Doing More with Less: Tools to Help Governments Optimize Nutrition Funding's Impact

Webinar transcript.

Kelly McDonald:

Hello everyone, and thank you for joining us today. My name is Kelly McDonald and I'm a project officer with the knowledge management team of USAID Advancing Nutrition, USAID's flagship multi-sectoral nutrition project. We're very excited to share this webinar with you today on tools to help government's optimize nutrition funding and its impact. To start out, I'd like to go over some tips to hopefully improve your webinar experience today. Please take a moment to connect your audio by plugging in your headset if you do have one; then, please run the audio wizard. Click on the phone icon to connect your audio and to adjust your sound levels. Your icon will be green when you are connected.

Troubleshooting

Your experience today may vary depending on your internet connection and computer equipment. I'll quickly go over a few troubleshooting steps if you encounter any challenges.

If you lose connectivity or cannot hear, please close the webinar and re-enter the meeting room using a browser other than Google Chrome, by clicking on the webinar link provided via the webinar invitation. When you enter the room, if you cannot hear, run the Audio Setup Wizard found in the upper left side of the screen under the meeting menu. If you have any problems you can ask USAID Advancing Nutrition Tech for assistance. They will start a private chat with you to try and work through your issue. Please note that we are recording the webinar today, and the link and the recorded webinar and the slides will be shared with you via email.

I will now pass it over to Monica Woldt. Monica is a Senior Technical Advisor with USAID Advancing Nutrition. She will take a moment to introduce our speakers for this webinar. Monica is a public health nutritionist with over 20 years of experience in international maternal and child health (MCH), nutrition, HIV, and food security programming. Prior to joining USAID Advancing Nutrition she served as a technical advisor with the Food & Nutrition Technical Assistance III Project at FHI 360, where she supported work on modeling tools including the Optifood tool for development of food-based recommendations and PROFILES for nutrition advocacy. Monica has an MPH from the Johns Hopkins University Bloomberg School of Public Health and a Master of Science in nutrition from the University of Wisconsin-Madison. Monica, over to you.

Monica Woldt:

Thank you so very much, Kelly. As Kelly mentioned, I serve on USAID Advancing Nutrition, the agency's flagship multisectoral project designed to accelerate multisectoral nutrition programming—in part by hosting learning and sharing events like this one. To learn more about our project, we invite you to visit advancingnutrition.org. We are so very pleased to have with us today Dr. Nick Scott. Dr. Nick Scott is an Econometrician with the Burnet Institute in Melbourne, Australia. Nick uses mathematical, economic, and statistical modeling to inform health policy to better target health interventions among vulnerable populations. He has worked with the World Bank to lead the development and application of the

Optima Nutrition model that we will hear about today. He has done so in several countries and he has also facilitated training workshops on the use of the Optima model. Nick has extensive modeling experience across a wide range of topics including nutrition, viral hepatitis, HIV, and malaria, with the aim of translating research into practice. Nick has a PhD in mathematics from the University of Melbourne and Nick is speaking with us today from Melbourne, where it is 1 AM Thursday morning, so thank you so very much, Nick, for being with us in the wee hours of the morning. We really appreciate it.

Our second speaker is Dr. Steve Vosti, who is an Adjunct Professor in the Department of Agricultural and Resource Economics at the University of California, Davis. Steve leads a team of nutritionists, economists, and policy engagement specialists to develop tools to design and manage more cost-effective micronutrient intervention programs and policies in developing countries, with a focus on Burkina Faso, Cameroon, Ethiopia, Nigeria and Senegal. He has field-based research experience in a broad range of countries -- Bangladesh, Brazil, Burkina Faso, Cameroon, Ecuador, Ethiopia, Ghana, Kenya, Malawi and Pakistan. Steve received his PhD in economics from the University of Pennsylvania and was a Postdoctoral Fellow with the Rockefeller Foundation in Brazil. Steve is speaking with us from Davis, California, where it is in the early morning hours of Wednesday, so thank you as well Steve for make the additional effort to share with us today.

Next, before we move into the presentation by our speakers, I'd like to welcome everybody to this webinar. One of USAID Advancing Nutrition's goals is to facilitate learning to advance progress toward improving nutrition. This webinar is one way we do just that, by connecting nutrition implementers working across different sectors to share resources and experiences to help improve nutrition programming. So, today we will learn about two tools that can assist in understanding how governments, donors, and other key stakeholders can best allocate scarce budgetary resources to achieve nutrition outcomes, particularly to prevent stunting, wasting, and micronutrient deficiencies. This webinar will also serve as an opportunity to discuss your questions about the use of these tools to meet your needs.

We recognize that stunting and micronutrient deficiencies continue to be serious problems in many areas of the world. Globally, stunting affects approximately 149 million children under 5 years of age, the vast majority in Asia and Africa, while about a third suffer from vitamin A deficiency, and almost a fifth have iron-deficiency anemia. To achieve the Sustainable Development Goals and to achieve World Health Assembly targets around nutrition, we know that there are effective interventions, if they are implemented with high coverage, that can help us reach our goals, like promotion of exclusive breastfeeding and appropriate complementary feeding, and micronutrient supplementation or food fortification, among others.

However, we also know that funding at the national level is limited. We need to know how best to allocate fixed budgets across programs, and across regions, to maximize reductions in malnutrition. There are critical questions that we need to ask.

- Can we reach our targets with our current nutrition funding, as it is allocated?
- What if we change the funding allocation in nutrition, how will that affect our ability to achieve our targets?
- How much funding do we need to invest in various nutrition programs to achieve our overall goals, and do so efficiently and effectively?

Today we will see how two tools, Optima Nutrition and MINIMOD, can assist us in answering these types of questions. Optima Nutrition is a tool developed by the Optima Consortium for Decision Science, the Burnet Institute, and the World Bank that can provide practical advice to governments to assist with the allocation of current or projected budgets across nutrition programs. The MINIMOD

tool, developed by the University of California, Davis, helps to select the most appropriate intervention strategy, or mix of national or subnational strategies, to reach the greatest number of individuals at risk of micronutrient deficiencies and at lowest cost. We will get an overview of these tools, how they work, what data and technical resources are needed to use the tools, get a feel for their strengths and limitations, and see examples of how they have been used and their impact at the country level.

So, I'd like to thank you again for joining us today. I would also like to thank the Nutrition Modeling Consortium, without whose efforts we would never have had this webinar today. The Nutrition Modeling Consortium, or NMC, was organized by the New York Academy of Sciences, under the leadership of Dr. Gilles Bergeron, who is the Senior Vice President for Nutrition Science for the academy, with funding from the Bill and Melinda Gates Foundation. The NMC is an initiative that has been instrumental in bringing together experts in nutrition modeling, including Nick and Steve with these two modeling tools, and they have been doing so since 2017. The NMC works to improve the understanding and use of modeling tools for the design and implementation of effective nutrition policies and programs. You can learn more about the NMC and a number of modeling tools that can be used to address policy and program questions on the NMC website, and we will share a link to the NMC website at the end of this webinar.

With that introduction, thank you again for being with us, and I will pass it to Nick, who will discuss with us the Optima Nutrition tool and experiences with its use. So, over to you, Nick.

Nick Scott:

Thanks so much for the introduction; it's a pleasure to be here. OK, in this short presentation I'm going to quickly take you through the Optima Nutrition Model. I plan to talk about some of the details of the model, some of the interventions that it includes, and also some of the applications we've it for so far.

The main purpose of this model, and the reason we built is to answer the question: What combination of investments in nutrition interventions can lead to the best outcomes? Imagine if you have a fixed, limited budget for public health and you want to allocate the budget across a set of interventions to get the best outcomes. This is a difficult problem and one that we've used the model to help with.

The underlying model focuses on the under-5 population and tracks them over a given period of time. So a user will enter what projection period they're interested in. The model includes a series of risk factors that can contribute to mortality, stunting, wasting, and anemia in children, and it includes birth outcomes like pre-term birth, small for gestational age birth; and also includes breastfeeding behaviors and diarrhea incidence. In the model we have a range of interventions, and some of these interventions are targeted for children of different age groups, pregnant women, nonpregnant women of reproductive age, and the general population. We can look at a number of outcomes in the model, including number of deaths, both child and maternal, and we can also look at stunting, wasting, and anemia, both prevalence and number of cases. We've build in an optimization algorithm into the model that can tell us how a given budget can be allocated across nutrition interventions to get the best outcomes. When I say best, it can be user-defined, so you can set it up to meet national strategies or agreed upon targets.

In the model, we think of stunting in terms of the WHO definition, so we classify children into four different height for age categories, and we look at severe, moderate, mild, and normal. Risk factors for stunting include birth outcomes, breastfeeding practices, diarrhea incidence, and past stunting—which means that we model stunting to be chronic, so a child who is stunted at age 1 is more likely to remain stunted at age 5. We also capture the effects of stunting, so for children who are stunted, we model them as having greater risk of mortality from diarrhea, pneumonia, measles, and other illnesses.

In the model what happens is, children are born and we look at the prevalence of pre-term birth and small for gestational age birth in the country that we're modeling. These children enter the model in the neonatal age bracket, where they fall in their height for age distribution based on the data from that country. The model moves forward one month at a time, the children get older and move into the next

age category; and where their height for age fits depends on the breastfeeding practices, where they were at birth, and the diarrhea incidence in that setting. These children move through the different age brackets [1–6mo, 6–12mo, 1–2yr, 2–5yr]; they get to the end, and then we assess whether they're stunted or not. Children in any of these age brackets can also die from a number of causes, and we calibrate the model based on the data in that country.

There are a number of stunting interventions—we've got about 17 in the model at the moment—you can probably find your favorite [in the slide]. These mainly focus on stunting. We look at some different interventions given to pregnant women that can improve birth outcomes, which is modeled to reduce stunting. There are also interventions for children, different feeding programs such as the lipid-based nutrition supplements, public provision of complementary foods—sometimes they're called different things in different countries. There are micronutrient interventions like zinc and vitamin A that can reduce diarrhea and indirectly reduce stunting, and there are also education programs, so infant and young child feeding education is one intervention that we've spent some time working with in the model. It can increase breastfeeding and complementary feeding behavior, which can lead to a reduction in diarrhea and stunting.

And in fact we've set up the model to know that the intervention [interference]…so we've set it up so that a user can have multiple education programs. A user can choose which group it's targeting, who receives the education, and they can also choose how it's delivered—through health systems, community platforms, or mass media.

Wasting is another really important feature in the model. Again, we include wasting based on the WHO definition looking at the weight-for-height distribution, and we classify children as having severe acute malnutrition (SAM), moderate acute malnutrition (MAM), or being in the mild or normal category. We define wasting as children who are in the severe and moderate categories. One of the main differences between stunting and wasting in the model is that we consider wasting to be an incident, or short-duration, condition. So we actually model episodes of wasting where children can experience an episode of wasting and then recover from it.

There are a number of interventions that can have an impact on wasting in the model. The main one is treatment of SAM, which improves recovery and can reduce the prevalence of wasting, but it can also reduce mortality by limiting the time that children spend at risk of death. A number of interventions in the model can reduce or prevent wasting, including cash transfers, sometimes called a social security protection program, food distribution program, and there are also some micronutrient programs that can indirectly reduce wasting by reducing diarrhea incidence. This is also the case for infant & young child feeding education programs.

We've spent some time with countries to try to make this treatment of SAM program modifiable, depending on how it's delivered in different settings. By default, what happens is that the intervention will move children from the SAM category to the MAM category, and then it will leave them there. We know that some countries continue this through a management of MAM intervention that can appear in the community or other types of settings, and so there are options to include this in the model.

Anemia is another main feature that we include in the model. We include anemia interventions for women of reproductive age, pregnant women, and children, and we define everyone in the model as being either anemic or not anemic, so it's slightly simpler than stunting and wasting. There are a number of interventions that can reduce anemia in the different populations—iron and folic acid supplementation that can be given to women of reproductive age or pregnant women. There are other supplements that can be given to pregnant women—multiple micronutrient supplementation, IPTp (intermittent prophylactic treatment during pregnancy) for malaria. These can reduce anemia in pregnant women, which can lead to reductions in maternal mortality, and improve birth outcomes. For children we have

some supplements; and there are broad population interventions such as food fortification programs and LLINs (long-lasting insecticide treated bed nets) in areas where malaria is prevalent.

For food fortification interventions we consider three different vehicles—wheat, rice, or maize flour; and we look at what setting we're modeling depending on which intervention is the most appropriate, based on the consumption pattern in that country. We also allow for the fact that these are imperfect interventions because there will be a subset of the population who are not reached by the program. Finally, there's also a program for iron and iodine fortification of salt, in settings where that is being conducted.

Mortality is another outcome of interest and often a target for countries. We have some interventions that target this directly. Again, there are supplement interventions for pregnant women, and other interventions for children, such as kangaroo mother care, treatment of diarrhea, treatment of SAM, and the food fortification interventions that can have a small effect on child mortality.

The final set of interventions are a couple of other nutrition-sensitive interventions, in particular family planning (FP), by which I mean modern contraceptive methods. When family planning gets scaled up it will decrease the number of projected births, but it will also decrease the odds of suboptimal birth spacing, so reduce the risk of births being too close together. Finally, five different WASH (water, sanitation, and hygiene) interventions are included in the model. At the moment there's a little uncertainty about the effectiveness of some of these interventions, so we're looking at the findings of a number of studies to know what to include in the model.

Each of these interventions has an economic framework attached to it, and what I mean by that is that what the model does is it takes as an input the amount spent on each intervention, and translates this to a number of people receiving the intervention. And as you increase the spending on an intervention, more people will receive it, and this will lead to reductions in stunting and mortality according to the effect sizes from the literature. This relationship doesn't need to be linear; as the [second] graph shows, as the spending on the intervention increases, the coverage among the target population will increase, but as you get higher and higher coverage, people will get harder to reach, so you have the saturation effect, so the final 10 percent will cost a lot more to reach. What the model does is takes as inputs how much is being spent on each of these interventions and gives a collection of outcomes associated with them. So, whenever you change the amount being spent on an intervention, you will change the outcome. Now all the optimization algorithm does is to search through all possible ways to allocate a budget, each time trying something out and seeing what projected outcomes it gets, until it finds the combination that has the best outcome.

I'm going to go into some specific examples here. This is some work we did in Pakistan requested by the World Bank.

When doing this type of analysis, there are some types of data that you need to gather as inputs. First, you need to understand undernutrition in the country, so you need data on stunting, wasting, and breastfeeding behaviors. Second, you need data on intervention cost and coverage, and you need to identify constraints on interventions—so, what is feasible in that context, because not all countries would consider all interventions. Third, you need to consider any objectives and constraints that they might have; so, what are their national strategies, what are they trying to achieve? Only then can you put all of this information into the model to get your results.

In Pakistan, we started off just looking at what they were currently spending their budget on (this is what the bar on the left shows). Most of their nutrition spending was on the cash transfers or social security programs, and a little bit to treatment of SAM and in young child feeding education. They had a plan to invest US$180 million per annum into nutrition, and the intention was to invest it in specialized nutritious foods for pregnant women and children (shown in purple [second bar]). These are effective interventions but they're quite expensive. We estimated that this investment could lead to an extra

62,000 healthy children. We then ran the optimization over this [third bar] and looked to see if some of the funding could be diverted to other cheaper interventions such as Vitamin A supplementation in the black line on the top, multiple micronutrient supplementation in the green line, and kangaroo mother care in red, with an expansion of infant and young child feeding education. We could have 4.5 times the impact with the same amount of money, simply by diverting some of those funds into cheaper interventions that could achieve a higher coverage.

Another feature of the model is that we can look at a geographical prioritization of spending.

[**Tanzania**] This is some work that we did in Tanzania. We looked at some of the different states in Tanzania, and the first thing we did was to estimate what are they currently spending their money on. For each region, the bar shows the mix of interventions that they are spending their money on at the time of the study. The World Bank had new investments that they were going to make. So we wanted to look at, if they were investing $33 million per annum, how could they allocate it across the regions and across the interventions to have the maximum impact? We can run this scenario through the model and it can tell us how it could be allocated and what it could be allocated to. These results make sense when you think about the population sizes, the prevalence of stunting, and the burden of undernutrition in each region; but what this really does is it quantifies it as a useful tool and a useful document.

[**Bangladesh**] The final example is a quick one and it's similar to the Tanzania one; this is some work that we did in Bangladesh. The question here was: if there was an additional $10 million per annum available to spend on nutrition, how should it be allocated across regions and across the interventions? Through the model, not only could we identify how much of it should go to each region, but we could see that in Bangladesh the breastfeeding promotion programs and the complementary feeding education program would be the optimal way to spend it.

It's not just me in the Optima Nutrition team; there are lots of people who have contributed to studies, to the development of the model and the framework for the model, so I'd definitely like to thank many people.

The final thing that I would like to show you all is that we have actually developed a web interface for the model. We use the web interface when we do the studies because we would really like the country team to take ownership of these analyses and do them themselves. So, I'm in the main page of the model here. We run multi-day training courses on how to use the model, so I'm not going to show you how to use it now—I'm simply going to show you that it exists and that it's not too difficult to use. So whenever we do a study, the people we're doing it for, we can really get them to do it. You can see that for each study you're running at the moment, you can go into optimization; you can optimize your current budget or you can optimize new investments. With a click of a few buttons it can run these optimizations and show you a lot of projections of what would happen if you continue your current spending or optimize your budget. Here, in this example, is the baseline spending for this country; and here is what an optimal allocation of that spending would be, as well as what impact could be achieved by simply optimizing the budget. This tool is available online, it's free to use. You just need to register. There are demos that are loaded so that people can go online and play with; and there's also a user guide to run you through the steps involved, and you can export data and share projects and information with one another. So I'm going to end there, I'm going to hand back to everybody else, and will be happy to discuss this further and take more questions after these presentations.

Steve Vosti:

Good day, everybody. Since we're in all kinds of different time zones, with 116 of us participating here, some of us are even in different days, so thanks for taking the time to join us, and thanks especially to the USAID Advancing Nutrition group that has been instrumental in pulling this all together, and another shoutout to Gilles Bergeron and his Nutrition Modeling Consortium through the New York Academy of

Sciences. Without him and his efforts and the support provided by the Bill and Melinda Gates Foundation, we wouldn't be here today.

I'm going to talk about another one of the tools that has been developed to help countries design and manage nutrition problems but with a particular focus on micronutrient intervention programs. We all agree, I'm sure, that there are substantial contributions made by these micronutrient deficiencies to the global burden of disease. There are all kinds of very large private and social costs associated with these micronutrient deficiencies. In the long term, all of us want to have adequate diets for all; that is the long-term objective for all of us. But in the short-term this is going to take time. So in the short term, what do we do? There are lots of options—fortification of staple foods and condiments, biofortification, supplementation, etc., but we also agree that we cannot do, and probably should not do, everything, everywhere, forever. So some hard choices have to be made, and one of the core objectives of all of these optimization models is to help people choose—help to inform the discussion among decision-makers as to not only what to do but also what not to do and when, where, how, and how long to intervene. So, what do we need to know in order to do this? Well, we have to know what the micronutrient (MN) deficiencies are, to know the situations in a particular country. We have to know how effective the alternative intervention programs would be. We have to know how costly they would be and hence, how cost-effective they would be, and then we need guidance on what combination of micronutrient intervention programs to choose, and again, this will vary over space and time.

MINIMOD objectives and framework: Our objective was to develop and use tools to help design and manage a more cost-effective set of national and subnational micronutrient intervention programs in low- and middle-income countries. The model we have put together has three components—three parts. The first part estimates what the needs are and what the benefits of alternative intervention programs would be, both individually and jointly. We estimate the intervention cost. Then we use the economic optimization model to select the most effective collection of interventions, given budget and time constraints—and I'll show you an example of that for Cameroon. We also have to do this in a spatially and temporally explicit way. Spatially because diets vary over space and therefore needs are different, but also because intervention programs can be more or less effective in different places depending on diets. And they have to be temporally explicit because people need to know when they should turn on and off different programs, and some programs need extended periods of time to become mature, investments need to be made, so we need to have a timeframe that allows for that to happen as well.

In a nutshell, the MINIMOD tool framework is the following. First we need information on dietary intake—we need to know what people are consuming; and we use that combined with standards for adequate intake of micronutrients in order to identify proportions of folks in different target beneficiary groups who are deficient. And then we basically change the quality of that diet according to an array of interventions and I'll share some examples of that in a minute. Then we keep track of the number of people who in a sense graduate from inadequate to adequate intake, but also keeping an eye on the proportion of the population that may be consuming above the suggested upper limits. We have also linked with the Lives Saved Tool (LiST) to be able to predict some of the functional outcomes associated with improving nutrition—lives saved, anemia averted—and again spatially and temporally explicit. Also, nothing's free in life. And therefore all of these programs and interventions have costs—planning costs, establishment costs, operational costs—and these are all estimated using activity-based costing approaches; and these can vary spatially and temporally as well. And then what the tool does, as a first pass, is to generate estimate of all of these different possible combinations and the benefits of these combinations, and provide some relative cost-effectiveness estimates for these alternative intervention programs. And that in itself, these rankings, if you will, of these programs, and I will show you a couple in a minute, can be very helpful in informing these debates. But the final step is to take all of these different combinations and then put them into an economic optimization model that finds the most cost-

effective set of nutrition interventions, reports summary measures of benefits, and then reports on the savings vis-á-vis alternatives choices as well.

I want to spend two minutes telling you a little bit more about how we estimate nutritional needs and benefits to programs.

It's very important to note that decision-makers have to choose what they want out of life. What are the specific intervention's measures of success? There are many candidates. I'll give you four or five here. One is reach: this is just the number of individuals who receive an intervention whether they need it or not, and whether that intervention actually is sufficient to bring about adequate intake of a micronutrient. One that we focus a lot of attention on is called effective coverage: that is the number of people who are at risk of inadequate intake and who, thanks to one or more of the interventions, actually achieve adequate intake. There's minimum additional intake, particularly for the minerals—you have some specified amount that you want folks to consume. There are the functional outcomes—thanks to the LiST tool—lives saved in cases of anemia, and excessive intake: we want to keep track of all of those folks who may in fact be consuming more of a particular micronutrient than would be recommended.

The basic approach is, we estimate the usual diet, and we then identify the estimated average requirement and the folks who are, let me see if I can get this [muffled], oh, there it is, Ok. And so this area right here (left side of graph) is basically the proportion of the population that is below a specified EAR (estimated average requirement). What we can do is just introduce new programs that essentially shift the distribution from left to right and that gives us a different proportion of the population that is then suffering from micronutrient deficiencies. And simply calculating the difference between the two will give you what we call effective coverage. And this will vary by baseline intake, program reach, etc.

This nutrition model alone can be very useful in identifying the expected benefits of either current or hypothetical programs. This is an example of a program for B12 among children in Cameroon using two products—the bouillon cube on the left, and wheat flour on the right. What we see is that there are very substantial proportions of the population in the southern part of the country, the northern part and the large cities in Cameroon consuming the bouillon cube. However, bouillon cubes are less effective than one might expect, lots of people eat them but they tend to deliver very little, especially to young children, therefore, the effective coverage is substantially [muffled] would be. The same is true for wheat flour.

This is an example of using the MINIMOD tool to assess the effects of increasing the fortification level of wheat flour on the number of cases of anemia averted among women. The target for Cameroon nationally is 60 mg per kg. And if that is achieved what you see is that you get very substantial reductions in the number of cases of anemia, especially in urban areas, where there's lots of wheat flour being consumed; less so, but still significant increases in the others. But it really depends on how well this system performs—this particular intervention performs. In 1976, in Yaoundé the target levels remained 100, but 76 percent of the target was actually achieved. When we went back in 2016 we were down to about half the target level; you can see the benefits dribble down practically to zero. So this [information] was of fundamental importance to the Cameroonians, who went back and are retooling the monitoring and evaluation (M&E) program to increase the level of fortification in that context.

In the model itself there are lots of different delivery platforms for an array of different micronutrients. We have the periodic high-dose supplements, daily supplementation, industrial fortification, biofortification, agrofortification; and there are other intervention strategies that use different platforms, supplements, micronutrient powders, and others. All of these models, all of these delivery platforms, require investments and monitoring and evaluation; and if they don't perform well, the benefits will not be delivered. One of the things that MINIMOD can do is to predict the effects of poorly functioning programs, which can be next to zero.

The costs are very straightforward. We look at all the startup costs, including planning, legislation change and the like. We look at the operational costs—both the fixed costs, the overhead and management, as well as those costs that vary with the scale of the program. It's quite important that we include the costs faced by all of the stakeholders: the public sector, private sector, as well as caregiver and household costs. And we look at this in the context of marginal or incremental costs: that is, the costs of adding new micronutrient interventions programs to existing platforms, or starting from scratch in designing and implementing new programs. And the cost tool calculates the costs for all of these interventions, individually and different combinations of them as well.

This is a little harder to see, but I wanted to show you what can emerge when you simply take the information that you have on benefits and costs and link them. This is for Cameroon, and it looks at several different intervention programs and these are the benefits: this is reach, this is effective coverage and this is the number of deaths averted shown on the far right [of the table]. What you see is that we have vitamin A fortified edible oils at 44 percent of the target, and edible oils with improved performance; bouillon cubes with vitamin A fortification, biofortified maize with vitamin A, and vitamin A supplementation on Child Health Days. What you see is very dramatic differences in the reach and consequently also differences in effective coverage and the numbers of lives saved, and so these programs have very different effects. And they also have very different costs. You can see the program costs that are quite high for the Child Health Day campaigns—much less for the others—and this translates into cost per child reached, effectively covered, and cost per child death averted—costs are quite different across these interventions. But also, it's important to note that within countries we can have and we do have very different impacts and costs that need to be taken into consideration by the economic optimization work.

What the economic optimization model does is that it combines the results of the nutrition benefits and cost models, and then uses a linear programming technique to basically seek and find the economically optimal combinations of interventions over space and time. And you can look at it in two ways. You can either minimize the cost of meeting a specific objective, or, given funding constraints, you can do the best you can in terms of one or more of the identified objectives.

So I want to show you how this works, very briefly. This is an example for Cameroon, for vitamin A for young children. What we will do is look at the existing programs. This is business as usual—what they're doing now, which is vitamin A supplementation nationally and fortified cooking oil at about 45 percent; and S, N, and C represent south, north, and cities macro-regions, so in each one of these cells, SNC means it's a national program—they are doing a national vitamin A supplementation program and have national fortified cooking oil program. What you get is about 1.2 million kids effectively covered per year, so the programs are working—but they cost about $3 million a year, which gives us an average cost per child effectively covered of $2.49. But this [average] masks very substantial differences across regions within Cameroon in terms of both the effects and costs.

So we used the tool to do something new. First, let's add some new interventions. We're going to develop and introduce a fortified bouillon cube; we're going to introduce biofortified maize. And both of these programs take investments to begin and don't generate any benefits until about year 4. And we want to improve, over a three-year period, the performance of the oil fortification program. We use the optimization model, and the objective is to achieve at least what the business as usual scenario is achieving in the context of effective coverage, which is about 12 million kids over 10 years. We'll use the same effectiveness or reach of the vitamin A supplementation programs in this analysis.

What emerges is that the model suggests that vitamin A supplementation be done, but only in the north, and it should stop after a couple of years. The model suggests that you definitely invest in improving the cooking oil, and that you invest in the development of the fortified bouillon cube, understanding that you don't get any benefits of these until later on in the programs in the context of the vitamin A fortified bouillon cube, not until year four. It suggests that in this case you do not use the biofortified maize, in

part because children eat very little, it's very small portions, so there isn't a lot that gets delivered via that platform for that stakeholder group. What happens then is that we calculate all the benefits over a 10 year period, in terms of the number of children effectively covered, and it turns out that there are more children effectively covered in this particular scenario than with business as usual, and the cost per child covered goes down from $2.49 to about $0.71.

The ongoing work that we have planned: we continue to work in Cameroon, Ethiopia, and Haiti in developing and using these tools to help decision-makers design and manage cost-effective micronutrient intervention strategies. We have new work in West Africa, in Senegal, Nigeria, and Burkina Faso. And in all sites where we begin, we form MINIMOD teams and support them over time. There are collaborative research projects done in all sites, including data collection, processing, and modeling; extensive amounts of policy engagement happens from the very beginning; and there's quite an investment in capacity strengthening, because we want folks to be independent in using these tools when we go home.

In terms of acknowledgments, I am sorry for the formatting there, I am speaking on behalf of a very large team of core members, mostly from UC Davis but other places as well; and we benefit from a huge number of collaborators—I mention only the organizations or institutions they belong to here—I won't go into it, but one of the core collaborators has always been Helen Keller International in each one of these programs that we are investing in; and the funding sources that we have are from the Michael and Susan Dell Foundation, Sight and Life, and the Bill & Melinda Gates Foundation.

Thank you! And for more information about MINIMOD, visit https://minimod.ucdavis.edu

Kelly:

Thanks, Steve, and now we will have a joint presentation with Nick and Steve.

Steve:

Nick, shall I begin? [Nick: Yes, take it away!] Now, one of the real challenges when you've got all these different models is sometimes people feel they have to choose one or the other, or one of the seven or eight or ten that are out there. And the answer is that you don't have to choose; in fact, we recommend that you don't choose. There are complementarities among these models, so can select collections of tools that are most appropriate for the policy questions that you are going to address.

The tools that you are hearing about today have a lot of complementarities. There are other tools that overlap as well, and I recommend that you visit the Nutrition Modeling Consortium's website for a more complete list of the tools available. But both of the tools that we have developed here, the one that Nick presented and the one that I just finished presenting, are aimed to guide investments, and they look at cost and cost-effectiveness or examine these issues through, in essence, an economic lens. But the lenses are somewhat different. For the Optima Nutrition tool, it looks very broadly across nutrition and other types of interventions that can be used to address some of the child health and mortality issues. The MINIMOD tool has been developed to look very specifically at micronutrient interventions. If you have, for example, a vitamin A problem or deficiency in your country, there are lots of ways of addressing them. This tool is geared toward helping you identify those places and select tools for using them. But a more comprehensive, integrated, targeted, national nutrition strategy would be enhanced by using both of these tools.

One could, for example—and we'll just take a hypothetical scenario—imagine that a country is updating its national nutrition plan with a focus on meeting some future objectives in terms of infant, young child, and maternal nutrition and health targets. They want to determine the most effective strategies for achieving these, and they want to look over time and space to identify what these might be. So Step 1 would be to run the Optima Nutrition analysis that Nick presented earlier, that can help you identify broadly the types of interventions that can be used to help you meet these objectives. And then you can

review these and see what sort of allocation of the lump sum fund would go to micronutrient interventions. And then, [in Step 3] you can use the MINIMOD tool with this information about how many resources should go to, for example, dealing with vitamin A deficiencies, and the MINIMOD tool can be used to identify the most efficient way of [decreasing] vitamin A deficiencies and the different interventions over space and time to deal with them. And [Step 4] if there are cost savings, which there often are, identified by the MINIMOD tool, then you can go back to the Optima Nutrition tool and ask, "Hey, we have some additional savings here, let's rerun the tool, and see what the best way to use these savings might be to meet the agendas that were set out in the new national nutrition plan.

So—what to do if you want to use one or both of these tools? Well, for general information regarding data requirements, funding, and time required to actually set up and use these tools, for Optima Nutrition you can go directly to Nick or to the website that he identified; and for MINIMOD you can come to me or to Katie Adams—we're both at UC Davis—or you can go to the website that was identified earlier on. For potential USAID support for either or both of these tools, we can go to the USAID missions in country, or to the USAID Advancing Nutrition Contract Officer Representative, who is Leslie Koo. For other potential donors to support these, go to the donor country or regional offices, or to the donor headquarters, and let them know you're interested. That interest can percolate up through their administrative mechanism and we can get these programs up and running in countries once the funding is set up. I think that's my last slide, so, Kelly, back to you.

MONICA:

Actually, I'll take it from here, Steve. Thank you so much, Steve! And Nick, feel free to add comments about how the two tools work together.

NICK:

Yes, I was just going to say that Steve and I have put together a series of poll questions for the audience so this is really to sort of illustrate to you some of the complementarities between the two models, and it's also a test to see if you have all been paying attention to what we've been saying in this webinar. And so, hopefully you can see on your screen—there's an interactive poll. The first question that we would like to ask is: What tool can help you to estimate the impacts and costs of implementing nutrition intervention programs on adequate intake of vitamin A, iron, zinc, calcium, vitamin B12, folate and iodine? So I'll just pause for a moment while everyone can answer that question on their screen…OK, so we've got a current leading answer of "both models" with 25 votes—actually, the answer to this question is "MINIMOD." So, Optima Nutrition can look at how much funding should be directed for different programs but it doesn't actually include the dietary intake. So to go into the level of detail of the dietary intake of these micronutrients, this is one of the key benefits of a MINIMOD analysis, to supplement an Optima analysis or on its own, of course.

So, the next question: What tool can help you to estimate the impacts and costs of implementing nutrition intervention programs on stunting, wasting, anemia, and mortality among young children—MINIMOD, Optima Nutrition, both, or neither? I think most of the votes are in here…The leading answer at the moment is Optima Nutrition. In fact, this is "both models." So, both models consider the same sorts of outcomes, which are the stunting, wasting, anemia, and mortality. The difference between Optima Nutrition and MINIMOD in this instance is that Optima Nutrition has a broader set of interventions whereas MINIMOD is focused on the micronutrient interventions.

Next question: What tool can help me to estimate how to economically optimally allocate funding across education, micronutrient, treatment, and selected nutrition-sensitive interventions? …All right, the leading votes in this case are for Optima Nutrition, and that is correct. Optima Nutrition considers a broader set of interventions, including some of these nutrition-sensitive, education, and treatment interventions.

[Next question]: What tool can help you to estimate the most cost-effective ways to meet agreed-upon micronutrient objectives at national and subnational levels?...Very good paying attention by the audience—the leading vote is for MINIMOD and that is correct. MINIMOD is interested in the micronutrient objectives.

[Next question]: Which tool can help you to geographically prioritize investments? ….And the leading answer, "both," is correct in this case as well.

[Next question]: What tool can assess the impact of micronutrient interventions on women of reproductive age? ….The answer to this is that both models in this case consider women of reproductive age.

A question on some data: A MINIMOD analysis requires data on...? So you can select multiple options from the following—what sort of data would you need for a MINIMOD analysis?... OK, so most of you are correct here—you would need dietary intake data, micronutrient requirement data, undernutrition data, and the cost and coverage of interventions.

The same question for an Optima Nutrition analysis, what type of data would you need? ….And most of you were correct here—for an Optima Nutrition analysis, you would need data on undernutrition, breastfeeding behaviors, and the cost and coverage of interventions.

And the final question: If you would like to undertake a MINIMOD or Optima Nutrition analysis, what should you do? …You should contact Steve or me or go to the websites—you should eat lots of nutritious food anyway, but please make sure contact us or go to the websites. Thank you.

MONICA:

Super, thank you so much, Nick. Thank you to both of you. Thank you Nick, thank you, Steve, and thank you for the great presentations and those poll questions, because they helped us to see where our understanding is clear and where maybe it wasn't so clear and to clarify some of the questions that we might have. So in summary—what did we see? We've had a chance in this webinar to look at these two tools, Optima Nutrition and MINIMOD, that help us determine the most cost-effective way to allocate resources to achieve nutrition objectives. And we've seen also, in the last presentation by Nick and Steve, how Optima Nutrition and MINIMOD can complement each other. For example, Optima Nutrition can provide information on the overall budget for micronutrient interventions, and the impact of optimizing micronutrient interventions on other nutrition outcomes, while MINIMOD can refine the information—refine the information from Optima Nutrition on the costs of micronutrient interventions and other Optima inputs and identify the most cost-effective delivery mechanisms for micronutrient interventions. So now, we've had a chance to take a closer look at these tools, but now we want to hear from you, and we have—you have been sharing your questions, and we really appreciate that so much. We are going to start taking some of those questions, and I'd like to start with some questions about costs, costs that are used as inputs within these models. I'll ask these two questions together. First of all, are personnel and delivery costs included in the cost estimates for each intervention? And also, for Optima, do you need data on costing interventions and budget tracking—so confirming, you do need, right? Information on costing for interventions and also budget tracking. I'll leave that to you to respond. Nick, if you can start, and then Steve, if you have anything to add to that.

NICK:

Yes, thank you. So, very quickly, yes, the costs of interventions should include all the costs involved in delivering them, so this involves personnel, logistics, delivery, any overheads as well. Then the second part of that question, in terms of, do the intervention costs require budget tracking—budget tracking information can be very helpful in estimating the unit costs, so it doesn't get entered into the model. The unit costs themselves get entered into the model, but if you have any budgetary information, this is very helpful in that [unclear].

STEVE:

Yes, for MINIMOD, we do use the detailed budgetary information for ongoing programs if you have them, and they have to be put together for the experimental or hypothetical interventions in particular countries. And these things vary over time and over space as well; and include a lot of the sometimes overlooked political costs, or, sorry, the cost associated with changing legislation and rewriting laws and all of the sorts of things that can be very time-consuming and very expensive to do before any new micronutrient program is adopted. So, all of these costs are included in all of the options, both the ones that are currently ongoing, and the ones that are being considered.

MONICA:

Great, thank you so much. Another question that we have from one of our participants deals specifically with how far down in terms of region or province or district can you take the analyses. For example, if you were to look at these tools, can you look at the level of the province, or can you estimate at smaller geographies within the country, like divisions or districts? Nick maybe if you want to start with that, and then Steve, if there's anything you want to add.

NICK:

Sure. So, you can look in as much detail as you have data for. So, typically you can go down at least one geographic division if you have a good DHS survey or MICS survey that's being conducted—then we usually go down one division. Once you've run out of data there's no point in going down any further, so it will be on a country by country basis.

STEVE:

Yes, it's exactly the same for the MINIMOD tool, both for the expected benefits and also for the costs. We stop there in part for practical reasons—the data to support further disaggregation usually isn't available in a representative form, but also because for many of the policy decisions that we are trying to inform, are taken at these higher levels—either national policies or the next step down which would be regional or provincial policies for food fortification and targeting of vitamin A supplementation, for example.

MONICA:

Super, thank you so much. We have a question now that's looking at the use of these tools and applying an equity lens. If you could speak about how you might apply an equity lens while looking at these types of analyses to make sure that we're targeting the funding to reach the population that are most at need. Steve, do you want to start?

STEVE:

Sure. By design, one of the things that the MINIMOD tool does is identifies the differences over space--the geographical differences in dietary intake and consequently, differences in need; and this helps to target the areas that are most needy, but also helps identify the areas where the costs associated with certain interventions may be higher or lower. We find in the context of Cameroon, for example, that the needs for vitamin A for children, for example, are highest in the north, and the costs associated with meeting those are actually lowest, and so the most efficient thing to do is to in fact target the folks who are in greatest need. I'll leave it at that.

Monica:

Ok, thank you. Nick, do you have anything to add?

NICK:

Yes, another way that we've thought about doing this is we talk about multiregional analyses and looking at dividing funding between different geographical regions. But [in] a geographical region we can think of a multi-analysis as having different population groups. So, we can set up population groups for, as, say, the lowest wealth quintile, and the second-lowest wealth quintile, and we can look at how funding can be directed across wealth quintiles. That's just one example of an equity lens that you can take to look at the impact there. But there are other ways to divide the population up to look at this issue.

MONICA:

Great, thank you so much. We have a question specifically about taking into consideration communities that rely on subsistence farming. So, for example, when you're looking at fortification approaches, does the effective coverage, when you are looking at effective coverage, does it take into account, for example, the number of children living in communities that might not receive the various fortified foods—so Steve, can I pass that question on to you?

STEVE:

Sure. If by subsistence agriculture we mean individuals who basically consume only what they produce, then yes, we know what people are consuming, and we also know the extent to which the things that they are consuming that are brought into the household—for example, edible oils—are fortified. So, we know this, and we can use this information to identify the intervention strategies that are most likely to reach these folks. So, in the case of folks who produce only their own foods, then that is a one mechanism or one platform that can be used, and we use—we address this using biofortification and also agrofortification. But we also have some additional supplementation and other interventions that can be used to enhance the quality of the dietary intake of these individuals who rely primarily on their own production.

MONICA:

Thanks so much. I think we'll move on to the next question. This question is for you, Nick. For many of us who are familiar with LiST, you mentioned in your presentation the LiST tool, and also the One Health tool—could you describe how Optima differs from LiST or the One Health tool—are the assumptions for estimating the impact available online? So, if you could talk a little bit about those two things—what are some of the differences between Optima and the LiST and One Health tool, and also are the assumption for estimating impact, are those available online.

NICK:

Absolutely. So, we have a user guide that has all of the assumptions behind the model in it, and that's available online. In terms of the impact estimate, we use a similar modeling framework to LiST, and we use the latest literature that we have available on these things. So, the impact estimates have been validated against that tool and they should quite similar. The main difference between the models is the optimization feature of the Optima Nutrition model. So really what we can look at is trying to answer this question of, if you had a limited budget, how should you allocate it—and that's the key difference between Optima and these other tools.

MONICA:

OK, great, thanks. Nick, I think this is another question for you. It is speaking specifically about wasting, and the wasting algorithms that are used in Optima Nutrition. So, the question is, do these algorithms, do they take into account, like for example, recent reductions in costs and program improvements around the treatment of acute malnutrition, including the combined and simplified protocol for SAM and for MAM—if you could speak to that. We know there are some ongoing changes in terms of how SAM and MAM is being treated, there's a lot of discussion about that these days, so I just wanted to ask you,

Nick, about the reflection of those discussions and any advances and information that's available into the Optima Nutrition model.

NICK:

Sure. Firstly, on the costs, yes, these things are considered. The unit costs are entered on a country by country basis, and so they should be calculated based on the program that's being delivered in that country, so they should account for all those factors. The impact and the effectiveness of these things, as they change over time—the effect sizes can be updated in the model once there is robust evidence available. And so. we follow the literature to try and do this. What that does mean is that there is some delay between protocols changing, evidence being developed and that being included in the model.

STEVE:

Monica, can I add one thing? The issue of costs goes beyond just the MAM and SAM and the improvements that have been made in dealing with those issues. Across the board, the intervention programs that are existing in most developing countries are really not functioning up to what the expectations were; and a lot of times, one of the first uses that the MINIMOD tool is put to is to estimate the benefits of actually improving these programs, and then digging into the cost algorithms to see how costs might be reallocated or what additional investments might be made to improve the performance of existing programs. That has yielded huge benefits, in terms of re-igniting discussions around food fortification programs and the like.

MONICA:

Ok, great. Thank you, Steve and thank you Nick. I have another question… I know, Nick, that in your presentation that you had a slide that talked about the other risk factors that, I believe, are taken into consideration in the model, related to stunting. There's a question here about—what about other risk factors, you know, those related to, for example, inflammation, mycotoxins, enteric dysfunction. Is it possible, is it feasible to take that into consideration—have you looked at that at all, is that something that you would like to look at yet in the future, and what does the evidence out there look like for that? Nick, I'll pass that question on to you.

NICK:

Sure. So, at the moment we don't include those specific mentioned risk factors in the model. In order to include a risk factor—again, it comes down to the evidence that is available for the causal link between the risk factor and the outcomes of interest. So, it's possible to include any risk factors in the model—really what it comes down to is what evidence is available to support that and what interventions are available to address those factors.

STEVE:

In the context of MINIMOD, the core issue is absorption, and some of the factors that were just mentioned in terms of risk can influence absorption. And so, what we have in the context of the tool is the ability to examine different assumptions—about the absorption of iron, for example—and the knock-on effects of these different assumptions for the effectiveness and cost-effectiveness of alternative interventions, related to iron, for example. So, you can get some, in a sense, confidence intervals, if you will, or some ranges of expected benefits, based on different assumptions about absorption.

MONICA:

Ok, super, thank you. We have time for maybe two more questions. One question that we have that I would like to pose to both of you is: is there some type of program information that could determine the best combination of health *professionals* for a country or for a region, thinking specifically about nutrition professionals like dieticians or nutritionists. So, do these modeling tools—I know that for

example for Optima Nutrition you're looking at very specific interventions and then the cost of those interventions. Is there any way to look at the best combination of health professionals to provide those interventions? Nick, I'll pass that question on to you.

NICK:

Yeah, that's a good problem. We don't consider those features in the Optima Nutrition model at the moment. They are definitely key considerations that need to be considered when defining the constraints on interventions, so how high can you scale an intervention in a country will depend on the human resources available to deliver it. But we don't actually model the types of human resources and the optimal combination of human resources.

STEVE:

From the point of view of MINIMOD, the composition and training of the human resource teams that are involved in delivering these micronutrient interventions emerges from the discussions in country—what are the collection of skill sets that need to be present in order for an intervention program to work well—and these are included explicitly in the cost model. So, while the tool does not optimize based on skill set, what it does is, the optimal solution includes the costs of these user-determined skill sets in the cost function.

MONICA:

OK, great. Thank you so much. Unfortunately, we have come to the end of our question and answer time, we're drawing to the end of our webinar. It breaks my heart because there are still some questions out there that I would like to ask, but we will see if we can address those in some other way. So, thank you again, everyone for those great questions, and thank you, Steve and Nick, for your wonderful responses and the lively discussion. So, as our webinar now draws to a close, I will pass it back over to Kelly.

KELLY:

Thanks, Monica. And I want to thank Steve and Nick once again, and all of our participants for taking the time to participate in this webinar today. We hope that you found it useful, and we will be sending out a survey following the webinar. We ask that you take a few minutes to take the survey, as we do review all the feedback we receive, and we find it very useful as we plan future webinars. If you have an idea for a future topic or would like to share your work through our webinars, please let us know through the survey. We look forward to seeing you online at our next USAID Advancing Nutrition webinar, which will be next Wednesday, February 26, from 9:00 to 10:00 AM, Eastern Standard Time. We will be launching the nutrition-sensitive agriculture design guide. If you'd like to register, you can do so on the News and Events page at advancingnutrition.org. Thank you all once again, and have a great rest of your day.

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