

Erta Kalanxhi

Hello, everyone, welcome to today's session. My name is Erta Kalanxhi. I'm a researcher at CDDEP and I'll be moderating today's session. Today is the fourth one in a series of conversations on global health, which we launched to celebrate 10 years [of CDDEP].

We'll explore the long-term effects of early nutrition, health, and non-outcomes, as well as economics, and also discuss some challenges. For this today, we are very happy to be joined by experts in the field that will share with us both research findings and their views on the topic. So here with us today we have:

- Dr. Jere Behrman, professor of sociology and economics at the University of Pennsylvania
- Dr. Marine Black, professor at the Department of Pediatrics at the University of Maryland.
- Dr. Purnima Menon, senior research fellow at the International International Food Policy Research Institute
- Dr. Arindam Nandi, senior research fellow at CDDEP.

We will have a discussion with the speakers and then we'll have some time to take some of your questions, so please submit your questions in the q&a section in the chat.

We are ready to open our session. Initially, Dr. Ramanan Laxminarayan, director of CDDEP, was supposed to be here and give a brief presentation or a brief introduction to this topic. He's not able to join us here today because he's leading campaign efforts on trying to raise funds in order to help with the situation in India. As you all know, the situation has been dire all over the world, but recently it has become so much worse in India. So our colleagues at CDDEP are working hands-on at the moment and trying to raise enough money to buy oxygen tanks and concentrators, in order to help those who cannot afford them.

So basically, the situation on the ground is that hospitals have reached their capacity and doctors are advising people to get treatment at home. But there are so many who cannot afford life-saving medical oxygen. For this reason, the CDDEP team in collaboration with a lot of other team members and other organizations has started this effort called Oxygen For India. You can visit our website at oxygenforindia.org and you can make donations through that website. You can also make donations through our own website at CDDEP@org.

Thank you. Thank you for listening. I took the opportunity to bring this to your attention since this is something that is affecting all of us these days. We are now ready to start our discussion on childhood nutrition, and I will start with Dr. Jere first. Thank you very much for joining us today.

Some of the things that we wanted to discuss are health and non-health outcomes related to childhood nutrition. How does early childhood nutrition affect future health and non-health-related outcomes? What are the main pathways governing it, and what do we know about the economic returns? Over to you, Jere.

Jere Behrman

Okay, thank you very much. I'm pleased to be here as a part of CDDEP's 10th anniversary celebration, of course, very sorry, given the current situation in India. The work on undernutrition, or particularly chronic undernutrition, tends to focus on stunting. And here's an example of two little girls in Peru. The shorter one actually is the older of the two and she is stunted. The other one is of normal height.

Stunting has a technical meaning of more than two standard deviations below the median of a well-nourished population. In a well-nourished population, there'll be some children who are stunted about 2% or 3%. But if you look at the world as a whole, the amount of stunting is much greater than that down in this corner. It's about a quarter, 10 times as large. It's particularly large in Sub-Saharan Africa and South Asia. And in terms of numbers of people, this means for children under five, there's well over 60 million in Sub-Saharan Africa, over 60 million primarily in South Asia, and over 140 million children under five who are stunted. This stunting occurs in a substantial, very early part of life.

These are the months of life along the horizontal axis and the blue line is the line of interest. This gives the average height-for-age Z scores. In a well-nourished population, these would be at zero along this horizontal line, but in poorly nourished populations, there are sharp declines over the first 24 months of life and then it tends to sort of flatten out. This has important physiological considerations because it's the time of critical physiological growth.

Also important are neurological considerations because of important neurological changes that are occurring during this stage of life. This is a summary from a well-known article by nutritionist Cesar Victora, the lead author, from *The Lancet* which is the relationship between schooling attainment, adult height, labor income, and birthweight of offspring, with a number of anthropometric measures early in life and finds these significant associations.

This is an example that Harold Alderman and I produced, using the best data we could find, in which we tried to summarize the present discounted value of moving a child out of low birth weight status and low-income country contexts to no longer being in that status. And the points I want to make here are, there are a number of outcomes over the life cycle. We include seven of these outcomes. Secondly, that given the data available, the best we could find, the big gains are not early in life, not from say, reduced neonatal care — but from productivity gains during adulthood. They account for the largest share of the weight.

I'm going to spend the rest of my time talking about the INCAP nutritional supplement trial, which is in Guatemala and occurred from 1969 to 1977. Two villages were given atole, which is a high protein energy supplement, the other two were given fresco, less nutritive and particularly without protein. Supplements are available to all every day over that period of eight years and all children under seven in '69, or who were born over the period of this study were enrolled. And you can see here, this is the height-for-age Z score. Again, zero would be what you expect for a well-nourished population.

This population is much below zero from birth, declining to severe chronic malnutrition, less than minus three by 24 months and leveling it off a bit after that. The supplement delivery was all you can drink. This is the immediate result of the supplement. Atole is a protein-enriched supplement, fresco is the alternative. This is the percent of children who are severely malnourished. This is a very malnourished population, almost half the children were initially severely malnourished. For fresco, that didn't change much. But for atole, with the protein enhancement, that dropped considerably into half over the time period.

So there are a number of subsequent data rounds that I won't discuss. We basically look at the effects of the supplement by the following consideration: the supplements occurred from 1969 to 1977. Those who were completely exposed to the supplement were from 1969 to 1974, others were either too old or too young. So basically, we compare a complete exposure with lack of complete exposure for atole and for fresco. And we get a number of impacts in terms of education. For women, but for women only, schooling improved by 1.2 grades. That's a very large increase in average schooling for women, this population was something like five or six grades.

For reading and cognition, for both men and women, there were increases of about a quarter standard deviation, 35 years later, in their scores. So there were persistent improvements in cognition. In regard to adult economic activity, the key point is the bottom line here for men, and for men only, wage rates increased by about 67 cents an hour, about 0.4 of 0.5 standard deviation, which is a very large increase. We perceive it did not occur for women because of the nature of the occupational distribution by gender.

For men and women, there were some effects in the long run. This bottom bullet point summarizes those. Some are bad: increased fatness, blood pressure, and blood lipids. Some are good: reduced post-challenge glucose, reduced odds of diabetes. Again, this is almost 50 years after the original intervention. Across generations for women only, not for men, there were significant effects with the children of the women increasing about 100 grams of birth weight, over a centimeter taller, larger head circumference. Here's height-for-age Z score, red for atole, blue for fresco. You see, for different ages, the children of the atole mothers had better height-for-age Z scores.

Then, all these estimates that I've summarized so far are the impacts of the experiment itself, of the supplement. But we also looked at the impact of height-for-age Z scores at age 24 months and at stunting at 24 months, using instrumental variable aspects to control for endogeneity. And the bottom line is, there are impacts on many dimensions of adolescent and adult life – improved education, labor market outcomes, reduced poverty, limited impact on health outcomes, improved marriage market outcomes, improved fertility outcomes – so these supplements had very widespread impacts.

Now at this point, we've talked only about the benefits, but presumably what's adventurous for policy are the benefits relative to the cost. So we've also done estimates of those. These are costs summarized, which vary depending upon the context and upon the intervention. And here are the benefit-cost ratios estimated for a number of high-prevalence countries primarily in Sub-Saharan Africa and South Asia.

We actually attempted to be conservative making these estimates. The benefit-cost ratios, the loss of these is 3.8 and the DRC, all the rest are over 10. You may suggest if our estimates are all credible, very large benefits relative to costs from improving macronutrition in these populations. Thank you very much.

Erta Kalanxhi

Thank you, Jere, for that. We're now going to direct a question to Dr. Maureen Black and that's on nurturing care.

So concerning nurturing care, how important is it for a society's long-term health and well-being, and do you think that we're investing enough? What did you consider as priorities for the next 30 years, especially in low and middle-income countries? And you have prepared some slides, so that's great. Thank you.

Maureen Black

Very nice, thank you. Let me start by saying that our hearts really go out to the people of India and the terrible issues related to this virus and what we know is that, it increases the disparities and those who have the most disparities are at the greatest risk. So our hearts certainly go out to the people of India. I will talk about nurturing care, and let me start by defining what nurturing care is.

The science behind nurturing care came from a series of papers that were published in The Lancet in 2016, 2017. And as you can see on the slide, nurturing care includes five components. Nutrition, of course, is a key component in nurturing care. This means what children need, what all children need, so clearly they need adequate nutrition, healthy nutrition. And on the top, you can also see they need good health. These are critical aspects of children's growth and development.

And then you'll see on the left in the red that they need opportunities for early learning. This often comes through play. And then over on the right in the medium blue, you'll see that they need responsive caregiving. That means someone who is loving and nurturing and listening to them and playing with them. And then on the bottom, you see security and safety – they need protection from infections, protection from violence, and the security of having a stable place to live. This is what all children need to grow and to develop.

Where does that come from? Where do children get this? Well, they get it from enabling environments. So the enabling environments, you can see the circle of nurturing care sitting inside these green concentric circles.

The first place that children get nurturing care is from their families, from their caregivers, from their homes. And so what that means is for children to be able to get these five components from their families, their families need support, their families need to be able to provide these five components, so they need the support to do that. And that takes us to empowered communities that can support families and can enable families to provide this, and then that takes us to supportive services. So those are services for those who need additional assistance with nutrition or with health or with any of the other aspects. Those are part of the enabling environment.

And then that takes us to policies. These are child, family-friendly policies that can provide universal care for children, can provide education, and can enable families to provide support for their children. Now, the way nurturing care works is that you need all of them. They are interdependent, and they work together. So if one of them is awry, if one of them is not working, then the system does not work well.

As Jere showed you when children are not growing well, when they're stunted, when their nutrition is poor, the rest of the system does not work well so you need all of them, they are all critically important. There's not one that's more important than the other. We need them all, they all go together.

So the science behind this was developed and reported in The Lancet series. Then the World Health Assembly adopted Nurturing Care in 2018 and WHO has really advanced Nurturing Care, and you can see many countries around the world have begun to have programs related to Nurturing Care. This is for children in the first three years of life. This is a formative time, and we've learned that what happens early in life stays with you. So we better get it right. The building blocks will do better if they have Nurturing Care.

So what's happened recently is that we have recognized that, yes, the first three years of life are critically important, but that nurturing care really operates from a life course perspective. What this diagram shows is, you can see the five components of nurturing care, but then you see that really where they start, is prior to conception. So they start with the health of the parents before conception occurs. And then it's the health and well-being and nutrition of the parents prior to conception. Then during the prenatal period, so during pregnancy, and then you see the infant and toddler, and then you see the preschooler, and the middle childhood, and then up through adolescence, and then it goes back again.

So it's an intergenerational cycle that occurs. So yes, we need nurturing care during the first three years, but it's not one and done. One continues to need, our children continue to need, all the components. They continue to need the nutrition, they continue to need the learning, the protection, the relationships. So those continue to be important.

And you can see then the enabling environment that starts with families and extends to communities and services and policies, and then it goes beyond to the economic, sociopolitical environment and to climate. This is a conceptualization that takes nurturing care and spreads it from preconception through adolescence. This is a recent paper, in fact, one of the authors of this paper was Dr. Behrman. So we're

excited about talking about nurturing care in a broader perspective, starting early in life, but continuing through adolescence. So we think of childhood as a continuum rather than segments.

I'm going to show you some examples of how nurturing care works. The first example is from India. This is a project that we did in collaboration with the National Institute of Nutrition in Hyderabad. The rates, as you know, rates of anemia and iron deficiency are very high in India and in many other low and middle-income countries.

So, what we did is work with the Anganwadi Centers. India has an amazing system of the Anganwadi Centers throughout the country, very impressive. So we worked with children who were ages three and four who were enrolled in Anganwadi Centers, and half of them got micronutrients during the first bites of their midday meal. So that means when the midday meal was prepared, a small amount of the first bite that the children received either had micronutrients or had a placebo. You can see the picture of the children there.

And the rest of the bites did not, so we made sure that the micronutrients went in the initial bites, and that happened for eight months. Then we looked at the children's rates of anemia, along with other micronutrients, and then we looked at the children's development, aspects of neurocognitive development. And what we found is that the rates of anemia, starting at 47%, dropped to 10% among the children who received those first bites of micronutrients. That was in comparison to the children who received the placebo, their rates of anemia dropped to 36%. So you can see the dramatic difference between those kids who got the micronutrients and those kids who did not.

You can see it in ferritin and you can see it in some of the other micronutrients as well. So this method of delivery is relatively economical, the micronutrients are not expensive, but the delivery can be expensive. This way, working through the Anganwadi Centers and having the teachers mix it in the midday meal was a relatively efficient way of providing the micronutrients. Well, that's fine, they got the micronutrients, but how about their learning? Did it have any impact on their learning?

So we evaluated children before we had a baseline and we had an endline. And this is just an example of how we found differences in three areas of learning. This is an example of the language scores, and it's particularly prominent in the lower-quality Anganwadi Centers. So you can see in the drawing on the lower left, that the children started off fairly similar and the ones who got the micronutrients are the dark line on the top, the ones who got the placebo are the dotted line.

So they did not gain language skills at the rate that the children who received the micronutrients did. That translates roughly to a difference of what would be the equivalent of about six IQ points. Language among young children, again, these are three and four year old children, is a very important component of development that predicts subsequent development in primary school, or academic achievement. We were very pleased to find this. We found this on language development and socio-emotional development and also in an aspect of executive functioning, so the children's regulatory processes also improved. We were excited to be able to see that these micronutrients early on also impacted the

children's learning. Now I want to show you a study that we recently did using data from two birth cohorts, one in Brazil and one in South Africa.

This is the conceptual model. We know that when children have early adversities, and this could be low birth weight, this could be mothers who are undernourished themselves or who are not well educated, then that places children at risk throughout life. The adversities are represented by the gray circle on the left, and then throughout life we are looking into adolescence. So the pink on the right circle represents human capital. So human capital would be aspects of growth, aspects of intelligence, and psychological functioning.

The question was that if you had a nurturing home environment, could you disrupt the association between adversities and low human capital? Could you alter that? In this study, what happened is that there were home visits among families when the children were preschoolers, between two and four, and during the home visits, they measured the responsive caregiving and measured the early learning. So that's the red box that you see, so that's measuring nurturing care in the home.

The question is, if you have a household where there is nurturing care in the home, then do you disrupt the association between adversities and human capital? Well, let's see. What the next slide shows is that in the box on the left with the red around it, these are households where the nurturance is low. So there's not a lot of learning and there's not so much warmth and interaction.

And the blue box represents children who do not have a lot of adversity, the red box medium [adversity], and the green box represents children, this is all in this red square, who have a lot of adversity. So when the children were adolescents, we measured their IQ, and you can see that there's a clear linear trend for those in the low nurturance household. So those kids who had low adversity had higher IQ and those kids who had high adversity had lower IQ, as you would expect. That's what we found.

When you look at this rectangle on the right, the green one, you'll see there's no difference in their IQ, it's not there. But we still had children who had low adversity early in life, medium adversity, and high adversity. So what happens, the way we would interpret this, is that the nurturing household was able to mitigate the relation between early adversity and children's IQ during adolescence.

So we found that nurturing care not only promotes development, but it can overpower some of the adversity that you have early in life. So that was an exciting, interesting finding. So if we take these together, what did we learn? Well, we learned that economic growth requires adults who have high human capital – that means they have health, they have intelligence, they have psychological well-being, and they're able to handle the demands of the 21st, 22nd century. And in order to get there, we need healthy, well-educated, functioning children.

We know that nutrition builds healthy bodies and healthy minds – we know that happens. But we also know that there are millions of children who are raised with multiple early adversities throughout the world, and we know that these adversities increase the risk of low human capital. So what have we

learned? We've learned that nurturing care, and that includes nutrition and health and responsive caregiving and learning opportunities, can mitigate the negative consequences of adversities on human capital. In other words, it can break that relation. So we know that nurturing care can build high capital. So I thank you and look forward to the discussion.

Erta Kalanxhi

Thank you. Thank you, Maureen, for that very, very lovely presentation. We had another small question for you, but I think you've touched upon it.

You touched upon it with your presentation, but do you have any other comments on the intergenerational aspects of childhood nutrition, for example, parental health, schooling, and economic status in association to childhood development?

Maureen Black

Thank you, yes, absolutely. If you look at this slide that we showed, looking at nurturing care and the life course perspective, you see that if you are investing in the health and development of adolescents, then not only is the adolescent functioning better, but that goes back and the offspring of the adolescents, when they become parents, are more likely to be of a healthy birth weight and healthy birth length and not stressed or challenged during pregnancy. So certainly, it makes sense, that's why we have the life course aspect. It's not one period, you invest there, and then you're done. There's a continuity to it, a continuity in education. It starts early, but you have to continue it. So I'll stop there.

Erta Kalanxhi

Yeah, thank you for emphasizing that. Thank you. That was a very nice illustration.

Over to Arindam. Okay. So, at CDDEP, we've done a lot of work on the long-term benefits of early nutrition in India. Could you please share some of the findings?

Arindam Nandi

So first of all, thank you for having me. And thanks to all the panelists for joining us today. I'm going to jump right into the work that we've done based on the ICDS program in India and Maureen talked about it a little bit. It's one of the largest nutrition programs in the world, focusing on early childhood within the first six years of life. This is a program which is across the board in India and children are given supplementary nutrition, either to take home or at the center.

There's also several other components of the program starting from vaccination and health checkup, and referral and nutrition education for the mothers as well. So this is a program at the community level which is run by Anganwadi Centers. There's one center in each village, and it has over 100 million nutrition beneficiaries and over 35 million preschool education beneficiaries. It's a very large program with a \$3 billion budget last year.

And recently it was combined with three other programs to make it a package of childhood nutrition and health programs for children and nursing women and adolescent girls as well. So the bulk of our work is based on this nutrition trial which was done as a part of ICDS back in 1987 to 1990. Now near Hyderabad in India, there were 29 villages and of them, 15 were included in the intervention village where a ICDS program, along with the food supplementation, which is a daily cooked meal for pregnant and nursing women and young children, was introduced for three years and after the end of the trial study over the three years, another 14 control villages were then introduced into the program.

Now this program gave a daily cooked meal, which had about 500 calories and 20-25 grams of protein for women and about half that amount to children. And in the intervention and the control groups there were, you know, similar levels of healthcare access and public health programs at the beginning of the trial. And back then, the main objective of the trial study was to assess the impact of this food supplementation in utero and in early childhood on the birth weight of infants.

This is a quick map showing where the study was. Roughly, these are the locations of the villages. Now, this is interesting. So, then the study was followed up several times, first in 2003 to 2005. This is Sanjay Kinra and his collaborators – Sanjay Kinra, who is based at the London School of Hygiene and Tropical Medicine, he and his collaborators went to the villages in that time and then they followed up with the women who participated in this trial originally and then they track their children, children who were born during the trial period of 1987 to 1990. And they were alive at the time of the follow up.

And they set up a clinic in these villages and then they invited the mothers and the children to participate in the follow-up study. Some of them participated in that round and there were two other follow-ups, 2009-2010 was one and the last one was 2010 to 2012. And they collected a lot of data on these families. The main focus of the follow-up was collecting a lot of data on general health and a set of biomarkers, and the objective of the studies were to look at, for example, growth of children and cardiovascular outcomes and so on. So that was a primary focus of the study.

Now later, this study, the combined trial and all the follow-up rounds, is known as the APCAPS, Andhra Pradesh Children and Parents' Study. We collaborated with them recently over the last four or five years. This is a joint work with Sanjay and Jere and Maureen as well in some of these papers. What we did is we went beyond...by this time, by 2016 when we published our first paper, the APCAPS researchers had published a lot of work on looking at health outcomes, essentially linking the nutrition trial and the food supplementation with long-term health outcomes of adolescents and children. So we went beyond health outcomes and we started analyzing the data. They didn't have a lot of data on cognitive outcomes

unlike other studies, but [they had] a very rich data set on schooling outcomes, school enrollment, grades, and so on.

So the first paper that we published in 2016 was using the 2003 round of APCAPS, where children who were born originally during the trial at this point were 13 to 18 years old. And we found using regression and propensity score matching methods that children who were born during the trial in the intervention villages and were exposed or received the nutrition in utero or during the first three years of life, those children, now adolescents, had higher school enrollment rates. Also, they had about one additional schooling grade, although we did not find any differences in test scores in school, not standardized test scores, but test scores at school.

And then we did another follow-up study in 2018, where we took the next round of the follow-up data. These children that were born back then were now 20 to 25 years old. We again found that remarkably, the schooling benefits persisted in adulthood as well. We found that they had higher completion rates of secondary and graduate level schooling and then, especially for women, 6% fewer women were married in the intervention group as compared with the control group, and in the overall sample, 5% higher employment or high education rates in the intervention group as compared with the control.

Then the third follow-up study we did was again using the same data set, we looked at the reproductive outcomes of women and men as well. We found that later menarche and later cohabitation for women with their partners and it also delayed pregnancy. Women who were born in intervention villages, their first pregnancy was about half a year later as compared with women born in the control group. We did not find any significant differences between the control and the intervention group in terms of the number of children they had at this point.

These three studies were based on the child data and the follow-up, but then we also went beyond that and we used the nationally representative survey and this is the fourth study that I'm going to talk about. We used a National Family Health Survey, which is the standard DHS survey done in 2005-6 in India, and we were able to track all the adults in the survey in the age group of 15 to 59. And we have data on their grades of schooling. We also had data on whether they were living since their birth in a village with an ICDS center.

So there was a question of whether the village had an ICDS center: yes or no? And if the answer was yes, there was also data on the year of establishment of the ICDS center. So we matched the year of establishment with the birth year of the adults. And then we compared adults who were living during the first three years of life in a village with an ICDS center with other adults who did not have an ICDS center in their village during the first three years of life. And we find that adults who were exposed or who had an ICDS Center in their village during the early years of life had higher schooling grade attainment as compared with adults who did not have a center, or who had a center which was established later, after the first three years of life.

So these are the main studies that we have done all related to the ICDS. There is another study, the fifth one, which is slightly different. It does not look at ICDS nutrition, but it looks at breastfeeding duration. There also we used longitudinal data from APCAPS and the India Human Development survey. We had information on the breastfeeding duration for children from their mothers in the first round of this longitudinal panel survey, and in the second round, we had data on their test scores and schooling grades and school enrollment.

Using these two data sets, we found that longer duration was linked with higher test scores in APCAPS and similarly in IHDS, the Indian Human Development Survey, which is a nationally representative survey, we found that a longer duration of breastfeeding was linked with additional schooling grades as well. So that's the bulk of the work we have done, and the last one is sort of a follow-up of what Jere has previously touched upon. This is another study which Jere, I, and others wrote, where we found that benefits-cost ratios were really high of early childhood nutrition investments in low and middle-income countries. So that's a quick summary of the nutrition work we have done, focusing mostly on the ICDS program in India. I'll stop there.

Erta Kalanxhi

Thank you, Dr. Nandi. All right. Thank you very much for giving this very nice summary of very important work. I'm now going to direct my questions to Dr. Purnima Menon.

The question is on challenges related to childhood nutrition policies in low and middle-income countries. Do you see any success stories? For the countries that have struggled making improvements, what are the lessons to be learned?

Purnima Menon

Thanks so much for that. So I didn't prepare slides because I thought this was a panel and we were going to talk. Let me first say, congratulations to CDDEP, it's been really nice to see your work evolving on nutrition and Arindam, I thought that was a great summary and some really important pieces of work there on nutrition. So I really look forward to seeing more of that.

Second, I think what was so nice for me about Jere, what you presented and Maureen, what you presented, which were really reflecting on the impacts of carefully done interventions on change over time and then that dovetailing, Arindam, with your work on interventions and programs and then to the national surveys is that I think we're at a point now where we have a lot of evidence from the intervention literature on the kinds of interventions that work. But what's been for me a very rewarding piece of research that we've been doing, both at IFPRI and with a broader network of researchers under the Exemplars in Global Health team is, and I'll drop that in the chat box in a couple of links there for

people to go take a look, is that we are now seeing a body of real world, large scale change, studies of large scale change at the national and sub-national level in many different countries.

We've had the privilege of actually bringing that together in the most recent Lancet nutrition series, which just came out in February 2021. And before this meeting ends, I'll drop a link to that in the chat as well for everyone. And so I think what's so clear in the success cases that we've seen, and actually I'll just focus my comments on that, is firstly, that we've seen that success is possible. So, in the Lancet nutrition series, for example, we summarized about 20 national or sub-national success cases, and four of the sub-national success cases we showcased on reducing stunting, are from Indian states, to make a nod to that.

But the other thing that is very remarkable about the success stories is I think it maps phenomenally well to what, Maureen, you were talking about in terms of the vulnerabilities. But also, in a sense, what I think really comes to me in the nurturing care framework is how important it is to have actions in many different sectors. So the line that I'm using now is that you can't solve nutrition, or the challenge of nutrition, with just a nutrition program.

I think if we go into the nurturing care framework, if we look at the success cases that have been analyzed very thoroughly, actually, between the research team, and network link to IFPRI's stories of change and the Exemplars in Global Health that is summarized in the Lancet, it's so clear that we need to change the vulnerabilities, we need to change the household, societal, and familial vulnerabilities that put people in conditions where they're not able to provide the kind of nurturing and nutritional care that we want for their families.

But I think what we've also seen is that change is possible, and that change is possible at scale. So the countries that we have documented and seen changes for, in addition to the four states that I mentioned for India, we've seen documented successes in Peru, Senegal, Nepal, Bangladesh, Ethiopia even, and none of these are small, tiny countries. These are countries where change has happened at a pretty substantial scale. And it's now, in a sense, incumbent upon those of us who work in the sector to really drive home this message that you need action in multiple sectors to create these nurturing environments. So let me stop there on where we have seen success.

The question of where have we seen failure or what are we concerned about on the failure side, is very much that in big countries like India, the big states, the biggest states, that carry very large birth cohorts — so the states of Uttar Pradesh, Maharashtra, Bihar, Madhya Pradesh — these are states where change has been slow, even in the previous decade in which we studied success cases. But more importantly, these are states that are going to be affected in very difficult ways, even as we look forward, in terms of the impacts of the pandemic and what that's doing. I mean, UP, for example (Uttar Pradesh), has a birth cohort of 5 million a year. That means that if 50% of those 5 million births missed antenatal care visits, that's two and a half million kids whose mothers didn't get the care they needed.

And so I think, for me, as I look forward, I feel like all our attention, or a lot of our attention, has to go to those places in low and middle-income countries where most children are being born. We have to turn our attention to states and countries with a high burden and high numbers if we want to see the numbers change in the world. I'll stop there.

I'll drop a few of those links and what I tried to do here was to connect the dots across what each of you had shared so eloquently about the findings from individual research studies, and then some of the large-scale research studies, and the frameworks that we have to kind of look at the challenges that lie ahead and the successes. So thank you for that. I can see questions are starting to come in on the chat box as well.

Erta Kalanxhi

Thank you very much, Dr. Menon, for tying up and bringing together all the presentations and discussions today. Some very interesting points, especially the question on how the COVID pandemic may have affected everything today in relation to childhood nutrition. We are going to look at some questions from the audience.

There's one in particular, it's open to Dr. Black, but also others, and it's with regards to if you'd have any comments on the ethics around the randomized control trials in nutrition research, and especially in low and middle-income countries where, for example, giving some children micronutrients while others receive placebo might be a problem since the benefits are expected or now.

Maureen Black

Thank you for the question. The ethics of doing these studies is always of paramount concern. That particular study that was done in collaboration with NIN, we had to go through the ethical approval both in India and in the US, it was a collaborative study. When we designed the study, we went in an area and used what the children were already receiving.

If you think about the micronutrients, it's not obvious that there's always a benefit and, in fact, one of the things we were concerned about was the consequences, could there be negative consequences? So we instituted a surveillance system. It was also completely double-blind, meaning we did not know, the teachers did not know, the packages looked exactly the same. So it was totally double-blind by preschool.

And then I think it was important to say we instituted a surveillance system. That meant that there were visitors to the households monthly that asked about diarrhea and respiratory infections and any other concerns which, fortunately, we did not find, but certainly the care and well-being of the children are

paramount. The issue is, if you don't do this, then you don't have evidence and you don't know how much or if there has been an improvement or not.

So we try to be careful. We work with partners, as researchers typically do, so that we're all in this together. But I applaud your question on the ethics and it's something that we should continue to think about and to be concerned about as we move forward.

Erta Kalanxhi

Thank you very much for that answer. There's another question that may also be directed to you because it's on maternal mental health and how that could impact nurturing care.

Maureen Black

Thank you also for that question. There's no question that maternal mental health is really a very, very critical issue, both in terms of the biochemical aspect of it, so that's what I call card-carrying mental depression, but also the millions of women and fathers and men who have mild levels of depression, so it's not enough to carry a strong diagnosis, but also symptoms, because they can interfere with caregiving.

So yes, this is a concern. And what we do about it is look to see if there are services that have been instituted by community health workers, and some have been published that can be effective. So maternal mental health is certainly an issue and one that we should not ignore. On my slide of early adversities, maternal mental health is in there. Thank you again, it's an important issue.

Erta Kalanxhi

Thank you very much. First of all, thank you to all of you for your presentations, for the links. Thank you for showing up today. These are really hectic times, I see that we've reached our time limit for the webinar.

I'd like to say thank you to everybody who participated and I'd also like to say that our next webinar in the series is going to be on antimicrobial resistance, another important topic that CDDEP is involved in, but this time from the One Health perspective. So thank you again.

And I hope you've had the chance to visit oxygenforindia.org and be aware of the campaigns and the effort that is ongoing to help, as much as possible, people who are in great need at the moment. So thank you very much and have a good day, everybody.