

# **INCORPORATING NUTRITION INTO FEED THE FUTURE RESEARCH PROGRAMS**

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## PRESENTATION

*Julie Maccartee:* All right, good morning everyone. My name is Julie Maccartee and I'm a knowledge management specialist with the USAID Bureau for Food Security and I'd like to thank you all for joining today on this webinar on incorporating nutrition into Feed the Future research programs. As you can see this webinar is being recorded, so if you'd like to review any of the content at a later basis or share it out with your colleagues we'll make sure to send a recording to everyone who joined this webinar today.

I'd like to thank those who have already introduced yourselves in the chat box. If you haven't done so yet please let us know where you're joining from, which innovation lab you are associated with, with city/state you're joining from. It's great to just have introductions and please feel free to network with your colleagues using the chat box, ask questions at any point and just let us know about any interesting resources or links that you'd like to share with the group.

We welcome your questions at any point throughout this webinar although we will be pausing for a longer Q&A session at the end, after the presentations. But if we see any essential clarifying questions along the way we'll be sure to jump in and answer them. If you would like to download the slides from the presentation you can do so in the file downloads box that's over there to the left and we'll make sure to send you a copy of the slides after that as well.

I figure we should just go ahead and jump right in to the content but first I would like to introduce the speaker and I will start out by introducing Ahmed Kablan with the USAID Bureau for Food Security. I will show you his bio slide and photo right here. And he is the activity manager for the Feed the Future soybean innovation lab and the Feed the Future nutrition innovation labs for Africa and Asia. And so I'll go ahead and let Ahmed introduce our subsequent speakers. So passing it over to you, Ahmed.

*Ahmed Kablan:* Thank you, Julie. Hello everyone, and thank you for joining us today for this webinar.

The other speakers we have: Dr. Jeffrey Griffiths from Tufts University and he's the director for the Feed the Future Innovation Lab, Africa; Patrick Webb, dean of academic affairs Friedman School of Nutrition and the director for Feed the Future Innovation Lab, Asia; and Maura Mack, nutrition advisor at USAID Bureau for Food Security Office of Agriculture and Policy and she's the EOR for both Feed the Future Innovation Labs and for the Soybean Innovation Lab.

In the first presentation I will give it about just an overview of the global context of the malnutrition problem and some terminology that we commonly use in case you are looking for terminologies in your program or looking at the impact of your program on these different indicators.

What's malnutrition? Malnutrition, as we know, it is composed of two parts, the undernutrition and overnutrition. Undernutrition it is stunting underweight wasting, that's the \_\_\_\_\_ of it and we'll go into how we're going to manage it later, and overnutrition: obesity and overweight. Both of those malnutrition problems they are shared, among other things, micronutrient deficiency.

As we know the impact of malnutrition has a multisectoral impact and just as it is multisector that we'll need to work together in order to produce an impact or reduction in malnutrition, also the cause or impact of it is multisectoral. It affects the health, we know that from the recent statistics that contribute about 45 percent of under five years, education: the lower IQ, and poor performance in schools. It has a negative impact on economic growth, an estimated loss of about three to six percent of the annual GDB.

Of course poverty, wages for those who are stunted or malnourished are half of those of adult who are normal children, and also aggravate the conditions of other infectious diseases and make the treatment for them harder to achieve the target, and also with the side of overnutrition the children who are stunted are higher rates of nutrition-related **necromancavate** diseases such as type II diabetes and cardiovascular diseases.

Now in order to just **have an eye** about the effect of nutrition and mortality and you can see in the figure here the shaded areas indicate the contribution of undernutrition to each cause of death whether it is from pneumonia, diarrhea, measles or malaria. The overall underlying cause of about 45 percent as I mentioned and one in five children is stunted. That will give a total number of about 165 million children are stunted worldwide. And most of those, or majority of those lie in 34 countries in low and middle income countries. Also small birth weight as we learned from the recent Lancet series contribute about 3.3 percent of total children death.

Malnutrition, as we all know, is the result of insufficient intake and consumption of healthy nutritious food, inadequate care and infectious disease which include the stunting which is height for age, or the child will be short for the age and \_\_\_\_\_ as a chronic -- it is a result of a chronic inadequate intake of nutrient over time. And the effect of it is poor cognition function, lower lifetime learning, greater risk of **NCDs**, wasting,

which is measured by their weight for height or the **obtain** for their height. And this results from inadequate condition, inadequate intake of calorie such as in the case disasters or conflict and increase the risk of morbidity and mortality.

Underweight \_\_\_\_\_ measured by weight for age and these children are measured by low weight for their age and it results from chronic or acute, and associated with increased risk of mortality and morbidity. Overweight and obesity, which is majority people for weight for age these children are, as we know, what is an obese or overweight they'll high weight for their age. And it is result from a chronic and acute overconsumption of calories.

There is a debate in the scientific community working in this side whether the period of -- some way up to four weeks of consumption of unhealthy diet will lead to an irreversible conditions or hard to reduce conditions in terms of obesity or overweight. Again, overweight and obesity, as you can see, it's shared with \_\_\_\_\_ cognition, higher rates of NCDs and lower lifetime earning. And micronutritive deficiency which is shared among all these forms of malnutrition and it is an inadequate intake of vitamins or minerals such as vitamin A deficiency which is very common in low and middle income countries and lead to blindness, stunting and other medication.

If we want to look how we measure these different conditions according to the WHO classification of nutrition status as an example I will just go over a stunting, for example, which reflects chronic malnutrition and when it is measured height or weight it is moderate stunting, all those who are two these scores below normal weight -- sorry, for normal height for their age and DCB is three Z scores below their normal height.

If we want to look at the nutritional status for the countries which are the focus \_\_\_\_\_ for Feed the Future countries we have higher rate of stunting overall, for example in Guatemala it is about 50 percent, in Senegal 29, Rwanda 44 percent. Also we still have significantly a significant high number of wasted children: 16 percent in Bangladesh. Underweight also, as you can see, still at a high rate. And at the same time the stunted mother, or stunted woman represent a risk to give for a stunted child and that's when you look at the woman BMI as less than 18.5 which is the cutoff point for a normal body weight it is very high in Bangladesh at 33 percent and as you can go down the list the number varies between 33 to 8 percent.

Now what causes malnutrition? Malnutrition causes are multisectoral and multi factors contribute to this. And most of you in this webinar are familiar with the casual cause framework for nutrition. There are two

immediate determinants of nutritional status. It is the food intake and the health. And it is -- the problem is not only about the food, it is the quality of the food that you are consuming. And at the same time there is other factors that Dr. Griffiths will go over them and Dr. Webb that determine the nutritional outcomes of how the body will respond to taking this nutritious and healthy food, whether they will benefit totally from it or not.

The leading of this cause is the critical contributors, it is in terms of the food security it's access for food and the availability of the food, maternal and child health and care practices and the water sanitation and hygiene, the topics of water sanitation and health services will be talked in depth, Dr. [audio pause] on malnutrition. We need all these sectors to work together, whether it's food security, the care resources, the health and nutrition, the WASH, or the health sanitations department, all of them need to work together in order to opt-in the optimum child eating and nutritional outcomes.

Now what is why we are focusing or targeting the 1,000 days of the child which is from the time of conception to the second birth date of the child? It is the period where the children are most vulnerable from the time they are in the womb until they are two years of age. And intervention at this period are not likely to have -- after this period, sorry, are not likely to have the same impact or significant impact as intervention during this period. And they have the most impact on the long-term consequences of the outcomes.

And just to brush on some of the infant and young child feeding it starts from preconception because you need to have a healthy woman in order to be able to carry a healthy child. And in the build from zero to six months after birth exclusive breastfeeding is one of the important factors in order to achieve the best nutritious outcomes and also help to build the immune system, the gut bacteria content, all the healthy components for the child body and after that, six to 24 months the breastfeeding, assisted with complementary feeding introduction at suitable age and suitable kind of complementary feeding.

The key points of this nutrition to other basic: the mortality, again, it can consist of unfortunately how high it is and its unacceptable high rate: 45 percent all childhood death is related to malnutrition in an era we are producing a lot of food which is enough for everyone. But the problem still persists.

The three underlying causes, or main underlying cause of malnutrition, food security care and practice and the health and the critical window of intervention, that is very crucial to produce an impact on any child it is the first 1,000 days from conception to two years of age.

What is the relation between child malnutrition and GDP? And I think Dr. Patrick Webb will also talk more to that but according to the recent Lancet series by role and L demand and 20 percent to get a 10 percent increase in GDP will result in about 6 percent reduction in stunting, and a 10 percent increase in GDP also leads to a 7 percent increase in overweight and obesity in women. So there is the benefit part and there is the negative consequence in increasing GDP. And as you can see it is not a linear relationship, it is not inverse in increase in GDP

will lead to the same reduction in stunting. And that could also -- there is multiple other factors that are in play to determine the nutritional outcomes.

So in summary in order to achieve and involve nutrition it is a multisectoral approach. It is not one thing. It is not agriculture alone, it's not health or providing the nutritious diet. It is agriculture to provide the food increase, household income, reduction in food prices, provide the high density, high nutrition density food, social programming, social behavior and health.

*Jeffrey Griffiths:*

Thank you very much. Let me go ahead and start by pointing out there are some unexpected linkages between things like mycotoxin, or aflatoxins, and sanitation. What I'd like to do in this talk is go ahead and outline what some of those are and then also discuss the paradigm that the lack of foods has been the key issue. But I don't think that that is the one that I want to focus on although that's important. There are other things which are critical elements as well.

I think many of us grew up with the paradigm which is that somehow or other if we could just feed people enough we could make up for these nutritional deficiencies like stunting and wasting and that other outcomes such as low birth weight, micronutrient deficiencies could be essentially taken care of by filling up the tank.

I want to go ahead and just put a visual representation in front of everyone. These are stunted children, and these are children who are then short for their age. These children here -- this is a child who's wasted -- this should say low weight for height. It is an extreme form of low weight for age but wasting is a child who even if that child was proportionately small, say a stunted child, they might not be wasted. So this is a typo: it should be wasting is low weight for height. But it's an extreme form of low weight for age. So you can see this poor child here is really just skin and bones. That's what we see with wasting, which is a nutritional emergency.

Now if the problem was just adding more food then we should be able to fix the problem through agricultural interventions which help poor farmers to grow more food. And there's been a paradigm which was more food production would lead to more income and better nutrition and there is a relationship there. But I'd like to point out that it's not as strong as many of us had supposed in the past.

This is data from the World Bank and you can see that while there is a good relationship between increase in income and a decrease in underweight for every poor people once people start to have a higher per capita income this relationship becomes much weaker. And indeed there's only modest improvement that we see.

This is data provided by our colleague, Will Masters, who looked at information on poverty and malnutrition in Uganda and you can see that although poverty has improved we don't see a commensurate change in indicators of nutritional status that would go along with those.

There's been reference to the 2013 Lancet series -- this will be talked about at greater length by Dr. Webb, who is in fact an author of the series, and I just want to point out that the Lancet series found that if the top ten classic nutrition interventions were implemented then stunting would decrease by 20 percent. That is not a very high number for many of us; we had hoped that in fact through nutrition interventions perhaps we could decrease stunting by a much higher percentage. If we look at many relevant nutrition actions which are listed in the bottom of this slide you can see that these are part and parcel of many programs that we have but sort of the bad news, or at least the reality check is that this is not going to address as much of these conditions such as stunting as we had hoped.

In this talk I'll talk a little bit more about these mycotoxins and the gut microbiome and enteropathy and explain a bit more about how they're important and how they relate through water and sanitation.

This is a simple diagram. I would ask all of you to imagine that that cylinder on your right is your intestine. And your intestine is inflamed. This is a condition called environmental enteropathy which I'll go into. And when you think about trying to address nutrition it's not only that a person is ingesting foods, the micro and macro nutrients, your intestine is also affected by other things that you eat besides the foods which are various bacteria and also these aflatoxins. The result of this is that your intestine can become inflamed, not work as well as it should and you have unusual and non-beneficial, actively adverse bacteria inside your intestine.

If you look at this picture here -- this is an old picture of mine from urban Nairobi. Here you can see that sewage which is leaking out of this sewer main right here is actually used to irrigate these crops, which are quite green and quite healthy-looking. However, obviously there's great risk of contamination. So the water that's used in agriculture can act as a way of transmitting bad bacteria, which would be from the sewage, to the foods that people eat.

And in fact if we think about what water might have in it water for irrigation purposes will often come from an area where animals have also been excreting their feces. If you look at agricultural wastewater it frequently will contain many different bacteria.

So this little laundry list that I have here of bacteria and parasites and viruses that are found in agricultural wastewater it basically is

demonstrating that many of these things that come from say cattle can also affect and make humans ill. So for example E. coli, very commonly found in feces, are also found in other mammals and humans as well.

When we think about small farm holders, small farmers and households in much of the poor world the water that they use, for example, may be contaminated both by other people or by animals and there's a process which occurs which is these nasty bacteria which are ones that cause illness, make their way through food and water into your intestine. They then create a condition called environmental enteropathy. And this is a really important piece to this talk which is to understand that these abnormal bacteria cause a chronic inflammation of the intestine and that this is an important contributor to malnutrition.

In this picture you can see what the normal villi of the intestine look like. So for those of you without a biomedical education your intestine has little tiny fingers that are sticking out there to help absorb food. And that's what you see in this top left-hand photograph. That's what you see right here, these little fingers that are used to absorb food and nutrients.

However, people with chronic inflammation, which is what you see here, no longer have these nice finger sticking up. They're blunted, and they're not working properly. What's been found in studies that go back actually all the way to the 1970s, is that people with this environmental enteropathy require more protein and carbohydrates in order to keep their nutritional state at the same place as someone who does not have that.

Now enteropathy is something which is a silent thing. You don't necessarily have diarrhea; you don't necessarily have some other acute illness with enteropathy. And in fact when we look at things like hand washing, which is an important sanitary intervention, what's important to understand is that by hand washing you can decrease a condition such as diarrhea. But it doesn't mean that it changes the bacteria which are inside of your intestine and doesn't mean that it's changed that inflammation that occurs for people who are living in a highly contaminated environment.

So when we think about water, sanitation, etc. it's important to think that there's a whole package of things which include sanitation. And a single piece of it such as promoting hand washing will help with diarrheal disease but it doesn't help with everyone who's got enteropathy.

This little picture, this diagram here is from a paper by a guy named **Knut Lund** -- excuse me -- who was important in understanding all of this science over the last several decades. And I have included this simply to point out that the way that this is thought to work is that you get these bad bacteria into your intestine, they cause some chronic damage, and it means

that your intestine is no longer functioning well as a barrier to the stuff that's inside your intestine. That can leak across the intestine and cause the inflammation. And at the same time this mucosal damage that is the lining of the intestine it doesn't work as well in terms of what it's supposed to do in terms of digesting food. And you end up with growth faltering because of these linked processes.

So if you focus on a village of 100 children where one child has diarrhea, this child here, you will prevent illness in that child. However, you have not necessarily helped all the other children because they live in an unsanitary environment and they have this condition called environmental enteropathy. They are still prone to malnutrition.

We've talked a little bit, then, about this enteropathy and how it affects 99 percent, if not more, of people living in an unsanitary environment. When we think about the bacteria that are inside the intestine I mentioned that some are from animals, some are from other people. It's important to understand that they act as a community. There's a paper that was published a year ago in Science which is really very interesting in terms of understanding these little devil bacteria that live in your intestine.

Let me cut to the chase in this, in the sense that there was a study that -- this study looked at twins in Malawi, these children, half of whom were well-nourished, half were malnourished and they looked at the spectrum of bacteria in these children, and even when they received this food stuff that's the therapeutic food called RUTF their bacterial spectrum did no change in the normal way. When these bacteria were put into mice -- I want to focus on this; this is quite important -- when you took mice who were given the bacteria from normal children these mice -- you can see their weight stays about the same here. However, when bacteria from the children with malnutrition -- kwashiorkor, which is a child who is bloated with stunting -- I showed you a picture of that earlier -- into these mice look at the weight that the mice lost. They lost a third of their body weight in less than three weeks.

The point of this is that the kind of abnormal bacteria in your intestines can be a contributor to weight loss and malnutrition. The other piece of this with the science is that when you have these abnormal bacteria living in your intestine it turns out that they change your metabolism and this bizarre kind of looking chart here tells you about whether or not the metabolic products of the food are increasing or decreasing. And the bad news is that in children with these bad bacteria living in there there are decreases in critical metabolic pathways.

So we're beginning to understand the biological basis for this now. So please remember you have environmental enteropathy and they will also

have an abnormal spectrum of bacteria living in the intestine that may actively contribute to their malnourished status.

Let me now go ahead and turn to aflatoxins. If we look at aflatoxins -- excuse me -- if we look -- ooh, I've got these out of -- you know, I'm going to go ahead and actually just skip this because I've talked about the microbiome. The important point that I want to have here is that malnourished children and obese people have a less diverse microbiome, and people who have a normal microbiome, one that has not got those bad bacteria, may tend to have a normal body mass index.

Let me go on and talk here about the evidence for sanitation, and I will get back to the aflatoxin issue. That slide was out of order. My apologies. There is some evidence that this business of sanitation is quite important when we look at data sets from 60 different countries.

There's a paper by Dean Spears, he did this work, it's been published by World Bank. And in this he looked at data from many different countries and looked at this business of contaminated environment. And what he found here was that sanitation, if you wish to use sanitation being the opposite of open defecation, is one that sanitation may account for more than half of the difference in height, e.g. stunting, between various countries. And the importance of this is actually higher, it's greater than things like country GDP, which is a form of average income if you want to think of it as being related to that, mother's height, education, infrastructure. It's this business of open defecation and a lack of sanitation.

So when there's open defecation going on it means that the environment is highly contaminated with human bacteria. And so even if you live in a house where you have a latrine, you wash your hands, everything is okay, then you go to visit your friends, your neighbors or your children go over there to play they are now exposed to this unsanitary environment.

So the point that I'm making here is that there are implications for both what goes on within the household in terms of water and sanitation, but also the larger community can contribute through their unsanitary behavior to your health here.

In Spears' economic analysis of this where he looked at height for age, which is a marker that we use for stunting you can see that there's a relationship of height for age, and with a lack of sanitation. So less sanitation a lower height for age. This issue of sanitation when we look at it is much more important than we had thought. We had thought sanitation was related to diarrheal disease, as I showed in an earlier slide, however the point that I'd like to make is that we have fairly good data that

sanitation and population density go beyond just diarrheal disease but to stunting in general, and this fits in with the environmental enteropathy piece that I mentioned before.

This slide is from Spears as well and it simply shows the mortality rates but in India and in Africa rise as you see more open defecation which is a marker of lack of sanitation. So you can see both in India and in Africa that mortality rates go up the more there is a lack of sanitation in a community.

I think we're back on target now in terms of the discussion about aflatoxins; I'm sorry for that slide being out of order earlier on. So aflatoxins -- this is a picture of fungus-y corn -- doesn't look very attractive; you wouldn't want to eat this. This is cassava and this is a picture of cassava in Uganda, picture I took and you can see it's yellow and green-colored from all of the fungus growing on it. This cassava is being dried on the ground, where water can pool. And where water pools then the fungus may grow on the food itself.

So aflatoxins are compounds made by mold, and it's been known for many years that they cause liver cancer. What is not as widely appreciated is that it's been known for well over 30 years in the animal industry, e.g. food producers, that aflatoxins in the food for various poultry or cows or pigs and so forth lead to decreased growth. We believe that is the case for people as well. And so aflatoxins in food can contribute to these lower birth rate, growth stunting and wasting in children. It may also affect the immunity people with HIV, and it's now been found that aflatoxins are widespread on many crops.

This is a visual representation of that. This is a paper that was published in a British medical journal back in 2002. And you can see that as, for example, height for age, or stunting gets worse aflatoxin levels in the blood in these children went up as well. The same thing was true for weight for age here. It's rare in the world that we see a relationship as strong as this.

When we look at environmental enteropathy and stunting it is likely that both the environmental enteropathy caused by contaminated water and height and poor hygiene which infects the intestine is matched by a similar process where these aflatoxins also do damage to the intestine and contribute to an intestine which is not functioning in the way that it should.

Now aflatoxins, the mold that causes them, can contaminate crops in the field and then they grow and the produce the aflatoxins. They are found

not only in the food, they will be passed in breast milk by mothers to their young infants.

I'd like to point out that many of the complementary foods such as the porridges that are baby foods that are given to kids are also frequently contaminated with aflatoxins as well. So there are important issues that have to do with harvesting and storage of crops to prevent the growth of these molds and to prevent the toxin production which can result.

This is a slide which I don't have any evidence, no one knows this but for example if aflatoxins cause a leaky intestine by damaging the intestine then does that mean, for example, if mother has HIV and she's breastfeeding does that mean there's higher rates of HIV transmission? We don't know the answers to these questions. There is a lot to be learned in terms of science that's still to be done.

This little slide here is simply to point out that if you can prevent the growing of the molds in these foods then you'll see that there's less aflatoxins in the food and there's less aflatoxin in the blood of the children who eat those foods. So you can make a difference with agricultural practices to improve the health of these children who are eating this and the adults as well.

I'd just like to point out that this last year's world food price included one for aflatoxin advocacy.

Let me just go on to this slide here, which is one which puts all of these pieces together in terms of water and the environment, and that is that we know of a cycle between malnutrition and infection which many people have recognized in the past. I think that the modern interpretation of this would be that there is a negative cycle between malnutrition and with having an intestine which is inflamed. It can be affected by pathogens from dirty water -- farm hygiene is therefore important, aflatoxins, which are related to water content and drying practices can also affect the intestine. I'd also like to point out that all of the other factors that we know of such as practices around feeding and so forth can contribute in this diagram as well.

This picture here is one where it portrays where agricultural interventions, interventions that have to do with water and sanitation and nutrition may fit within a cycle. What's pictured here is a child eating aflatoxin-contaminated food, so therefore the things that have to do with agricultural interventions could make a difference here.

Wash interventions could keep bad bacteria from making their way into this poor child, so the child would then be able to take advantage of the

nutrition that is available to him or her. And it's important to understand and remember that the nutrition interventions which have been identified to-date are critical in this picture and need to be kept up. But we must also, I think, address these things that have to do with interventions in terms of toxins such as aflatoxins and bad bacteria and so forth which come because of a lack of water and sanitation.

If we achieve that then to go back to this earlier diagram then what happens is we don't have these bad pathogens coming in, we don't have the aflatoxins coming in to the intestine and then the child was able to take advantage of these nutrients.

Take home messages are quite straightforward: we need good, varied nutrition. We need to keep toxins out of our diet, which are going to adversely affect our growth. We need to have good water and sanitation, a clean environment which keeps us from developing this environmental enteropathy, the inflammation that we see with that, etc., and keeps our gut and microbiome that is the balance of bacteria in the intestine within a normal spectrum.

Let me leave it at that and thanks very much for your time.

*Ahmed Kablan:* Thank you Jeff for this really very nice comprehensive presentation. Now we'll move to Dr. Webb presentation on access to approaches to adverse malnutrition.

*Patrick Webb:* Hello everyone. I'm assuming you can hear me. We've had two very deep presentations by Dr. Kablan and Dr. Griffiths focused on nutrition, health, biomedical processes and the problems. So I'm going to bring things a little more in towards the domain of agriculture and how that links with those. I'm going to start with the takeaway messages which are quite important.

One is that as Dr. Griffiths mentioned we can't do without agriculture. All of that presentation was really about nutrition and health. The role of agriculture in the process as we've been hearing about is key. And since the world food price crisis of 2007-2008 the huge surge of attention towards agriculture, food systems and so on really implies that we have to continue traditional conventional research in agricultural productivity in all its forms. That is a given. But we can go further, and we have to go further. There are many ways in which the innovation labs and other USAID supported research activities can go beyond productivity enhancement towards impacting nutrition in net positive ways. The value added is huge. And of course the high end goals of Feed the Future is not just to produce more food for healthy agriculture, it's actually to achieve a -- produce more nutrition.

The bell was in the background is correct.

So we have to take this on as a part of the agricultural agenda. The purpose of a healthy agriculture, a sustainable agriculture is of course enhanced and sustained health people, the consumers who are also the producers. But we have to also take into account that simply investing in agriculture, investing in agricultural research, that alone is not going to cut it. Nutrition doesn't happen by accident; it has to happen by design. And to achieve it and to document it in fact it has to be carefully measured and the impacts have to be demonstrated at scale. So these are the broad issues that we're going to be dealing with.

Now both Dr. Kablan and Griffiths talked about stunting and I want to reemphasize the importance of stunting. Not only is it a Feed the Future goal, action to reduce stunting is not just a luxury, it's not just a goal, something that will happen by itself if we produce more food or reduce poverty. There's still well over 160 million stunted children, and I'd point out that the under five population in the U.S. currently is about 20 million. So many, many times the U.S. under five population around the world and this matters because we can't achieve other goals in reducing preventable child mortality unless we resolve stunting. Severely stunted children, not just wasted but severely stunted children are five times more likely to die of something like diarrheal disease than a healthy, well-nourished child. Maternal stunting -- so even if a child survives and grows up to be an adult, particularly a mother, if they are stunted then the risk factor for having small births, gestational age, increases considerably and we now know that about 20 percent of stunting of the child by age three probably has origins in the nutritional compromise of the mother during the fetal period.

So there's a lot of issues there that we have to address: 80 percent -- Dr. Kablan mentioned the 34 developing countries, 80 percent of stunted children live in those countries, which means that it is manageable if we find the right things to do in those countries, of course others as well, then we can have a major impact. But because stunting is an equity issue and the poorer children are more likely to be stunted than richer, and most poorer people are in rural areas then the entry point for addressing stunting may well partially lie with agriculture. And of course that's where we need to go.

Currently if we just keep on with the way we're doing things by 2025 there will still be almost 130 million stunted children around and that compromises mental development in school, it compromises their productivity in agriculture. In other words the stunting, the malnutrition in

all its forms contributes to low productivity in agriculture. It's not simply an outcome of it.

Hence the growing and increasing number of reports and research outputs and goals that link agriculture with nutrition outcomes. In other words it's not just a responsibility of the ministry of health to deal with nutrition. The Lancet series, Dr. Griffiths and Dr. Kablan both mentioned, the Lancet series last summer on maternal and child nutrition pointed out that there are ten evidence-based targeted interventions, that if we implemented them up to 90 percent coverage in those 34 countries then we would be able to cut stunting by say 20 percent and mortality by 15 percent. In those 34 countries -- and these are things like vitamin A supplementation, iron and folate distribution to pregnant women and so on. The problem is that in those countries, like many other developing countries, coverage rates are very low. And the investment needed to bring coverage up to 90 percent in those kind of countries, the ones that Dr. Kablan mentioned, would be very costly, \$9.6 billion per annum.

The killer here, though, is that even if we manage to achieve 90 percent coverage of those ten targeted interventions that only reduces stunting by 20 percent, which meant 80 percent of stunting still unresolved. This is a problem. And of course, then, it brings us to start looking at nutrition-sensitive actions.

Now 20 years ago it was very common to claim or assume that producing more food -- and here that usually meant more calories, would imply an improvement in nutrition and health. Very common to see those statements that far back. Today we know that that's actually not the case, just producing more food isn't a guarantee of improved nutrition outcomes if you actually measure the outcomes, rather than simply assume them. And even the FAO will now say, explicitly, that investments in agriculture are not in and of themselves sufficient to improve nutrition. Times have changed. We understand that the agriculture can potentially play a hugely important role but we have to be more explicit about when and in what context the impacts on nutrition are likely to be achieved.

So we start talking not just about nutrition-specific interventions from the Lancet but nutrition-sensitive interventions, those interventions that can, at least in theory, impact on nutrition if they effectively address the underlying determinants of nutrition and have specific nutrition goals and actions embedded in what they try to achieve and how they measure their outcomes.

The if is really important: you cannot assume it will happen but if you do it correctly then we can probably measure the outcomes. Now just to give an example of why you can't assume it will happen; this is one example of

rice commercialization from a long time ago in West Africa the introduction, the new crop technology here, the introduction of rice, high-yielding varieties of rice with irrigation led to higher productivity in rice production which resulted in higher household net income and sales and consumption, not just of rice but of other foods, which was having a measurable impact on women and children eating better, which is great. No suggestion that isn't what you would want to see and in fact we can measure how that happens.

The higher productivity was in fact due to the irrigation and the higher yields resulted in three times higher net returns per day of labor, so higher factor productivity and labor which translated into a net real increase in income for households adopting this technology of about 13 percent per household per year net, so incorporating understanding of costs and higher labor inputs to this. And that resulted in itself to a net gain to the households of almost 50 percent of calories in this case. So energy deriving from all the foods resulting.

So what was going on was you could translate that in a different way. For every 10 percent increase in net income you saw almost a five percent increase in calorie availability in the household, and for every ten percent increase in calories available to the household you saw an almost 2.5 percent increase in nutritional status or fall in undernutrition.

The moral of this particular story is that you got through the adoption of new technologies, higher productivity which increased income which increased calorie availability which did improve child nutrition just a little bit.

What we have to try to understand from this is that it's not a one to one relationship. There's a lot going on between the point of adoption of a technology and the outcomes in nutrition that explain why there seems to be a dilution of the effect as you go forward. You could see this in a more linear way, if you like, if you assume that's a lot going on between the agriculture and livelihood side and the health and nutrition side. And on the agricultural side there are lots of programs that measure participation in a program, technology adoption, income effects of productivity; that's lots of things that agriculture programs and research often measure but often don't measure the rest of the chain, and on the other hand on nutrition and health programming and research often looks at dietary composition and food expenditure and nutrition outcomes without actually looking upstream at what got us there.

And there's a lot going on between the adoption of a new technology and the nutritional status that is coming out at the other end that you might assume, or that you might actually perceive and measure. Some of these

things were just mentioned: irrigation can increase malaria, increased concentration of poultry could be a contributor to bird flu, if poorly managed pesticides can have an effect. Empowerment, income control matters a great deal in terms of how income is used and whether programs are ensuring that they are gender sensitive in understanding female control of the income derived and that there's no compromise to the opportunity costs of time, of women as well as men, and the tradeoffs: if you do one thing versus another.

On the other side diet quality matters a great deal. It's not simply growing more of the same but ensuring the diversity of cropping is key to greater diversity of diet but often you need enhanced knowledge behavior change, communication, education to understand what's going on on the other side.

And then Dr. Griffiths mentioned the environmental enteropathy, the various mycotoxins that can compromise what is going on between the food going into the mouth and the nutritional status of the consumer. So while this is a linear relationship participation in a program in theory is a straight line towards nutritional status. Actually it's a very complex line, and it's one that incorporates -- that we need to understand a lot more what's going on in these boxes and in the arrows to be able to understand where to invest, both in research and in the agricultural programming we're concerned with.

There are lots of possible innovations, lots of current innovations going on in agricultural research and programming around the world supported by different missions, genetic advances and improving the quality, the diversity, the impact in nutrition of various seeds whether they be vegetable seeds or biofortified staples or higher yielding species of animals. But we also have to look at programming and process innovations. Where and when is it appropriate for agriculture to be a platform for ensuring not just more is grown but actually more quality is embedded into both the agricultural package and the consumption package that results. What models are there out there that could be replicated at scale or combining, for example in South Asia, aquaculture with say orange sweet flesh potato with homestead gardens off season. But together, as opposed to individually, can enhance nutrition. And when can, for example, there be effective cross training of agricultural extension workers with behavior change communication?

Aaron was asking for example the HKI example of Burkina Faso. There are very many examples of HKI style combinations, not just from HKI anymore, of homestead models with vegetables, with small ruminants, with agriculture and with aquaculture and so on.

When can we get health workers to incorporate better messaging on agriculture? When can we get social mobilizers to incorporate better understanding of both agriculture's potential both positive and negative impacts on health and nutrition. And of course then how can we do a better job of capturing evidence of best practice and dissemination of what works and what it is that we need to measure as we go forward to demonstrate value-added of combining that we do collectively.

Now many of you have heard of the six pathways -- I'm sure anyone who's been to a USAID glee has been hearing the six pathways from agriculture and nutrition that are spelled out usually in linear fashion; here I've put them in a wheel so that we can understand that actually they are all, each of these potential ways of having agriculture impact on nutrition if you imagine nutrition is at the core here, the center here there's lots of research increasing and improving yields and drought resistance and the value of both staple and commercial yields, the increasing focus on women-owned or women-controlled animals, vegetables, fruits through homestead gardening, integrated pest management, livestock vaccines which keep the diversity of species alive, increasing focus on the quality of seed, biofortification, food safety through storage improvement, on-farm improvement, reduction of post-harvest losses. You can see there's a -- these are not individual pieces; they all contribute together to enhancing the potential contributions of agriculture, both research and programming to the nutrition outcomes that we're trying to achieve.

That said one could argue, one could spend a little time identifying where is it that we have less information. And I think we have relatively less information on how to measure, what to measure, how to influence women's health and nutrition in relation to agriculture, women's opportunity costs of time and effort when relating to agriculture versus other things that they could be doing supporting health and nutrition of their children, women's empowerment and resource control. And then of course women's control not just of production but also value-chained development, market price development and the net outcomes in prices for goods that women control.

I think we need to think very carefully about where it is that investments going forward in both agricultural research and programming and policy will have greater aggregate synergistic effects.

Dr. Kablan said all sectors need to work together and I think that ultimately is the conclusion that we need to take away here. Agriculture needs to be understanding that it has in itself a responsibility for addressing nutrition, not just growing more food but addressing nutrition. But it's not going to do that alone. We have to find ways in which all the innovation labs and all the different sectors within USAID missions can

work together to have greater impacts on nutrition that are measurable. There's no question that we are going to have greater impacts, the more rigorous the evidence we have of that impact. That requires us to have gender disaggregated, very good cost-effectiveness as well as process evidence of what works in what contexts, anecdotes and numbers fed or we grew more food and therefore we improve nutrition -- that's not enough. That simply won't cut it anymore. There's lot of scope for innovation in the ag field to have impact on the nutrition field but we all collectively have to work on generating the evidence of that best practice and the only way of doing that is through collaboration.

I'll stop there and thank you.

*Ahmed Kablan:* Thank you, Dr. Webb, for this really very interesting presentation and look at overall how the agriculture sector relate together with other programs such as \_\_\_\_ program and feeding, the two \_\_\_\_\_, how they could work together to co-produce the result that you want.

Now we'll pass it to Dr. Mack to give us an overview of the USAID focus on nutrition in USAID programs.

*Maura Mack:* USAID was created in 1961 under the Kennedy Administration and pretty much from the beginning, specifically 1965, nutrition has been a priority issue for USAID.

Okay, thank you. So since the beginning of USAID's existence nutrition has been a key focus area. That said, there has never been as much attention or as many resources devoted to nutrition, both in USAID and globally, as we are now seeing. This is really an unprecedented situation.

As demonstration of USAID's commitment to nutrition we are in the process of finalizing a USAID nutrition strategy. This has been under development for more than six months and reflects the input of more than 100 stakeholders globally. The strategy emphasizes the importance of a multisectoral programming approach that is implemented in collaboration with a broad spectrum of stakeholders, including host country governments at all levels, civil society organizations, the private sector and academia, in coordination with the International Donor Community and UN agencies, with the aim being to reduce malnutrition among the world's most vulnerable populations.

The USAID nutrition strategy is targeted for a spring 2014 release date and as soon as it's available I'll be sure to make it available to you through your AOR.

In addition to the USAID-specific nutrition strategy a process is now underway for developing a whole of U.S. government nutrition strategy with a target completion date of late 2014. The goal of this whole of government strategy is to coordinate our collective efforts so that we can maximize the impact of our U.S. government resources on reaching world health assembly and post-MDG's nutrition targets for improving nutrition outcomes globally.

Just basically four main points I want to make during the presentation so this, what I've just said here, is my first main point. My second point relates to four key concepts that are driving USAID's current nutrition-related activities, and these are, first of all, integration.

There is a very strong push right now from the highest levels in USAID to ensure that nutritional considerations are integrated into all Feed the Future agricultural and research programs in the 19 focus countries where Feed the Future is working. The second concept is multisectoral, multistakeholder collaboration. And this is to build on what Dr. Webb has just presented. And as I mentioned previously our marching orders are to get away from siloed programming and to replace it with multisectoral approaches to problem-solving on any issue, not just nutrition, in collaboration with multiple stakeholders.

The third concept is our focus on evidence-based approaches and not practices based on assumptions. This is where you all play a critical role. The research that you and your colleagues are undertaking in the innovation labs and the collaborative research programs is providing the necessary evidence base for the technologies, approaches and interventions that are contributing to improved nutrition and health not only in our Feed the Future focus countries but in other countries around the world.

And the fourth concept that we are emphasizing here at USAID currently is results. We're talking about results now in the next year looking at intermediate results. We know that longer-term results such as decreased stunting take several years to achieve and so that's why we're focusing on results and looking at in the immediate the intermediate results such as improving dietary diversity, reducing maternal anemia, etc.

The third point I'd like to make today relates to the Feed the Future Food Security Innovation Center. This is a concept that was launched in the past year and it's the way that Feed the Future is implementing its research agenda. Within the Innovation Center there are 23 innovation labs and 10 multi-donor-funded collaborative research programs that are under the **CTIAR** system.

These labs [*off mic conversation*] -- and programs are organized around seven research themes, one of which is nutritious and safe foods. Now this slide here provides the listing of the various innovation labs and collaborative research programs that are under the nutritious and safe foods program. You can see there's quite a number here.

All of these research programs have a hook to nutrition, some more explicitly than others. The Nutrition Innovation Labs for Asia and Africa and the collaborative research program number 4, agriculture for nutrition and health, is being implemented by IFPRI, these are the ones that are specifically nutrition-focused but all of these innovation labs and programs do have a clear connection to improving nutrition.

And as Dr. Webb mentioned all of our research programs under the Food Security Innovation Lab all have strong potential for improving nutrition in the Feed the Future zones of influence. Presently I am working with Ahmed Kablan and another nutrition colleague here at USAID to review the research programs of the innovation labs that are members of the nutritious and safe food program.

The aim of our review is to identify possible opportunities for enhancing the nutritional contribution and impact of these and other programs. So more to come on this once we complete our review.

Finally the fourth point I'd like to touch on today is that the Nutrition Innovation Labs for Asia and Africa are a key partner in our efforts to better understand and address nutrition through the agriculture sector. They are a valuable resource and a willing partner for consultation and collaboration with other innovation labs and collaborative research programs.

I'd just like to mention that a sub award with the Nutrition Innovation Labs is always an option if you would like them to work with you on a specific scope of work, either to integrate or enhance the nutritional dimension of your research programs.

So with that I'd like to turn the program over to Dr. Webb, who will speak more about the Nutrition Innovation Labs.

*Patrick Webb:*

Thank you, Maura. You said it very eloquently. We are here as the Nutrition Innovation Labs to help as much as desired and appropriate. This is literally just three, four slides just to get the discussion going. There are different ways in which collaboration with us, but of course it doesn't have to be with us. But collaboration with the Nutrition Innovation Labs can take many forms. Our own Innovation Lab research is called deep dive research because it's focused first and foremost in two

major countries, Uganda and Nepal, although we have additional work in other countries like Egypt and Malawi and potentially others around the world. Our own research in those countries offers the basis for collaboration, given *[audio break]* same mothers and same children over multiple years. We have a prospect of cohort design for certain components which means following mothers from pregnancy through birth and growth of children. We have sentinel sites set up in Nepal for example, three different agro ecologies where we're looking at seasonality and dynamic prices and rainfall and all kinds of additional components as well as doing blood and serum collection in certain cases that can assess not just micronutrient status of women and children but could potentially also look at aflatoxin contamination and other aspects.

So we are doing research ourselves focused on how agriculture impacts nutrition through various forms of integrated programming packages. We're looking at some of those so far neglected biological mechanisms that we've talked about, aflatoxins, water quality, the effect of microbiome and we're linking with other nutrition labs in doing these kinds of research. We're also looking more explicitly at programming performances and the costs of taking things to scale and the constraints to implementation when you have multiple partners as well as nutrition governments, much larger issues around policymaking and how national partners can be part of the solution and not part of the problem in achieving collaboration.

To give you an example of the potentially for potentially piggybacking or linking with research in Nepal we're conducting research in 24 different locations that include three major different agro ecologies and all kinds of different rural as well as peri-urban sites. This gives an opportunity for understanding all kinds of different intervention types, as I said, agro ecologies, soil types, climate types. Same in Uganda, where in different districts, both in the center north and in the far south are very different environments where we can explore a variety of activities in collaboration with multiple partners.

So our own work offers a potential synergistic platform where we can link with other labs and research partners. We can link outside of those countries validating metrics for assessment of the actual impact of agriculture interventions. There's a lot to be done there in terms of validating new ways of measuring new combined indicators and so on.

We can work with partners in building capacity of individuals as well as institutions, either supporting or facilitating or simply giving advice on what kinds of training are needed, local curriculum development in country settings where natural counterparts have requested assistance in building capacity, as in Malawi for example, in dietetics programs, in Nepal, in master's degree programs in nutrition for example.

We have already been collaborating with multiple innovation lab partners in looking at their own RFAs they put out to see how nutrition sensitive they are, what else could be included to make them more nutrition impactful, what kind of instruments would be required and how best to measure, how best to design surveys to actually document impact.

And then of course assisting, going beyond individual country collaborations to regional collaborations, building, lessons learned, evidence-based but with partners that go well beyond our conventional agriculture partners. So our collaborators currently are actually from already many more than this but we have a range of academic UN governmental and non-governmental partners with whom we work in just a couple of -- these are just the partners in Nepal and Uganda, many other partners as well. So we stand ready to support and to facilitate collaboration along these different lines of research and capacity-building to the extent that we can. Thank you.

*Ahmed Kablan:* [Audio break] for this very brief [audio break] presentation. Would you [audio break] about moving forward, how can we scale to include that vision?

*Patrick Webb:* I will actually defer to Dr. Griffiths but we have already had discussions with other partners in Guatemala, for example, and have had additional missions express interest even if they were not Feed the Future priority countries. Maybe Maura so would like to comment on that.

*Jeffrey Griffiths:* This is Jeff Griffiths and while Maura's preparing I'd just say that I think that all of the team members for the Innovation Labs for Nutrition would be interested in scaling to include the LAC region. Certainly many of the issues which we're looking at already [audio break] --

*Julie McCarty:* Oh, seems like we lost Jeffrey for a moment there and we're also trying to get Maura's audio back up. I do not hear Maura quite yet, so in the meantime as we get some of the audio sorted out please feel free to enter any other questions that you have, whether it be general about the content or more specific about the innovation lab or labs that you're working with, your specific programming [crosstalk] to get these guys while they're available. And as I heard someone [audio break] --

*Jeffrey Griffiths:* I see that there's a question from Elizabeth Ryan about optimization of a person's metabolism by adjusting the gut microbiome. It's an extremely hot area and I think that many of us are hopeful that specific interventions in terms of the kind of foods that feed a specific kind of microbiome and things like water and sanitation to keep the bad bacteria away. So while we're promoting the good and keep the bad out that that will have a major impact on nutrition outcomes.

I see there's also another question from Aaron. That question is how environmental enteropathy research is being received by nutrition and ag communities. I hear a lot of interest and I think it helps people to understand what it is about what they're doing in terms of agricultural productivity and the availability of various kinds of foodstuffs and linking that [*crosstalk*]. There's a lot of enthusiasm there [*crosstalk*] that direct connection, that biological connection.

And so the answer to Aaron's question also is do I see wash beginning to be more strongly integrated. I certainly am seeing indications of that. Sometimes programming is like trying to get a large ship to turn left or right and so it takes a little while to do that. But certainly historically there's been a tremendous amount of interest in wash. And so bringing that to bear there's already a cadre of people who are really interested with a lot of experience.

*Julie McCarty:* Thank you, Jeffrey, for those answers. Sorry, here in the DC control room we're having a bit of microphone issues and on a bit of a delay but we got your answers there loud and clear, Jeffrey. Maura I think you should be able to speak now.

*Maura Mack:* Thank you. Jennifer, to respond to your question about scaling to include the LAC region: yes, this is definitely of interest to us as Patrick had mentioned. We have in the recent past been in touch with USAID Guatemala about possible collaboration. In essence right now we're working primarily in Feed the Future countries but that does not preclude us from collaborating with other USAID missions in other Feed the Future countries. So it really is a question just of either expressed interest from a mission, a Feed the Future program there or us also reaching out which we have also been doing recently with a number of countries that aren't necessarily Feed the Future. So Latin America would definitely be a possibility right now. Feed the Future is in Guatemala and Haiti but if you have any suggestions please feel free to pass them on to us. Thank you.

*Julie McCarty:* As you type in your questions we'll stick around for a few more minutes in case any other questions come along. Ahmed I didn't know if you might want to mention the idea for ways that people can continue to stay involved and ask further questions going forward. We had discussed the possibility of office hours in the future, ways that people can connect back to the Nutrition Innovation Lab and to USAID as needed as issues arise.

*Ahmed Kablan:* So for the way forward we are \_\_\_\_\_ especially around the launch of the USAID nutrition strategy to have a monthly nutrition office hour. It will be more of a web chat hosted by the same group, Agrilinks. Also if you have any question, suggestion or comment please email me and Maura and we'll make sure we get you to the right collaborator if it's about

collaboration or to the right answer. And of course if you are an innovation lab if you contact me and Maura please also CC your AOR and activity manager at USAID to make sure they are in the loop.

*Julie McCarty:* Thank you, Ahmed. It seems as though that answers some of Jennifer's questions there at the bottom of that how you can gain contact with us to stay updated on nutrition-sensitive interventions.

*Patrick Webb:* This is Patrick. I would be more than happy to interact with and answer questions from anyone going forward. Please don't feel shy reaching out to us and you will always get a response as quickly as we can possibly do it. Sometimes we'll have to say we can't help but on the whole we'll always try and be as helpful as possible because this is such an important agenda that affects all of our labs and all USAID programming.

*Julie McCarty:* Thank you, Patrick. And yes, this presentation will be archived and we'll make sure to send it email to all of you with the recording and the Power Point just so you have these resources from today's webinar.

I see there's a little bit more typing going on in the chat box. If anyone has any final questions or comments please feel free to jump in. \_\_\_\_ I can see that you're typing and Jeffrey as well. Oh thank you Cynthia and thanks Aaron; I'm glad that you found this valuable. And Jeffrey, yes, is also willing to hear about any questions or collaboration so we definitely want to keep the lines of communication open here as much as possible.

*Ahmed Kablan:* *[Audio break]* Patrick for spreading the word and reaching out and being open to answer question and providing support for us and other collaborators.

*Julie McCarty:* Thank you all. Then I think we will go ahead and officially wrap up this webinar. We are just about right on time, just a few minutes after our official ending time. So thank you all very much for joining; I hope you found it useful. I know I certainly found the really concise summary of the issues very useful and will be reviewing the slides myself. So we'll be sure to send them out to you as well. That's about it, so thank you all, have a great rest of the day and we'll be in touch.

*[End of Audio]*