



# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

## The Role of Micronutrients in Child Growth and Development

### Webinar Transcript

#### Katie Appel

Good morning, afternoon, and evening, thank you all for joining today's webinar to learn more about the role of micronutrients in child growth and development. My name is Katie Appel and I'm an assistant researcher for the Feed the Future Innovation Lab for Nutrition and will be your MC for this webinar today. As attendees are joining, I'll begin by going over some housekeeping items. I'd like to direct all attendees to a few functions on this zoom webinar. At the bottom of your screen, you should see a chat icon and Q&A icon. Use the chat feature to engage in relevant conversation with other attendees. If you have a question for one of the panelists, please use the Q&A feature. Panelists will respond to questions in the Q&A box throughout the webinar, and we have allotted the final 25 minutes of this webinar for Q&A. If you are experiencing any technical difficulties, send a message in the chat box to all panelists so that our technical support staff can work with you to resolve them.

This webinar is being recorded and will be made available on the Innovation Lab for Nutrition website and the USAID Advancing Nutrition website. There, you can also register for upcoming webinars and view recordings and slide decks of previous webinars. We will repeat these technical housekeeping items in the chat throughout the webinar as people may join in at later times. I'd like to begin by introducing Dr. Patrick Webb, who is the director of the Innovation Lab for Nutrition and the Alexander McFarlane Professor of Nutrition at the Friedman School of Nutrition Science and Policy.

He will provide a brief description of the Nutrition Innovation Lab before introducing the moderator for today's webinar. Over to you.

#### Patrick Webb

Well, thank you Katie and welcome everyone. Welcome back to those who already participated in some of our Nutrition Innovation Lab webinars and welcome to new attendees. Just brief background, next slide please, the Innovation Lab for Nutrition has been, is one of a suite of Innovation Labs supported by USAID and its many partners around the world. Our Innovation Lab on Nutrition has been working on a large array of different kinds of topics from very applied research around multi sector and nutrition programming to more frontier science. Inquiry around, for example, the role of mycotoxins in child growth and development and birth outcomes, in a range of different countries. So, the kinds of work that this Innovation Lab has been doing ranges from randomized control trials through to observational studies, ecological studies, secondary data analyses, and a lot of capacity building, and training and workshops at the same time. All of it aimed at informing evidence and program support to achieve the right kinds of outcomes that we want in improving diets, reducing poverty, and enhancing nutrition.

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Today we're going to deepen our relationship with USAID, next slide please, because we're thrilled to have with us among the many different partners, which the Nutrition Innovation Lab has worked with both in the US and globally, we're thrilled to have with us both Shawn Baker and Omar Dary who are

going to lead us through this really fascinating topic, not just of micronutrients in the sense of deficiencies in those micronutrients and solutions, but the role of micronutrients in child growth and development.

Next slide please.

So, I'm going to introduce Shawn as our moderator, and he will introduce our distinguished speakers today. Most of you here I'm sure know Shawn as to have nutritionist of USAID and currently where he chairs the Agency's Nutritional Leadership Council, and also oversees the Division of Strategy of the Agency's Center for Nutrition within BFS. Shawn has so much experience- more than 30 years of experience globally in terms of public health and nutrition and development. Many know him as the first Director of Nutrition at the Bill and Melinda Gates Foundation, but he was also Vice President regional director for Africa at Helen Keller International. and he's served on so many technical reviews and panels and is a key player in the Scaling Up Nutrition Movement and the Global Alliance for Improved Nutrition. Really, we're thrilled to have Shawn with us, and I hand you over to his excellent moderation. Over to you Shawn.

### Shawn Baker

Thanks, Patrick for that introduction, thanks to the Nutrition Innovation Lab for putting together this webinar. We've got an exciting array of panelists and thank you everyone who's joined us today. And taking time to really delve into the role of essential vitamins and minerals and child growth and development. A couple of words, I think this is really timely, because if... For those of you who read the third Lancet series, one of the headline messages was how deficient we are in data, on micronutrient status, and that is really hindering progress. I think everyone who's also looked at the projections of the impacts of the pandemic, we're seeing just- it was already extremely difficult for families to access nutrient dense diets, and the pandemic has worsened that ability. But I also think this is coming in at a very important time, because with this year when we have the UN Food Systems Summit and the Nutrition for Growth Summit, there's a huge opportunity to reposition the micronutrient agenda as essential to delivering on our child survival and development agenda. So, I'm really pleased that we're taking time today to delve into the role of micronutrients in child growth and development. I'm very happy to have three esteemed panelists with us. I'm going to introduce all three of you up front.

So, starting with Lynne Ausman, who is a professor of International Nutrition and director of the Master of Nutrition Science and Policy Program at the Friedman School at Tufts University. She has a doctoral degree in nutritional biochemistry from the Harvard School of Public Health. And her bio is up for you a wide array of research interests and experience. After Lynne presents, she'll pass it on to Andrew Thorne-Lyman who is an associate scientist and nutritional epidemiologist in the department of international health at the Hopkins Bloomberg School of Public Health. He also has a doctoral degree from Harvard. And spent many years with working with implementing partners across the world, before coming back to academia.

And then, closer to home, Omar Dary, with whom I think I've been collaborating since probably both of us were fresh out of kindergarten. He's our nutrition science specialist in the Bureau of Global Health here at USAID. He's been with USAID since 2007 but partnered with us for many decades prior to that. Omar has a PhD in biochemistry, and he served as an advisor to many institutions in the UN and elsewhere and is a recognized really thought leader on micronutrients as well as other issues. And with that, a huge thanks to everyone who's joined, please put your questions in the chat box. And I will hand it over to Lynne to kick off the first presentation. Thank you, Lynne.

### Lynne Ausman

Good morning, afternoon, or evening everyone, wherever you are. I'm happy to share with you results from the birth cohort study that we carried out in Uganda. Next slide please.

Uganda birth cohort study followed pregnant women in 16 sub counties in north and south west Uganda through the birth of their child and for several months thereafter. We administered questionnaires, took anthropometric measures, and blood samples at regular intervals. In a sub study of this group of 1244 mothers, we analyzed serum samples for ferritin, soluble transferrin receptors, retinol binding protein, C-reactive protein, and alpha-1-acid glycoprotein. And this report presents the results of these mother and infant characteristics at the time of parturition.

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The green and gray areas in the two circles here in the map of Uganda show the areas in the north and the south west, where the study took place. These are more rural and far from Kampala, the capital of Uganda. Next slide please.

Standard practices of iron and vitamin A supplementation in Uganda include iron and folic acid supplementation to pregnant women. Additionally, vegetable oils are fortified with retinyl palmitate in wheat and maize flours, and may be fortified with iron and other nutrients.

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One of the problems that we have in predicting the degree of iron or vitamin A deficiency at the population level is that our biomarkers respond not only to deficiency, but also to inflammation. So, the BRINDA working group has provided methodological approaches to minimize the effect of current inflammation. Here's an example of how a raw ferritin level is converted to a corrected ferritin level, taking into account elevated CRP and a AGP concentrations in the presence or not of malaria. Similar equations have been developed for the correction of soluble transferrin receptor for women and children, and RBP for children.

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Here are the results of the adjustment for ferritin and soluble transferrin receptor. The main ferritin decreases from 67 to 49 micrograms per liter. And the soluble transferrin receptor decreases from 7.8 to 7.2 milligrams per liter. For both biomarkers the values are highly skewed as can be seen from the maximum values shown. You can see from the CRP and AGP values that many of the mothers were showing values indicative of inflammation. Next slide please.

Using the BRINDA correction, we can see that the prevalence of depleted iron stores is measured by ferritin increased from 7.4 to 12.3% and iron-deficient erythropoiesis decreased from 27 to 22%. The adjusted depleted body iron stores, that is BIS, increased from eight to 10 and a half percent. And finally, anemia, after correction for altitude, was 13.8%. Next slide please.

In terms of predicting prevalence of vitamin A deficiency using RBP as a biomarker, the standard cut off is usually RBP less than 1.05 micro moles per liter. And that predicts the prevalence of eight and a half percent. There are other cut off values in the literature, but this is, this is a standard one. Next slide please.

This slide provides the anthropometric birth outcomes for the infants. And using the standard metric Z scores there was 26% stunting in our cohort and 19 and a half percent preterm births. Wasting was 7.8%.

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The question is, are these biomarkers associated with any specific birth outcomes? And the answer is yes, once ferritin was adjusted using the BRINDA correction, there was a trend for increasing ferritin to be associated with improved weight for length Z scores. No other relationships were significant.

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However, using the soluble transferrin receptor as the biomarker, we also found that there were lower odds of a preterm birth with higher soluble transferrin receptor. And this is the opposite of what one might think, but it's also been found in the literature.

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Using maternal retinol binding protein as the biomarker, we found that the RBP was significantly associated with improved length for age, whether the model was adjusted for the usual covariance of age, education, and so forth in the footnote. The increased RBP was also associated with lower odds of a preterm birth, that is protective of a preterm birth. But once the equation was adjusted for the usual covariance the difference disappeared.

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We also did 24-hour food intakes for each of the households. These showed that only 36% of the families were food secure. Consumption of fortified foods, that is liquid vegetable oils, wheat and maize was uniformly low. And foodstuffs rich in iron and vitamin A occurred less than 50% on the one day we took them, except for the non-heme iron sources. Only 17% of the women had a minimum dietary diversity score of at least five out of the 10 categories. Now from the positive standpoint, greater than 94% of the women were supplemented with iron and folic acid during pregnancy.

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So, the summary, the BRINDA adjustment for ferritin shows an increase in iron deficiency from seven to 12% in women. And after adjustment, the maternal ferritin levels or showed a positive trend toward improved weight for length Z score. The adjustment of soluble transferrin receptor showed a decrease in iron deficient erythropoiesis, from 26.7 to 21.6 in women. And after adjustment, the soluble transferrin receptor was associated with lower odds of a preterm birth. Maternal vitamin A deficiency is measured by RPB range from three to eight and a half percent, lower than the 10% that's considered a standard vitamin A deficient area. The maternal RBP was associated with increased length for age Z score of the offspring. Deficiencies of both nutrients continue to exist in pregnant women in Uganda. The vitamin A intake from oils in both animal and plant source foods appears to be low. And heme iron intake is very low. Finally, only 17% of women consumed at least five food groups, minimum dietary diversity score, suggesting the necessity for investment in programs to diversify diets. Thank you very much, and I will turn you over to Andrew for the next talk.

[Andrew Thorne-Lyman](#)

Thank you very much, Lynne. So today I'm going to be walking you through a quick tour of a number of papers on micronutrients that we wrote, and most have been published. And the common theme, aside from them all being from Nepal, is that they all relate in some way to women's nutritional status and the connection to children. So, I've titled this life cycle connections. Just one thing, before I begin, and I just wanted to say, we know that this is a very tough time in Nepal and India and Bangladesh, and we just wanted to say that to all of our colleagues in the countries that have been hit hard by COVID-19 that were thinking of you and doing what we can to advocate for assistance from afar. So, thank you.

Next slide please.

So, this is a figure, once upon a time, it was shown in almost every presentation that that you saw in the international nutrition world. And these days I haven't seen it featured as much, but I thought it was important because I mean, first of all I think it's important to say that women's nutritional status is very important in its own right, but this figure can help guide how we should be thinking about nutrition and micronutrients, in particular. Because we know that especially in early childhood there's such strong connections between mothers and children. And increasingly data is showing from intervention studies that intervening at just one part of the life cycle usually isn't enough for our interventions to have lasting effects. And so, we should really be thinking about interventions that can reach multiple segments along this life cycle.

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And so, this is admittedly an oversimplified figure, but just thinking a little bit more about those connections. You know, for some micronutrients such as iron, pregnancy stores are extremely important and have direct connections to the status in early infancy of children. For other micronutrients, breast milk is incredibly important. And there's a lot of research going on right now about, you know, what are adequate levels of micronutrients in breast milk. But another really important thing to think about is just the connections between the availability and access at the household level to a diverse diet. How intra-household food allocation, so when there's high quality food items. how they're allocated within the household, either to children, to men, or two women, and how that influences things as well. And epidemiologists are concerned about that, because of the potential for confounding, but I think when we think about programming it's really important to think about. You know, how, what are the opportunities to try to influence this to affect different population groups along that life cycle. So, this is also part of micronutrient interventions.

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So, the first study I'm going to talk about is about to come out in Current Developments in Nutrition, and it was led by Monica Pasqualino, who's a graduating doctoral student from our program at Hopkins. And it's a study in which we examined the risk factors for anemia in three national surveys in Nepal.

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And if you've attended these webinars before then you're familiar with the PoSHAN Community studies, this was a side of same year-- I'm sorry, not same year-- same season. Surveys that were national surveys administered in 2013, 2014 and 2016 across Nepal in 21 VDCs and 63 wards. And data was collected on individual, household, and Community level factors, with a goal of understanding linkages between agriculture to nutrition.

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And so, as part of the study, a random sample is taken of children six to 59 months and their mothers. And in that random sample, anemia, hemoglobin measures were taken using the HemoCue, and we estimated anemia for both women and children using standard cut offs and adjusting for altitude as well.

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So, you can see here at the top, the national prevalence of anemia among children six to 59 months. And the first thing to notice is just that it's very high. That it exceeds 50% in each year. The second is that it does move around a little bit, depending on what the year is. And keep in mind, this was the same sampling frame the same season. So that I think there are implications there if you think about the measurement agenda and trying to track progress over time. When you do see you do see it move around. Another thing to notice is that in the tarai the prevalence is much higher than other parts of the country consistently.

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So, we investigated risk factors at the child level, the household level, community level, and maternal level. And I'll present risk factors related to children and mothers today. And you can see, at the bottom, this is, I think these are adjusted odds ratios for these different factors. And you can just first notice the relationship there consistently, that young children six to 11 months of age have the greatest risk of anemia. And then anemia is also consistent, at least the direction of the effect is consistent, for stunting and diarrhea, both being associated with higher risk of anemia. Although it does overlap the null for some of these measurements. You also see this sort of dose response association, at least in 2013 and 14 between, meat intake and risk of anemia. So, I think about half the children in each survey, only about half of them had consumed meat in the past seven days at least once. And so that gives you a sense of dietary quality nationally. There's room for improvement for sure. But for the children who did

not consume meat, they were at greater risk of anemia. There was also some indication, especially for 2014 and 16, that those who are not dewormed also had a higher risk of anemia.

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And here, you see maternal level risk factors. And so, not surprisingly, maternal education, the children of women who did not receive formal education appeared to be a greater risk of anemia. Especially for 2013 and 14, not in 2016 interestingly. The children of thin mothers measured using mid upper arms or conference were at greater risk, and there was a strong relationship between maternal risk of anemia as well as hemoglobin, maternal hemoglobin, and the risk of child anemia. So, this connection is quite strong.

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And so, we see that maternal anemia is a strong and consistent predictor of child anemia. With this study design we don't have the ability, really, to investigate that too much more than just to say that this exists. But clearly there could be common shared environmental factors, there may be some genetic factors as well. You know, we think we know that thalassemia can be genetic, you know passed from mother to children as well. And then, for, especially for young children, there may be other connections there as well.

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In the second study, this was a study that was led by Vintuna Shrestha, who was a master's student at the Institute of Medicine and has participated in a lot of our efforts within Nepal to develop the scientific community related to nutrition. And we're very proud of her for publishing this, this was her first peer reviewed paper. And it was also her master's thesis. And in this in this paper she looked at the minimum dietary diversity for women score, which you know has been validated against nutrient adequacy. And she found, this was in an urban area of Nepal, not in the Kathmandu valley, and she found that 45% of women had low dietary diversity.

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And she also used this conceptual framework to explore factors that were associated with low dietary diversity. And, you know, I think oftentimes when you read risk factor analyses that are limited by the variables that are included, for example, in demographic and health survey. And in this case, because it was her thesis, she had the ability to include a lot of other factors, including things like women's empowerment. Including things like a nutrition knowledge score, and so it gives us a greater and more comprehensive understanding of what, what are the modifiable risk factors for dietary diversity?

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So, you can see, in an adjusted, multi variable adjusted model, what factors were associated with it, with the risk of adequate dietary diversity. And you can see that, not surprisingly, wealth is a very strong predictor of adequate dietary diversity, as well as having a joint family. Larger families are associated with better dietary diversity. But, more importantly, some of these modifiable risk factors such as women's empowerment, women who are more empowered had a much greater odds of achieving adequate micronutrient intake using this proxy. As well as greater nutritional knowledge, and so the nutrition knowledge score was also significant. And so that, you know, a take home from that is just that these are modifiable risk factors that could also be part of this package of interventions that we're trying to put together to change micronutrient status or improve it.

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And the third study, this was a study, or a series of studies that were conducted in Bhaktapur, which is an area in the Kathmandu Valley. And we've we started these perhaps around 10 years ago, and this was a collaboration between colleagues from Norway, University of Bergen and other schools in Norway and institutions, as well as the Institute of Medicine again at Tribhuvan University. And the goal of this particular study was to assess the adequacy of micronutrient intakes of lactating women in this peri

urban setting. So, there was a very comprehensive effort to collect dietary data from this population, a population of 500 reproductive age women, lactating women. We did three 24 hour recalls over the period, spanning an entire year to try to capture seasonal associations. And then we calculated the main probability of adequacy for 11 micronutrients.

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And you can see here, for each of these different micronutrients on the right, the prevalence of adequacy, you can see that even in this fairly well-off peri urban part of Nepal, there are still large dietary gaps. There are still large micronutrient gaps there. It's really only for zinc and for vitamin C that more than 50% of the average is greater than the requirements, the EAR. So, think about that relative to those national statistics. Which we don't have good estimates for many micronutrients of diet in Nepal, but if this area that's on the outskirts of Kathmandu valley has such high inadequacies, then the rest of the country must as well.

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And so just also highlighting the mean probability of adequacy across all of the 11 micronutrients was point one nine.

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And then, in the same population, this was a separate paper. We looked at a variety of parameters of iron status. And we looked at the, we tried to predict this using different risk factors. And in one of the models just looking at maternal hemoglobin, we found the intake of supplements in pregnancy--and so bear in mind, these are lactating women-- and we found that there seem to be some carry over there. And so, the supplements, if they had received more than six months of supplements in pregnancy, that was associated with their hemoglobin status. We also calculated body iron as well, using... There's a formula where you can take the ratio of soluble serum transferrin receptor and plasma ferritin along with body weight to calculate this. And what we found was that there was an interaction between the time since birth, and so women who had given birth in the previous six months, that in that population of women there was an effect or an association between consumption of supplements, more than six months, and their total body iron. So there appeared to be some sort of residual effect of consuming supplements that lasted into early lactation for the first six months.

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Then in the last study, we looked at vitamin D insufficiency among Nepali infants and their mothers as well. And so, it's the same group of 500 women and their infants. We measured plasma, 25(OH)D, 25-hydroxyvitamin D concentrations, we also estimated because we didn't have individual measures of sunlight exposure. We estimated the mean daily solar radiation over the past three months prior to collecting the samples. Interestingly, we saw a quite a high prevalence of low vitamin D or vitamin D inadequacy among mothers. You can see the prevalence is about 60% compared to infants only about 4%. And so, we did some investigation to try to figure out why.

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And here you can see the predictors of maternal vitamin D status. Now we tested a lot of different predictors and the only ones that came out significant were those that were included in this model. Body mass index is consistently associated in almost every study that I've seen with vitamin D status, only in this particular case it was in the opposite direction of what I thought. So, usually with higher BMI you get lower status in this case, it was significant putting the opposite direction. We also found that local solar radiation was associated with better vitamin D status, and also there was a negative relationship with mothers' age.

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And here, looking at the predictors of infant vitamin D status, you can see age, mothers' status, and mothers' BMI were all significant.

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And so, thinking about possible explanations for why infants would have a lower prevalence of deficiency. Now one thing that's important actually to talk about because you don't hear it very much, like there is this perception out there traditionally that breast milk is a poor source of vitamin D, and that you know breast milk substitutes because they're often fortified are a good source of vitamin D. This is a bit of a misconception, because it depends on the woman's status. And there's been a variety of studies, supplementation studies in the US. From the University of South Carolina and others that have shown that if you give women supplements at a high enough dose, you can really significantly increase vitamin D status. And so that's important, women status is important. And what we hypothesize, one possibility, we were wondering whether it's possible that maternal transfer of vitamin D to the infant combined with lower production of maternal vitamin D might be an explanation. Another possible explanation might be fortified foods. And at the time we did this study, it was some time ago, there were not a lot of fortified foods on the market. We did find all of the 500 infants were breastfed, and most also did receive some type of complimentary foods. But when we looked at the children that were exclusively breastfed, all of them had sufficient vitamin D status. And we also noted that there was rare use of supplements. I think only about seven women had been taking regular supplements and we don't know exactly what was in those supplements. And so, this remains a bit of a mystery, but what we thought you know there's a very common practice in Nepal of oil massage, you know after children are born it's not uncommon to see scenes like this outside of houses, where children are getting this oil massage in the sun. And perhaps the sun and this exposure to the sunlight could help to be protecting their vitamin D status. Although the mother there is covered up so maybe she's not getting as much. So that was what we are hypothesizing, it remains a bit of a mystery, as I said, but a very interesting one. So now I'm passing it over you to Omar. Thank you.

Omar Dary

Thank you, Andrew.

Andrew Thorne-Lyman

Oh sorry, I'm sorry, I just wanted to acknowledge all of the people that were involved in and in this study. The respondents, all of our funders, multiple institutions. I think I even have another page of acknowledgments. So, thank you all very much. And passing it over to you.

Omar Dary

May I have the next slide. It is a real pleasure being in this webinar with more than 500 persons joining from all the countries. Not the continents, many countries in the world. And really this, that's all the interest for this subject, and I'm pleased to be here. The title of my presentation is Overcoming Micronutrient Deficiencies in women and children, and you can see, I did not use the word "mothers." I used the word "women," and you are going to understand why along my presentation. The two previous talks really put us that we cannot really avoid the link between mothers and kids. What happened with the mother's health status is going to be reflected in the kids. We cannot take only one, we need to have the pair. Or probably even more than that. May I have the next one.

Okay let's think about the ideal food for the children, which is the breast milk. Mothers transfer the micronutrients to the kids during the pregnancy times and during the lactation. The breast milk contains all the macronutrients that they need, kids need in the first six months of life and even beyond until the second year of life. With the milk they're going to receive the protein, the fats, the carbohydrates, which are the energy and the building blocks. Also, the micronutrients, and those are the vitamins and minerals that are looking for the catalysis and functions. But also, the protective substances, the antibodies and non-digestible compounds that they don't have a nutritional role, but they are promoting a healthy microbiota in the intestine, and that helps the kids to be ready to receive the family diet. One paper that just appeared one month in JAMA is telling us that even the antibodies against COVID-19 by immunization is going to the breast milk, and that is a very interesting finding. It tells us that really breast



milk has no substitute, cannot be on the formula or any synthesis. With formulation, we can imitate macronutrients and micronutrients, but we cannot make the context in the environment that the mother and the kids are living. Can you press once?

Now, talking about the nutrients in the breast milk. This is that resource from Lindsay Allen, who has been studied what happened with the intake of the nutrients by the mother and the content of the indulgence into the breast milk. That is important to look at this. B-12 through the flour increases the content of B-12 in the milk. The vitamin B1 in fish sauce also doing the same. Vitamin A in sugar or iodine in salt. It tells us that it's really important that the mothers continued about good nutrition, otherwise all these nutrients are not going to translate to the breast milk and they're there for the kids and not going to receive. Also, the foods, the red palm oil is beta carotene, is a good source, but not too much beta carotene from other sources. For the docosahexaenoic acid these are Omega three long chain fatty acid. This can be transferred from the fish but not in an efficient way. Means that probably we need to have a storage in the women in order to have and transfer that to the baby during the fetal time. Supplements also work, but they are not as efficient as the food support and fortified foods. But in summary, it is important to keep in mind that a good health is good for the mother's wellbeing to take care of herself, but also for the health and nutrition of their kids. May I have the next one.

Now let's move to some of the problems that we are facing. This is an interesting study done by IFPRI and collaborators in Guatemala. Guatemala is a country where there is not a lot of micronutrient deficiencies, probably only B-12 and zinc at this time. And also, in this population that they studied, they were not...stunting is high in the country, but not wasting, not too much underweight, and was around 50% overweight and obesity in the mothers. Despite of that, the experiment was done, providing micronutrients through three different ways. The gray line is the control, they don't receive any of this specific micronutrient interventions, but only the normal type of diet and time to be sure that the population is not hunger. The orange line is lipid nutrient supplements, the green line is multiple micronutrient supplements or MNPs in the case of kids, on the black one is the one with a corn soy blend. And this type of nutrient interventions were supplied to the mothers during the pregnancy and to the kids from the six months of life. And this graph shows to you the evolution of stunting. And you can see, no matter what they were receiving the stunting rate increase. Until the 18th to the 24 months of age that some of the interventions are starting to have an impact, the kids, and those were related mostly to the corn soy blend. Which means that, in addition to the micronutrient the corn soy blend also provide essential amino acids and other things that also make this an understandable, this information. But the important point that I would like to have here is what happened during the first month of life. The position of stunting was determined at the moment of birth. That means that no matter what you do after we need to do that in order to have a good nutrition of the kids. But the growth, linear growth, was determined in this population by the mother's nutritional status during pregnancy, and that is important for everyone to look at. Can I have the next one?

But despite that probably the effect in reducing stunting is not too much for micronutrients, that does not mean that they are not important. We need to come back to some of the basic reasons we are focusing on this important nutrients in our life. For example, right now in the world, the intellectual disability due to iodine deficiency has practically disappeared. Most of the countries on earth with very few exceptions, and communities. And this is impressive because 100 years ago there was this problem in the central United States and to the Large lakes, in the Sierra Madre in Mexico, in the Andes in the South America, in the Alps in Europe, in the Himalaya in Asia, in the Highlands of Africa-- I mean it was a problem everywhere. And that was because the iodine intake was too low. Iodine was put into the salt and the problem has been practical. So, the two graphs they're shown to us that the year 1993 many countries where they still having low supply of iodine to the salt. About in the years 2017 most of them have been corrected. But this is not the consumption of salt. It is using salt as the vehicle of iodine. And in some of the Western countries that probably don't have good supply of iodine through the salt, but they have good supernatural iodine through the dairy products, because the animals are receiving iodine.

The basic principle here is that we have been able, as a human society, overcome these important deficiencies in the world. Can I have the next one?

This graph coming from Guatemala, and it is telling us coming down of xerophthalmia. If we look here of xerophthalmia, yet I mean that many hundreds of more of the kids are also being protected against the consequences of vitamin A deficiency. And that was done, mostly to the addition of vitamin A to show them that has been working in the country since the year 1989 and continually until now. The last part of the graph is with the addition of the supplements only for the kids from six to 24 months of age, and that is an additional type of benefit. But the country itself has been really controlling vitamin A deficiency adding to sugar, that does not mean that the sugar consumption has been promoted. It is only using it a vehicle. It is true that the sugar has a high intake, but that's doesn't matter with the fortification nature. Is because the cost of the product is lower. And that is has been because the policies of the countries have favored the production of crops that they produce a lot of energy, but not a lot of nutrients. That is a problem that we need to face. But in other countries if these fortification of any commodity is not possible, in the case of the kids we still have the vitamin A supplementation every six months. And that has been proven that it has been successful. May I have the next one please?

Now talking about, like Andrew was saying, about the vitamin D deficiency. That causes rickets in the kids, and that is related to the vitamin D status of the mother. And that is because, this is not specifically as a nutrient. The human being has the capacity to synthesize these with very smallest partial every day to the sunlight by 15 minutes and not at noon, but the morning and the afternoon. But its own cultures are some countries living far from the equator, that is not true, and that is why does countries have this problem. In the US, is that is normal to ask vitamin D supplementation to the children because the mothers of them are vitamin D deficient. In the right top panel is not a related to kids. Those two graphs are showing us what happened with the improvement of the vitamin D status, using supplements in people trying to reduce the diabetes. The left part is telling us if the vitamin D status was already fine from the beginning, the supplementation didn't work because it's already fine. The supplementation work when there was a vitamin D deficiency in the individual, in that case the as a range of the prevalence of diabetes reduce. Can you push one for the graph to the bottom?

It tells also a very basic principle in nutrition and in micronutrients. If we have the deficiency, and we supplied in it, we are going to be to the top of that graph and that will tell us that we have a benefit. If we already have a good status, the additional supply of the nutrient is not going to do us anything, because the supply was already fine. But if we are going to, in the extreme top and we provide too much, it will go and have the same similar adverse effects, the excesses are not appropriate. And that happened in Canada in the 60s when vitamin D was putting in too many types of foods that that were having adverse consequences in the health of the kids. And now they have a regulation with only the few foods that contain vitamin D in order to prevent vitamin D deficiency under those conditions. May have been next one?

In this case, is a problem that affects rich and poor countries. This is the neural tube defects associated to the quality of the diet. It was discovered in United Kingdom in the 60s and what happened is that when the mothers were supplied with folic acid, before the next a type of pregnancy, the reduction of the effects in the next kid was reduced in a very large amount. But it's important to know that it was not only folic acid. When folic acid was absent in the supplements there was also a reduction, more or less by half. With the folic acid alone was reduced by 75%. That means that in that condition of the UK, folic acid was the highest limiting factor. That was having the problem. But in other countries it could be on the nutrients. For the folic acid to be converted in an active form, it needs to have B12, B2, niacin, and B6, and that is attention we need to put in developing countries. The graph to the right, it was telling us what happened in Chile. Chile is not a low-income country, it's a middle high-income country. The diet is good, but they are clearly the diet is supported with a lot of wheat flour that has not contained in folic acid. When folic acid was added into the wheat flour, it was reduced, neural tube defects, to a point that is around eight by 10,000. That is not anymore, the folic acid, the result of that

problem. Could be other ones, could be genetics or other types of nutrition deficiencies. May I have the next one?

Now, this is what happens if we see that the mother is not giving sufficient iron to the kids to the breast milk or through the pregnancy. The problem is that many of these nutrients are also required by pathogenic bacteria and some of this is iron. This is the results that using iron micronutrient supplements in children in Kenya in an environment which contains a lot of different diseases. The yellow squares there, the yellow blocks, is telling us how the pathogenic bacteria, the different types, increases with the presence of iron into the supplement. On the contrast the blue blocks is telling us that the good bacteria, the Bifidobacterium, came down. This is a consequence we need to keep in mind, that we need to have a comprehensive way really to intervene in nutrition. Because this is a balance between the needs, and balance also what is happening. And it means that there is a lot of other organisms that are fighting for us. Our organs is trying to protect our cells, trying not to absorb sufficient iron when it's infected, and this is something that we need to look at. The summary of this graph is telling us that we need to approach the good nutrition of the children with a good nutrition of the mother, may I have the other one?

I'm using here the same graph that Andrew presented. The arrows is telling us the evolution, but we look the arrows in the order. In order to have a good fetal life, we need a good, healthy... a good established pregnant mother. In order to have that mother, we need to have a good health in the women who are going to be pregnant. And that is because the adolescents needs to be in a good way to create that woman. It is the adolescent, we need to go to the girls. Then that means we need to start thinking that the approach is going to be at the family level. Everyone needs to learn how to do a good nutrition, we still need to keep attention to the vulnerable groups. But we cannot have a success if we don't look this in systems. Now we have food systems, we have health systems-- let's also think in family systems for driving the nutrition.

The next, and the last, slide.

As a conclusion of this presentation, press the first one, the nutrition and health status of the women, not only the mothers, before and during pregnancy is needed for the well-being of them and their survival. As well as the physical, mental and social development of the children. The second one, the next? Micronutrients all the essential nutrients are transferred from mothers to children during pregnancy and through the breast milk.

The next.

Intake of micronutrients from mothers is reflected in the breast milk content, except for calcium which comes from the mothers' bones, folate, iron, copper and zinc, and therefore they must be transferred during pregnancy. Then the other one.

Micronutrient interventions, mostly food fortification, have been successful to improve the woman's micronutrient status, and therefore the status of the offspring. The next one.

Trying to improve the nutritional status during pregnancy, it may be too late for some micronutrients. Therefore, attention to the family's diet and the family's habits is important. Thank you, and it has been a pleasure here. Now, I would like to introduce Shawn for the last thoughts.

**Shawn Baker**

Thank you, Omar, thank you, Andrew, thank you, Lynne. I think if we could all come back on camera now, really a series of brilliant presentations and really thanks to all the participants who, I think we have over 500 across the world. So, I'm going to start with a series of questions. We have a lot of questions that have come in through the chat box and some of them have been answered already. And I'm going to take the liberty of moderating and sometimes bundling some questions if you don't mind. My first question is going to go to Lynne. And I have a lot of questions for you, Lynne, but rest assured I have a lot of questions for all three of you. The first question, and perhaps the most importantly, as you

laid out the landscape in Uganda there actually are quite a number of programs in place to correct these deficiencies. But, in fact you're still seeing a lot of problems. And I guess, could you in general, what what's your perception of what's the gap between the programs that are in place and the actual ability of them to correct these deficiencies.

Lynne Ausman

Okay that's an excellent question. I was wondering that myself, so I... besides looking on the web and seeing information from the Ministry of Health, talked to my Ugandan colleagues. So, whereas the fortification of maize and wheat flour are recommended, and they've been training people, as of a couple of years ago no maize was fortified because nobody was trained. And the government is working on that. I also found out that many people instead of buying commercially, from the commercially fortified sources, use local places where the maize or wheat are milled, or they even do their own in their own backyard. And not everyone uses oil at all, they use a vegetable called kimbo and they squeeze that to get fat. So, reality is everyone is trying to do the right thing, but, at the very local level there's all sorts of cracks. And so that could be why a few percent of the people simply don't reach the expected levels.

Shawn Baker

Thanks for that, I think, and I'm sure Omar, you opine about that, but it's, I think you point out one of the things we've been learning so much food about fortification, that we need to be very smart, or evidence based in selecting our vehicles, that they are actually reaching the people at risk of deficiencies. And they're meeting them with the right nutrients. Andrew, I had a question for you... well, I have multiple questions again for you. I want to actually perhaps start with one that is... and you'd mentioned it of the links between animal source foods and better nutrient status. But when you look at a lot of the dialogue that's going on right now around the food system summit sustainable diets, there tend to be some very broad stroke narratives of how the need to move to more plant-based diets. But don't necessarily take into consideration, in fact, the real challenges of meeting nutrient requirements, particularly of pregnant lactating women, infants, and children without animal source foods. So, I guess the question is really do you have some insight of how do you bring more balance and more evidence to that dialogue to help better tailor the food system to the needs of different populations.

Andrew Thorne-Lyman

And that's a great question, and I think there are very polarized views on this issue, and I think it's an issue that really requires a nuance. And really at the heart of the sustainable development goals is this idea of trying to balance different objectives. And clearly with hunger and malnutrition and micronutrient deficiencies being a very pressing concern in low- and middle-income countries, that should also be part of the thinking. And I think it's also important to just think about how we produce different animal source foods and recognize the fact that not all of them are the same, and not all the production systems are the same. And in a lot of places around the world, small holder farmers own livestock and the way that those livestock are farmed is very different than these giant factory farms in the United States, for example. And so, I think there's nuances there that are very important to consider. But also, for a lot of countries, not necessarily Nepal, but for a lot of coastal countries in particular it's fish that's the major source of micronutrients. It's fish that's the major source of protein, animal protein, and that's a very different type of food than some of the other animal source foods in terms of its micronutrient composition and in terms of the methods that are used to produce it. So I do appreciate, and I really feel strongly that there is it's important to be nuanced in these things. And to acknowledge that, you know, animal source foods provide a very bioavailable source of many nutrients. And it is the food in the food system that has great potential to help people if we could increase the accessibility or bring the costs down.

Shawn Baker

Right. So, the message I'm taking away as we really need to be thinking about equity in animal source foods. That people who needs, it's the right amount for the right people at the right time. I wanted turn, Omar, to you. A brilliant presentation, as usual. I wanted to dig into one of the studies you presented from Guatemala, which showed that the corn soya blend had a better impact on reducing stunting than the micronutrient powders or the lipid-based nutrients supplements. And perhaps to unpack that a little bit. And is that something that's transferable to other settings, or is that unique to Guatemala? And how, I guess, one of the-- how do we have to think about transferring evidence from different trials from different settings to very different settings. Over to you Omar.

### Omar Dary

Thank you, Shawn. Before answering your questions, if you, let me to give some comments to the question you gave to Andrew because that's a really important one. And we are forgetting that the human being evolved as omnivorous species. That means vegetarianism started really more as a cultural part. Saying so, that means that we are not going to promote that everyone needs a lot of meat, red meat everywhere, all the time. But it is important to realize that we are on earth almost 8 billion persons. And everyone should have a good diet, and that includes nutrients that only certain animal foods we are going to provide. If we don't do that, we need to use technologies. And we need to recognize that the ruminants are the chemistry factories that are transforming the grasses into foods. That mean there is not other things that can do it, and there are pastoralists communities, and there are other area that the vegetables cannot be produced. And we cannot really go in a direction that we are taking out a very important food group, and a role of the ruminants and animals in the ecosystem. They have been with us for millennia, and for centuries of agriculture. And they have not a problem of warming in that time. Because the CO<sub>2</sub> that they produce, or any other warming gases was transformed by the plants. It has been the excessive production that they use for fuels for other things. I mean we need to be really, as you say Shawn, that we cannot avoid. And that is especially for the children, I mean the diet of the children are not adult miniatures. They have a different metabolisms and we need to be aware of that. When we are growing ox and we need to reduce certain foods, because we have the fear and the risk of non-communicable diseases, then our diets are changing. But we cannot have the same solution for everyone. And that's a problem, is the context which is related to the question. If the results in Guatemala could be extrapolated to other countries, but I will say no. The principles are the same, I mean the principles of the nutrients of the diet, what we can do are the same. But we need to find in each society, which are the limiting factors that really are not causing, making us to have an optimal metabolism. The case of Guatemala is very interesting because in hindsight it's a country where there is not hunger at a large scale, in general, with exception these years with the drought and the hurricanes. But despite of that, the children is still needed in addition to the micronutrients, something instead they are not supplied. Probably not the energy, probably are the essential amino acids that are contained in that the product. And that's what we need to look at it. It's easy for an intervention from micronutrients, but we need to look back of the quality of the diet. And micronutrients is only part of that. We need to put attention to the essential fatty acids, essential amino acids, and then look at the overall system. That is why it's important that we look at this as a family, as well as a comprehensive diet. I hope that can answer your question, Shawn.

### Shawn Baker

Sorry, I had to find myself... Right, I think I would summarize is that you need to know your gaps and what you're solving for. And I think that's an incredibly important, I think evolution of global nutrition, I think perhaps Omar when you and I started at this field in prehistoric times we had broad brush solutions that we sort of rolled out globally. And now we understand, or the world is getting so much more diverse, you really need, we need to better understand what are the gaps we're solving for and what are the solutions to meet those gaps.

Somewhat related to that, I want to go back to Lynn. There was a question that came over the chat box of, and I hope I'm capturing it correctly, could you look at, what data exist that have-- that relate to better, or birth outcomes for mothers who have better vitamin A and iron stores.

Lynne Ausman

Are you talking about data within our data set or worldwide?

Shawn Baker

Or worldwide, yeah, so we're really putting you on the spot.

Lynne Ausman

You certainly are, I'm going to ask, I'm going to find out if Omar might know or if Shibani who is on the website might be able to comment.

Shawn Baker

Okay, and, if not let me put you on the spot while we get Omar or somebody else on that. When you looked at the, you did in your data set, you did some very great research on the food intake. And I guess what from those food and those 24-hour intakes, what surprised you most?

Lynne Ausman

What surprised me most was the lack-- well, two things. Number one the really poor diet diversity score, that the diets in general are just poor. And we're talking about many rural areas of Uganda, people have limited resources. And so, their diets are more limited. And then the fact that within one day, only 20% of the people used any sort of vegetable oil in cooking. That really surprised me.

Shawn Baker

Yeah, and I think it illustrates again what Omar and I were just talking about, about how essential it is to understand, you know, we need to understand our problem, and how do we, how do we help solve for that? Andrew, and I don't know if... anybody pop in who has some questions about the broad strokes of the literature and the evidence in terms of birth outcomes for mothers who have better vitamin A and iron stores, so anybody who wants to jump in just jump in on the microphone. Yeah.

Shibani Ghosh

Sorry, this is Shibani.

Shawn Baker

Yes, Shibani.

Shibani Ghosh

I was just going to jump in on that, just to make a comment that you know I think multiple micronutrient supplementation in pregnancy has been shown to improve outcomes. And that, as of this past year I believe, that it is recommended in certain instances by WHO. And I believe, again I could be wrong, but the multiple micronutrients supplement does include vitamin A and it definitely include iron and B12 and folate, and I'm sure it is, it has some level of vitamin A. But I have to check on that.

Shawn Baker

Okay, so that actually tees up two other questions I was going to pose. And I think I'm going to start the first question to Andrew around multiple micronutrient supplements, but I, I suspect that Omar and Lynne will also have some points of view. So, let's take the case of Nepal, Andrew. Do you think that, and a lot of the multiple micronutrient supplements and pregnancy studies were done in Nepal, do you think it's time in a situation like Nepal to transition from iron folic acid to multiple micronutrient supplements? And what would be some of the implications.

Andrew Thorne-Lyman

Yeah, it's, it's an interesting question, and as Shibani said, WHO now recently revised their recommendation to say that antenatal multiple micronutrient supplements, including iron folic acid, is recommended in the context of rigorous research. And so, they had defined rigorous research is either in the context of for example, randomized trials, where you're trying to measure outcomes, or in the context of operational research, implementation research, where you're exploring things like acceptability and feasibility and equity and cost effectiveness. Nepal is an interesting and unusual case because it is one of the countries where trials were conducted. And there was a trial published back in 2003 by my colleagues at Hopkins, Parul Christian and Keith West and the group. And basically, in that trial they found that a multiple micronutrient supplement was associated with benefit. And so low birth weight, I think, was lowered by 14% or so. Now, there was a similar effect actually with iron folic acid in that trial, but overall, when you look at the Meta-analysis, you see generally, you see benefit across trials of multiple micronutrient supplementation. So, I would say, there are a number of countries that are trying out the replacement of iron folic acid with MMS. And there is a pretty good justification for that, but it's not the same supplement and there are a lot of questions around how do you implement those types of programs. And I think Nepal could definitely consider doing that, but it's important to think about what the composition is universally. And does a standard composition... And how can we build, for example, the science base around what the composition might look like in different settings, for example, given the needs and the nutrient gaps.

Shawn Baker

Yeah, and that's what I'd like to pass perhaps that question on to Omar specifically, because I know you have some points of view related to the tradeoffs between a standard formulation versus a formulation that's more context specific.

Omar Dary

Thank you, Shawn. Now, I would like to remind everyone that both fortified foods as well as micronutrient supplements are no more than platforms to supply micronutrients. They are not the solution, I mean, we don't have iodine deficiency because we are eating salt, we are having that under control because the salt contains iodine. Only good impacts of the micronutrient supplements is because we are supplying micronutrients, this is a way to deliver. If we find another way which is more effective and more sustainable, that's the way to do it. But that means for certain societies and communities, the diet is very difficult to change. If we can fortify foods okay good, we can do that. But also, that cannot be done in many contexts, which means we need to still depend on micronutrient supplementation. Despite it's not probably so efficacious, this is a good way to do it. The, I was reading the answers regarding the vitamin A or retinol during pregnancy. And although this is true that we need to go above the UL, or the opportune level, and the formulations right now are not containing that amount, containing only the recommended daily allowance. That's the case.

But what happens if we use the same formula in countries that already have an intervention that supplies sufficient amounts of vitamin A. I mean, that is the case of Central America. We don't need additional vitamin A into anything else. And then under those contexts, we need to analyze if adding the nutrient into the supplements is still even safe or it could be risky. And it's not the only nutrient. You have iodine, all the countries have good supply of iodine. It is Africa has largely needed a supply of iodine. In addition to that, we can, we can go into the excessive amounts. That is what you say Shawn, we need to look in the context and define what are the needs, and then our recommendation of our intervention needs to be adjusted for complimenting the diet. It is not thinking that everything is failing, and we need to provide everything, and that is the point I wanted to make. Thank you for the opportunity.

Shawn Baker

Thank you for that. I want to make, before we move on from multiple micronutrient supplements, the other point I perhaps want to make is that replacing poorly functioning iron folic acid supplementation programs with poorly functioning multiple micronutrient supplementation programs is not going to



solve really anything. And that I think the bigger message, and I think that's coming across clearly here is, we need to take maternal nutrition seriously. And I agree we need to take women's nutrition more seriously, but clearly there are huge missed opportunities of delivering adequate nutrition, particularly to mothers. And that if there is going to be a replacement, it needs to be a general improvement. So that the supplementation and other nutrition and health components provided from others during the prenatal period are well delivered. But I wanted to come, because there are a number of questions that came through concerning maternal vitamin A deficiency. And just perhaps to clarify or step back, what are the options? Because we all know that we can't provide high dose vitamin A supplements to mothers for any risks. But what are some of our best options for resolving maternal vitamin A deficiency. And I'm going to hand this quickly to Lynne for, and I'll do a round of the table. So, Lynne, some of your ideas for the best ways to correct maternal vitamin A deficiency? And then I'll pass it to Omar, and then Andrew I have another question for you, so I won't pass it to you.

Lynne Ausman

Well, taking into account that there is some vitamin A deficiency but it's less than the 10%, I guess I would pursue making the fortified oil available to everyone, even the poorest area. But another part of me desperately, I work in a lab that works on carotenoids and many of them are wonderful sources of vitamin A. And there ought to be... and I'm now looking at some of the crops that Ugandans consume. And it would be really wonderful if some of these could be changed, they would be a better source of vitamin A and you wouldn't even need supplementation. So that's kind of like a, one of my ideas that I'm starting to think about. So.

Shawn Baker

Yeah, and Uganda is one of the pioneers of adopting orange fleshed sweet potato, for example.

Lynne Ausman

Yeah, yeah. I'd like to see the diet improved in general.

Shawn Baker

I guess, let me push on that, of... because I find in dialogue, sometimes it's presented as supplementation is competing with industrial fortification is competing with improving diets. Could you maybe opine about that.

Lynne Ausman

I don't think it's a competition, I think that they help each other. I mean, as long as the supplementation is that reasonable levels, improving the diet fits nicely in there. I mean there are not that many really poor areas that can have huge amounts of retinol from animal sources, so I think improving the diet with plants sources is really one of the ways to go. And it's been very successful in many places, you obviously need to have crops that people like and that will grow in the arid areas. Or you know, depending on climate. But I think that's certainly something I would think about.

Shawn Baker

Thank you. Omar, wanted to bring that question to you about the options for correcting vitamin A deficiency in women.

Omar Dary

This is a really important question Shawn, and I would be a little longer in my answer. One of the products is the indicator that we are using for estimating deficiency of vitamin A in women. We don't have it. The serum retinol that we have using the criteria is for preschoolers, children. But then we move that into the women. And at least in Lynne's description she use it 1.05 micro moles per liter. But that hasn't been globally accepted. We are still using point seven. As a consequence of that, is almost no country that has vitamin A deficiency in women. Which is a problem, because when you look the intake



levels are very low. What is happening there is that our indicator is not for pregnant adult women. And we are really underestimating the vitamin A deficiency. Saying so, that your question is how to correct that? And we say the diet. And it is fine, I think that is what we would like to do. And we can go into biofortification or orange-fleshed potato the yellow maize and these kind of things. Which is good but it's still, the coverage is small. And I mean this is not large enough. In addition to that, we need to be aware that in order to transform beta carotene into retinol, we need a very good status of zinc. And that's another of the problems. Saying all of this, I think we still need to have an intervention with Vitamin A, especially for the women. If the diet does not work, we can apply fortified foods for me was a surprise that in the audience that Lynne was studying in Uganda, only 22% of the women were using fortified oil. I was behind that program, and I was hoping that that could have already solved the problem in Uganda. But if the coverage and use is low, that's something that we need to find. Which bring me to, in those countries that the diet is not good enough, and the fortification cannot be used, then we don't have any other option that going into supplements during pregnancy. That means we include vitamin A. And I don't know that answer your question Shawn, but it all depends on the context, whether we need to really have this comprehensive view that the solution should be looked at.

**Shawn Baker**

And based on the evidence. Andrew I'm going to come back to you with a difficult question, because the other ones I've posed everybody have been so easy. And you, you sort of referred to it, but, and I remember when Lindsay Allen did this brilliant presentation on what I will call, with some reservation, quality of breast milk. And she really caveated it to say that this is not to say that we should ever move away from promotion of breastfeeding. But you had said, one of the questions around the way it's perceived with vitamin D, and that infant formula may be better, how do we balance the study of the adequacy of nutrients in breast milk and look at the solution set without allowing undermining of optimal breastfeeding.

**Andrew Thorne-Lyman**

Yeah, maybe that's not such a hard question. Because I mean, I think the critical part here is that we need to improve women's nutritional status, right. And we know from vitamin D, I mean it made no evolutionary sense that we would have like, one essential nutrient be deficient in breast milk. And lo and behold, it was it was just inadequate status among women that was responsible for low vitamin D levels in breast milk. And so, I think I think the focus should be on, you know, trying to ensure that women are better nourished. And therefore, that breast milk is adequate. Now, maybe I misunderstood the question, but...

**Shawn Baker**

No, no, I think, in fact, you gave a very simple but appropriate response, I think, to a complicated question. And I think it's probably very important we all be on that message, right. That the solution here is that we take women's nutritional status seriously, particularly when it comes to micronutrients, and that's the pathway for, that's the path forward. I have a number of other questions teed up, but my last one I'm going to go to Omar before I give everybody a chance to have 30, a quick wrap up message you would like to leave with participants. Omar, you were talking about the fortification programs and the success of fortification programs. And two of the fortification vehicles you pointed out were salt and sugar. With the push to reduce all consumption, reduce sugar consumption, is there a conflict between fortifying those vehicles, and some of the other public health goals we have.

**Omar Dary**

You know, thank you for the question. In practical terms, they are not a conflict. I mean, we are using only those vehicles as a way to deliver the nutrients. At the same time, we can go and ask for the reduction of the intake. The problem has been that in order to promote fortification in the past, it was solved as it's a win, win situation. And it's like, we are going to increase the profits of these industries.

And we should avoid that. We need to recognize that we are simply using these vehicles in order to supply those nutrients to far away populations, so you got to sub-Saharan Africa, there are not many of these are food processed by the industry producers. And while we can avoid the use of them in order to supply the nutrient, the amount of nutrient that we are going to put inside is going to depend on the consumption. In the case of the salt, the salt intake is reduced, we increase a little the iodine content. But we need to monitor that. And that is something that we need to look at. In the western societies, especially sugar, we don't need that. But we cannot extrapolate our own conditions to the rest of the world. That's what we need to look what is going on in the other countries. And it's not the only two, we can talk about the bouillon cubes. Bouillon cubes are salt with some monosodium glutamate. But the people are having that and they're going to continue having those problems, no matter what we say. I mean this is the way they have a flavor. We can say don't eat this product, but at the moment they are still using quite not to use that very good for supplying something else. That is why is the point of view, should be an integrated way and to try to solve the problems of the context. It is not extrapolating solutions from one country to another one, I hope that the answer your question Shawn.

Shawn Baker

It does, but I wanted to push a little bit. Have you come across any evidence that fortification, the mandatory fortification programs that have been in place like you said, something like salt for now 100 years, actually increased consumption of that vehicle that's being fortified.

Omar Dary

That's a very important question and I would say not in general. And I was saying in my talk, if the society eats a lot of sugar does not mean anything with concern to fortifying sugar because that means it is because sugar is there, and people like it, and it's put in all the other products. It's separate. And we don't need to say because it's fortified the increment of the consumption of these foods is something that is going to happen. Those are commodities, those are staples. And I mean the intake is more or less stable, and but the attack has been coming from colleagues who are not really working in the area, but they are assuming that is going to happen.

Shawn Baker

Thank you for that. Now I'd like to start, I'm going to start with Lynne and then pass it to Andrew and Omar. We have four minutes left. I'd like to give you each, each of you 30 to 45 minutes-- seconds-- just quickly from this, what is one takeaway message you would like participants to leave this webinar with today. Lynne, over to you.

Lynne Ausman

Okay. It's an excellent question. I guess the takeaway, I'm also a dietitian, and the next time that I do a study, I would like to have more than a 24-hour food intake. So that I can know for sure, people don't eat the same thing every day. So, I think that's exceedingly important to better define the diet of the population that you're trying to make an intervention in. Based on what I've seen, the diet in general was very poor and is low in many other nutrients. So, I think overall diet improvement is what I would like to put forth.

Shawn Baker

Thank you for that. Andrew, same question to you.

Andrew Thorne-Lyman

That's tough, there's so many. I would say, you know, just thinking again about COVID-19 and where we are. I think in all countries, including Nepal, things are changing rapidly, and there's no doubt that diets have been affected by this and will be affected, probably longer term in many ways. And I just think this leaves us with even greater information gaps than we had before, and I think we really need to put in

place some efforts to take stock of where things are with respect to diets. Because they've changed and we don't know what they look like, so. I think that can inform our responses if we collect better data.

**Shawn Baker**

Great, Omar, quickly, because I need to give to wrap up, a couple wrap up comments.

**Omar Dary**

Yeah, I will say that without taking the attention to mothers and small children, we need to extend the attention on nutrition to the family. I mean it is the family which should really learn how to have a good diet. If the kid has bad health, and the nutritional status is a reflection of the society. And that we need to pay attention. It is not moving now to women to adolescents to girls, I think it's everyone should really know how to do the good nutrition.

**Shawn Baker**

Well, thank you. Thank you again to the Nutrition Innovation Lab and to our panelists, really enjoyed this discussion. There's so much to take away from this. I think we've heard a theme of how, while we've embraced 1000-day windows, we've often forgotten that women are part of 1000 days. And we certainly need to be focusing on the nutrition of women. I get, you know I think, I get outraged that we still are losing 2.3 million or more children a year to undernutrition. I get particularly outraged that we're losing so many children and we're losing so many other outcomes of children's futures to micronutrient malnutrition. Because as Omar said, I mean we have actually made tremendous progress. The iodine story shows we can make progress, we could actually resolve micronutrient malnutrition. There are many things we need to do in nutrition, but I would posit that we could really tackle micronutrient malnutrition quite seriously. And to do so, and I think this comes out incredibly strongly in The Lancet series, we're operating in a huge data deficit of status of diets. And we really need that to really solve this problem.

And I do think, as I started, that this year of as we move towards the food system, how do we make sure that the food system at a bare minimum, is delivering adequate micronutrients? And particularly for those people who need them the most.

And so, a huge vote of thanks to everybody who participated, to our panelists, and to the Nutrition and Innovation Lab for having organized this. And Devyn has said that everything will, the recording slides will all be available. And with that, let's go forward to a future replete for essential vitamins and minerals for everybody who needs them.

Goodbye everyone.

**Patrick Webb**

Thank you.



## USAID ADVANCING NUTRITION

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