was this huge amount of families that did not answer the same exact question pretty much the same way within two weeks of each other. I am not sure that they are in different worlds, it might be that we cannot get people to answer this question. There is so much involved in answering yes to this question that you might have gotten the adolescent to answer yes and not the adult to answer yes. But that might not mean that there is something different in the household. Am I making sense?

DR. NORD: Yes, but the method that we used in the paper we also compared what adults said about adults in the family, and what that sampled adult said in the MEC, and looked at that for single adult households where it would be the same person. Where there was a fairly high agreement and in two or three adult households where there was a little bit less but still fairly strong agreement.
It is not a perfect agreement but the questions are a little bit different. The one in the MEC is a 30-day so we do not expect them to agree perfectly but the agreement was a lot higher for single adult households and even in multiple adult households than it was between adult reports of youth and then what the youth said.

DR. FRONGILLO: I just want to reinforce the import of Hilary’s comment which is that, and frankly, I have struggled to figure out the right way to say this. It is not just about do parents know, it is about whether at that moment that you are talking with them or that they are answering the question depending upon the kind of study. Are they willing to avow that to express it and that is a function of a lot of things about how they are feeling about themselves, about how they are feeling about their failure at that moment, about a lot of different things. All of those are important, that is why I tried to emphasize the importance of understanding all of this in the context of roles and shared beliefs about those roles.

DR. BARTFELD: We are going to take two more comments and I am going to ask that they be very brief so that we do not get behind schedule.

DR. PEREZ-ESCAMILLA: Mexico has now included for the first time the Food Insecurity Model in the Mexican
NHANES. The data has been released in 2011, 2012 and as you found Maureen there is very strong relationship between household food insecurity and stunting but there is not relationship with wasting. Conceptually I am struggling a lot with these because why on earth food insecurity in the past three months or four months, we can assume that causally can predict stunting. What I would suggest is that it should credit wasting but not stunting so I just need some help understanding that.

DR. BLACK: I am not sure -- maybe A) it depends on the age of the child and, B) if you take the seasonality into the perspective -- because there is a large seasonality aspect to this. The other thing the food insecurity that happens in much of the developing is much, A) more severe and, B) more chronic that what happens here. These kids are undoubtedly micronutrient deficient as well but Ed has said that it is an enigma why you do not see it in terms of the wasting. But the rates of wasting are much lower than the rates of stunting are as well. You have wasted first and then you are stunted and you look kind of like a fireplug.

DR. PEREZ-ESCAMILLA: You see the assumption would be that the food insecurity of the country now is food insecurity when the baby was conceived.
DR. BLACK: That is what you think, yes. Can I make a rather grim pediatric suggestion which is that the most severely wasted kids are probably dead by the time you get to survey.

SPEAKER: That is absolutely true that it probably happened early in life and remember as I said 50 percent of the deaths are associated with malnutrition and that is probably true.

SPEAKER: Wonderful presentations. Ed and Mark, on the issue of measurement for the adults versus the children and the differential there the nutritionists in the room probably know this as common practice. But when you are doing dietary information intake you would think it absolutely ludicrous to expect the parents to know what the teenager ate, so you ask the teenager starting at about fourth grade. A break there that is commonly done in surveys including NHANES and our school nutrition dietary assessment studies and most of the others.

Is there some reason that we should not do likewise in terms of food security measurement is my first question. The second one is if we were going to be moving things in that general direction do we have the questions that pin down yet that would be the appropriate thing to do and what would it take to get there?
DR. FRONGILLO: In all of the work that we have been doing and what Kenny Bernal did in Venezuela were working with children as young as six or seven years old. So we are working basically with school age children and up. I think below that then that is probably a different story but children who are as young as six can answer accurately items that you ask of them with occasional failures where a particular child just cannot focus or something like that but those are very few.

For the most part children as young as six or seven can answer the questions. I think children as young as six or seven can tell you about what they are eating. Now whether that can work well in the context of NHANES and all of the things that need to happen and such a standardized survey that is a different challenge. But everything that we know about children and I appreciate Maureen bringing up the example of judging weight, but everything we know about children being able to report experiences of pain, experiences of all kinds of other things is that even young children can talk about those things and pretty accurately. Actually, it is the middle school children who are most likely to hide things. The older kids do not care what they say anymore and the younger kids will just tell you whatever they are thinking
and whatever has happened. It is the middle schooler who is worried about appearance and all of those things more so I think it is possible to do a direct assessment and we have been doing that for about a year and a half in a school district in elementary and middle school. Augmenting that with observations, reports from teachers and others, and that is sort of a model that we have been trying to develop.

DR. BARTFELD: Please join me in thanking our panel.

(Applause)

Wrap-up

DR. ZILIAK: Let me begin by once again, thanking all the speakers and discussants over the last day and a half and I give you a round of applause. We have covered a tremendous amount of territory. Maureen said that her objective was not to be redundant so that is my job description for this session is to be redundant as rapporteur and that is to try pull some recurring themes back together.

In thinking about my comments, I actually want to pull us back to the charge as a steering committee. I am going to beg your patience a little bit to read you a
little bit of the background and kind of the four key objectives that we were asked to address.

Section 141 of the Healthy Hunger Free Kids Act of 2010 provides $10 million on October 1, 2012 available until expended for research program on the causes and consequences of childhood hunger. The purpose of this research program as defined in the statute is to advance knowledge and understanding in the following areas. Economic health, social, cultural, demographic, and other factors that contribute to childhood hunger, or food insecurity, the geographic distribution of childhood hunger and food insecurity, the extent to which existing federal assistance programs reduce childhood hunger and food insecurity, the extent to which childhood hunger and food insecurity persist due to gaps in program coverage. The inability of potential participants to access programs or the insufficiency of program benefits or services, the public health and medical costs of childhood hunger and food insecurity, an estimate of the degree to which the measure of food insecurity underestimates childhood hunger and food insecurity because of the exclusion of certain households such as the homeless or other factors. Finally, the effects of childhood hunger on child development, wellbeing, and educational attainment.
As we think about each of these research purposes several fundamental questions arise. First, how adequate is the current state of knowledge? Second, do substantial knowledge gaps remain? Third, do data exist to support research to fill any remaining substantial knowledge gaps and if not can such data been generated? Fourth, how great are the research opportunities in this area?

So it is with this background that myself with the steering committee put this panel together for the last day and a half. I think we have covered a tremendous amount of territory on the charge addressing issues of the determinants of hunger. Looking at the geographic factors associated and other environmental factors associated with the risk of childhood hunger, looking at the role of the social safety net especially federal food assistance programs on hunger and insecurity, looking at the extent to which there are gaps in program coverage or inability to access programs. I think one of the fundamental questions that Scott Allard raised yesterday was how do we define adequate access? That is actually a fundamental question I think remains a challenge.

We have spent this morning talking about the public health and medical consequences of childhood hunger and of course this last panel and actually throughout the
last day and a half, a lot of attention has been towards measurement and its implications for how we understand child development and wellbeing, and of course food insecurity. Let me spend my time and then I will open up the floor for the remaining moments.

How adequate is the current state of knowledge? I would say that there has been tremendous progress over the last 15 years. I think there is a tremendous resource in the collection of data on food insecurity in the United States. We have learned a lot more about what is affecting low-income and disadvantaged populations in this country through the form of food insecurity and its links to child development and other outcomes that we would not have had in the absence of this thing. For those who are on the frontier of designing these measures and getting them implemented I applaud you and thank you for pushing this agenda because I think we are a heck of a lot further today with that information than what we would have been in the absence of that.

Do substantial knowledge gaps remain? I think the answer to that is yes. We have learned a tremendous amount over the last 15 years and I clearly do not have the time to repeat all the great findings that were presented, that is the job of the Academy in their summary report, but
there are some recurring themes and I want to touch upon these. I want to preface this, these are my own comments, writing stream of consciousness over the last day and a half as I am listening to the presenters, so I am not speaking on behalf of the Academy or the other members of the steering committee and so they may all summarily reject what I am about to say.

Measurement matters, how we conceive food insecurity matters, how it is asked matters. I think Sanders' raised a very provocative issue about the screener and the sequence and issues that are associated with this about how we proceed to ask the questions in the actual implementation of the food security supplement.

I was engaged in a flurry of emails with Hilary Hoynes at UC Davis, who has worked extensively with Diane over the last several years, as Diane presented earlier. Along with Bob Chaney and Charlie Brown, at the Panel Study of Income Dynamics, and the PSID food insecurity is measured in 1999, 2001, and 2003 waves. And what you find is that the rates of food insecurity are about half. When you compare '01 and '03, which overlaps the questionnaire that you see in the CPS, the rates of food insecurity are about half in the PSID compared to the CPS for '01 and '03.
The question is why, so we sent a series of emails going back and forth trying to get a better handle of the screeners, that the PSID uses to ask recipients of whether or not their food insecure as opposed to the screeners in the CPS. I am afraid to say that I do not know the answer to which one seems to be capturing it more. Sanders observation yesterday, I think is going to cause me to go back and dig even deeper into some of these issues, but measurement matters.

I think the food insecurity scale has tremendous information in there. There seems to be recurring debate that you see even flow over into the advocacy community, whether or not marginal food insecurity is a correct measure, or food insecurity is a correct measure. Craig and I have done a lot of work for Meals on Wheels Association Foundation of America. and they like the marginal food insecurity measure but Feeding America likes the food insecurity measure. Maybe as a research community, we need to provide better guidance to the advocacy community as to which measure seems to be capturing which types of phenomenon and which ones seem to be most pressing.

It could be different, the Meals on Wheels folks are focused on seniors, and Feeding America worries about
the whole distribution, but there are some advocacy groups that are focused more on children. So maybe the contract matters whether we are talking about seniors as opposed to children.

Another common theme that came out is that there is a real shortage of longitudinal data in this literature. We can debate whether or not we can identify causal pathways with cross-sectional data versus longitudinal. I would agree with Craig that there are some abilities to do that with cross-sectional data, but there is a whole richness of questions that we can address with longitudinal data.

Of course, we could look at issues of duration, transitions on and off, but also the evolution of health status over time. There is a whole literature out there done in both the health profession as well as health economists have done about the gradient of health status, not only with the life cycle but also across the income spectrum. Then an interaction between age and income over the life cycle, and it is longitudinal data that allows you to do that. Mariana had some very provocative stuff about these multi generation links of hardships in childhood and food insecurity.
What is the current data? Are there data today that allow us to address some of these longitudinal issues? We have the ECLS-B and K that allow us to answer some questions but that stuff is what it is. The NHANES is not a panel, right, so you could do repeated cohorts but you have to make certain assumptions to use as a repeated cohort as opposed to a true panel.

But there is for example, the Panel Study of Income Dynamics and in full disclosure, I am on the board of overseers as the PSID, I am not paid so it is all volunteer work so there is no financial conflict of interest, but I have been a user of the PSID for 25 years. I did my doctoral dissertation with the PSID and I continue to use it today.

The PSID I think has come to life with a new generation. Starting in 1999, they started not only three years for three waves, ’99, ’01, and ’03, they collected the food security stuff. They also started to collect comprehensive information on health and consumption and you get assets. It is a data set where you are following families since 1968, and their children, and their grandchildren, and now you get also this additional depth of information on consumption and health and wealth.
But the food stuff was only available in those three waves and so the next time the PSID goes out in the field for example 2015, because they are doing the 2013 right now, it is every other year. In 2015, a 10-year-old in 1999, will be 26 in 2015, so this could be a low hanging fruit opportunity to add the food security scale back to the PSID to allow us to do some of our first intergenerational transmission of food security. Look at consequences of being food insecure as a child, as a young adult, as a 25 to 35-year-old as they would be starting in 2015. That is just one example.

Yes, there are some existing data sets today that we can utilize and go back to, to move forward to address some of these important issues on longitudinal aspects. But the PSID is still a comparatively small sample so statistical power is going to be an on-going challenge if we want to drill down to the concept of very low food insecurity. This is a serious challenge for the research community to address. The only data set that I am aware of that is offered on an on-going basis that provides adequate sample size is the American Community Survey.

We all know that a year or so ago the funding for that whole enterprise came up to challenge and I know Census is nervous about even the concept of thinking about
adding more stuff. Perhaps this is something where this last session where we think about the two-item screener or something along those lines, maybe not the full 18, but maybe a subset of the 18. We could somehow find the financial will to add to something like the ACS, which covers 3 million families in this country annually, to move forward to help us out a bit on some statistical power.

Coupled with trying to utilize some of the existing, there are some data today that we do not have that we could use, and this would come in the form of demonstration projects, which were raised by several of the speakers. What is the demonstration project that should be demonstrated? I suspect that is what the funders want us to come up with and I think we need to probably put our heads together a little bit about that type of stuff.

Under the Institute of Medicine Panel that I serve for the SNAP Program, we talked about some research suggestions regarding SNAP going forward, trying to deal with issues of geographic differences and cost of living that perhaps that there could be some demonstration projects to vary the SNAP benefit.

We saw some positive evidence from a summary of EBT evaluation that the benefit matters in reducing food insecurity, there is Shore Sheppard’s work, which was a
very labor and econometric intensive non-experimental assessment of, does an extra dollar of SNAP and the safety net matter for food insecurity showed very positive results there, that yes it does matter. So I think that there are a real scope for some demonstration projects.

In terms of populations that were highlighted the common themes, immigrants were a repeated theme throughout the last day and a half -- understanding more about the challenges and hardships faced by the most recent arrivals in our country. Those that face disability, whether physical or mental and that disability, whether it is suffered by the parent in the household or the child, or both.

A couple of ideas and let me wrap-up here. Next steps, we need more research and I have been the fortunate, in conjunction with Craig, the fortunate beneficiary of running a program for FNS for the last three years as I mentioned yesterday.

Whether or not our program continues on going forward, I personally believe that a tremendous amount of momentum is moving forward on the research spectrum of childhood hunger. I really encourage the funders to keep that momentum moving forward. My program alone has funded now 34 separate projects on childhood food insecurity.
Many of the recipients are in this room, Judi through the RIDGE Program has funded a number of program projects over the last several years through the ERS RIDGE Program as some of the other RIDGE centers. My encouragement is keep the momentum moving, we are learning a lot right, let’s keep moving forward.

How do we do that? One idea of course, as the funders speculated in their background, there could be some notion of centers of excellence and it does not necessarily have to be one, it could be a few centers. But ASPE, the Assistant Secretary for Planning and Evaluation, in HHS has been running poverty research centers since the 1960’s so there is a model out there. Of course, NIH has the POP centers and what is slightly different I think from the RIDGE is that the POP centers and the poverty centers have a very strong component of mentoring the next generations of scholars. Diane mentioned about funding graduate students and I think that certainly has been a fundamental component of the center that I run is mentoring the next generation and so I think that is one mechanism that we need to take advantage of.

I think the idea of creating a network of scholars, bringing this human capital that is in this room for the last day and a half I think has been tremendous. I
think this type of thing has to happen on a much more regular basis. It does not have to be 75 people, maybe it is 30 or 40, or even 20 but the idea is to keep a community of scholars connected with one another, bringing ideas from medicine, from public health, from economics and sociology, social work, nutrition, and so on and so forth.

Craig and I have evaluated a lot of proposals in the last two years, three years, with this challenge and one of the things that has been a challenge is that not all the surveys have the 18-item scale. If they have a shortened scale some of the surveys have some questions, some surveys have other subset of questions, so maybe one idea is you could set aside some funds to create a questionnaire bank. People would have a mechanism to apply to use, for example, if the Three City Study wanted to go back into the field and they wanted to do more with food insecurity.

Maybe we have some of these good surveys out there, maybe there is a mechanism that these surveys need an outlet to apply for funding to add these questions onto their surveys. We have a lot of local focus surveys, we have some more widely scaled surveys, and there is a wide dispersion of questions out there and some of them may only have had one or two and they always say we did not have
funding to ask more. Maybe thinking about going forward a mechanism to allow people to add at least a subset of a commonly agreed upon set of questionnaires.

Of course, they would have to be applied for and verified. I am not saying that you would just give the money away willy-nilly, it would be a competitive type of program but just some mechanism to keep us moving forward and branch out the types of data that we can collect this important information from.

Let me open it up for some final comments.

DR. SMALLWOOD: I am not a researcher, I am a manager but let me say four things, data, data, data, and models. The research centers are great and we support all those but 95 percent of the research that was presented here was based on data that we had the foresight to fund years ago. The measure that is in the CPS, the CPS was before us, the measure in PSID, the measures in the ECLS-B and K. If you did not have the data, the researchers would still be grinding on the same stuff. When I talked to Alisha, she told me there were 127 households with very low levels of food insecurity of children.

Are you going to do case studies on those? We get those at a cost of $600 thousand a year and that is low because we are able to build on the CPS survey that is
already out in the field. Now you mentioned more data, if you go longitudinal we would need another type of survey to do that and to find enough very low food security over time that is more budget than FNS has. I want to encourage ideas about thinking outside the box on data, and that is, are there ways of latching onto any of these monitoring systems, the school system type approach that Ed mentioned. Are there any administrative systems that we can link into and when you do that you might have to give up the 18-item approach? There might be some biological markers or something so maybe research that could inform different data collections. I think coming back to models and a metaphor that Alisha had earlier, that rather than just looking at the 127 households in the CPS you could look at the iceberg and not just the tip. If you can understand the models, which are causing, or whether the causes of the consequences are, maybe you can extrapolate from the base to the tip and I just throw that out.

DR. ZILIAK: Let me respond briefly, those are great points Dave, thank you. I was going over my notes and one of my sidebars was to encourage the greater linking of administrative data to currently existing data. This of course can address a number of issues of under reporting
that we did in surveys that we could pick-up and perhaps improve.

The standard non-experimental evaluations, say for if you are looking at SNAP on food insecurity, we have selection problems or reverse causation and then you have measurement error under reporting. The linking of admin data to currently existing data sets can solve some of that measurement error and problem, and still require some good mechanics to deal with the reverse causation. But we know how to deal with those.

MS. MURPHY: Hello, my name is Mandy Murphy, and I am a Masters in Public Health student at University of California at Berkley. I am very grateful to have had the opportunity to be here and I would just like to share a few thoughts that I have had from my perspective early on in my career. To me being here it is very clear that we have a problem of food insecurity among children. But what is also clear is that we are very unclear on how to perfectly define the problem and it seems that if we try to attempt to completely, perfectly understand and define the problem by improving measurements and methodology and understanding determinacy, the problem will have probably shifted by the time that we define it perfectly.
I instead invite and challenge us and maybe myself early on in my career, to really as the people that robustly understand this problem the most to start being the leaders of initiative and creative solutions including the people that we are trying to help as an integral part of the conversation, and ultimately the solution. I would love to see some more innovation about utilizing the community resources we already have, creating new solutions, and looking at how to improve the federal assistance food programs. Thank you.

DR. ZILIAK: Thank you for your comment. I think that is a great observation, we certainly in this time of financial and fiscal retraction, evidence-based policy development is more key than perhaps in times when the federal coffers are more flush. I think Alisha made this observation early on, which is keep the eye on the prize and that is work towards finding creative solutions to the problem. Thank you.

DR. HIRSCHBERG: Jay Hirschberg with USDA FNS. I want to thank you and all of the speakers here. I want to thank CNSTAT and the Academy in general for sponsoring this. Steve is not here right now, he is off doing other duties, as an Associate Administrator must. This has been a wonderful event, I think as you said, and I do agree with
you that trying to keep the network alive will help. It is important for all us to recognize that we have a unique opportunity here.

The Healthy Hunger Free Kids Act, Section 104-A, has provided a one-time $10 million investment to look at the causes and consequences of child hunger and that is money that we want to make sure is invested with the greatest wisdom on behalf of this nation and how we do it. It is something that I am sure all of you here are intensely aware of and probably hoping to get a piece of. Let me go beyond that to say however, do not forget about Section B of 141, which also provides access a one-time investment of $40 million for demonstration projects to actually show what can be done about that.

Now part of my concern is and I think it was mentioned earlier, the timing is such that is unlikely that we will have the results of all the investment in the $10 million dollar work that is going to be funded under Part A, before we have to make decisions about how to invest in Part B. But I want to make sure that as we start talking about Part B and what is going to happen with that that you folks are involved in the projects that will emerge there. Because demonstration projects without truly rigorous evaluation to give us knowledge and results are largely not
much more than doing additional investments in benefits to clients. Which certainly might have its value but it does not have the same kind of long-term lasting value when it is coupled with a rigorous evaluation.

Because once things are taken to scale, it is very difficult to do the kind of research that was possible when things are in a demonstration phase. So as you start thinking about things, please try in advance of anything that comes out as official announcements to get together with other partners and teams in the room and figure out what might be done, and think about not just the $10 million on the research stuff, but also the kind of things that would be demonstration projects that might actually be evaluated. How you would partner with folks who actually could field things. Most of you here may not be true experts in fielding a demonstration, you are the evaluators for the most part that I can tell, some of you have very mixed experience there but we would like to make sure that is really coupled together to give us the best we can get. Keep in touch with each other and thank you very much for pulling this off.

DR. ZILIAK: On that, I say safe travels. Thank you.

(Whereupon, at 2:15 p.m., the meeting adjourned.)