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PROFESSOR: Where we left it at the end of last time was the mechanism for poverty trap that [INAUDIBLE] explained, and that was kind of a workhorse of development economics for many years, since the 1950s, might actually, surprisingly, not be at play.

In that, number one, the effect of your calorie consumption on your productivity in the immediate next few days is probably not large enough. And, perhaps as a consequence, or perhaps just because they have other things to do with their money, we don't see the poor also consuming as much as they can. And therefore, we don't see a very high elasticity of food consumption with respect to wages.

So if we don't have a very high elasticity of wages with respect to consumption, and we don't have a very high elasticity of consumption with respect to wages, then we are not going to get a very highest elasticity of wages tomorrow with respect to wages yesterday. And therefore, the whole thing of I am poor because I am poor, based on how much food I can consume is not really there.

So on the one hand, you could say fine, that great. It means we can start focusing on other programs, and nutrition is not really an issue. And for some people, that has been the conclusion. For example, on Tuesday, we showed some graphs coming from the paper by Angus Deaton and Jean Dreze about the fact that people are consuming less and less calories in India. So they are becoming richer, so they are moving along the angle curve. And that would make them consume more, everything else equal.

But the thing is, not everything else is equal. And at the same time, we have the angle of curve shifting to the right. So that it's a swimming upstream movement,

where you're trying to go up the angle curve, but the angle curve is shifting right, so you end up actually consuming less, fewer calories than you would otherwise consume,

So for some people in India, this is a sign that there's much more poverty than the official statistics are saying. Because if we define poverty as not having enough to eat, then we have more and more people who in fact don't have enough to eat.

But what is strange is that if we look at the other things that people consume, and we measure poverty in this way, which is, if you look at the entire budget, are you below-- are you someone who consumes less than a dollar a day per capita, of 16 rupees a day, because it's India? And you don't find that. You find that actually there are fewer and fewer people who are below a dollar a day. There is still a number. It's about 13%. but it's certainly going down. So it has to be that people exercise a choice not to eat as much.

So Deaton and Dreze who wrote this paper and documented the decline in calorie consumption in India, have one explanation. And their explanation is that people's need for calories has gone down because they are less ill, they have fewer children, they are doing less intense physical work. A lot of people have moved to the urban areas.

So it's just they eat less because they need less of the strength. And therefore we have nothing to worry about, in a sense. The fact that people are eating less is, in a sense, a sign of success of India's economic growth.

But if it were the case, then we should find that the nutritional status of people would be adequate. Defined in more objective terms. Not the calories you're consuming, but what is your weight, what is your height. Whether you're anemic or not. We should find an improvement in that. Because, to the extent that people are getting richer, they should want a little bit of improvement in their nutritional status.

And what is striking and surprising, which is why they might be hidden traps is that by all accounts, in India in particular but in other places as well, people are still not

very well-nourished. And it is more a matter of there is some undernourishment, which is people are not eating that many calories.

And also, maybe something that people referred to as hidden hunger, and you can think about as malnutrition. Which is even the condition of having enough calories if people are not getting enough of the other micronutrients that they need-- for example, anemia.

So here is a number for India. 33% of men and 36% of women have a BMI below 18.5. And meanwhile, iron deficiency anemia affects maybe something like a billion people worldwide.

And iron deficiency anemia means that people are in fact less strong, because the ability of their body or their blood to process the oxygen is limited. Because we process the oxygen with other blood cells in our body, the hemoglobin in our blood. And if we don't have enough of that, we're not very good at processing the oxygen. So you put people on the treadmill that are anemic, and they are not able to make it go as far.

So we have here a puzzle that, on the one hand, we don't see people appearing to be hungry for calories. In fact, in China we see this Jensen, Miller evidence, which goes the opposite way. Which is, you make the cheaper source of calories cheaper, and people eat fewer calories, at least in one region. And yet, they seem to be not very well-nourished. so what could be going on? Let me start with you, your reason. And I will present it.

AUDIENCE: Their diets are very narrow and the same all the time. So they don't really correlate what they eat to-- It's just kind of an informational thing. They don't realize what kinds of nutrients they actually need, so they just have what tastes good or what they're used to eating.

PROFESSOR: So it could be, for example-- I'm just rephrasing for everyone, because you speak in this very nice and soft tone-- It could be that they don't have the information that nutrition affects your strength. In fact, you proposed one very specific theory for

that, which is, if you've never experimented because you've always eaten same thing, then you might not know what would happen outside of your normal range. So that would be one reason why you don't have the information.

AUDIENCE: And then when someone, or maybe the government, suggests a different diet, or replacing what people are normally used to eating, they're not really willing to take that advice. And so that can-- they'll just continue eating [INAUDIBLE] just normally eating. Their diet is based mainly on grains and rice. And if someone in the government says, well, there's a shortage of that. Maybe you should supplement more vegetables for it. Then they aren't very willing to switch.

PROFESSOR: One reason why your information might be limited is that even when you get a source of information from outside-- for example, the government-- tells you, you should eat your vegetable. You should eat these kinds of cereals rather than those kinds of cereals. You should replace some rice with pulses, or some rice with cereals, people are reluctant to do it. And why would we think that people are reluctant to follow this information from the government?

AUDIENCE: A bunch of reasons. One might be a variety of foods might not be available in that region. And also, a lot of those things are more expensive. So the cheaper things are very carb-heavy things, which is quite filling. So you might not choose to go with vegetables [INAUDIBLE].

PROFESSOR: Right. So there are two reasons, two possibilities in what you said. The first one is a chicken and egg problem. Because if no one eats spinach in a place-- and spinach is a great thing-- but if no one eats it, it's just not available, and therefore you cannot try it out. What was the second one, excuse me?

AUDIENCE: The second one is that the cheaper food is generally more carb-heavy, and so it's quite filling, and you might choose to buy that over vegetables which are much more expensive than the rest of the food.

PROFESSOR: Right. And the second one could be a matter of costs.

AUDIENCE: And I think that the benefit of nutrient intakes are over the long-term. So if you're

taking a small iron tablet, the next day, miraculously you're not going to perform better. But over the long-term, you might see smaller improvements.

PROFESSOR: Right. So it could be that it is difficult to learn. So for example, one thing that could happen is that someone from outside, very well-meaning, says you should really eat iron-fortified flour instead of your regular flour. And you try. And then, after one week, you don't feel like Popeye. It's not that things have dramatically changed.

And in fact, if I put you on a treadmill and I ask you to perform an exercise, I will know that you are 10% stronger. But this is not something-- if you are 10% stronger the next month, are you going to be able to really see the difference or not? So it might not be immediately clear.

And if that is the case, then you might have a situation where people arrive from outside and give you this message, and say, you should really change your diet in this way. And you make, maybe, an effort to follow them for some time. Spend a little bit more money, or a little bit more effort into going into pasturizing your food. And then it happens, and you're not any stronger. And you're like, whatever did they tell me? It's like, this is no better.

Because your expectations were set high enough to encourage you to do the switch. And the problem is there would be a tendency to slightly oversell how much better you're going to feel. Which then is going to translate into a disappointment.

So one example of that is something that people have found in a deworming program in Kenya, which we're going to discuss in a moment. So it's a charitable deworming program. Deworming is, in some sense, a nutrition program, because the worms are competing with the kid for the food. So by removing the worms, you are increasing the amount of food that stays with the kid. I'm sorry, this is not a great conversation to have right after lunch. But that's kind of the biology of it, in two words.

So when you give deworming-- and we are going to see that in a minute-- that does make the kid-- that reduces anemia, that reduces the incidence of being sick. That

reduces, therefore, absence from school.

So there was an NGO that was trying to promote deworming in some randomly-selected schools in the late '90s, early 2000s. And they went, and they explained all of this with a lot of energy, and said, your kid is going to feel much better, and is going to go to school more, and all of that. And parents had to sign a form to agree to get the kid dewormed. So it's not money. It's not a huge amount of effort. But it's still a little bit of effort. And also, you have to want it.

And people were interested-- the researchers were interested to know whether parents were more likely to sign the form if they knew more people around them who got a chance to get the deworming.

So because it was a randomized experiment, which was done at the level of the school-- I'm going to show you a map in a moment-- some people got treated in some schools, and some people didn't get treated immediately. So people who are in a treated schools may have had friends who were in neighboring schools, which may have been treated a control.

So what the researchers did is to look at whether you were more likely to take up the deworming once you got the option if you had more friends who got the option the year before. And their prior going into this, was that the more friends you have who got into the deworming, the more you are likely to do it yourself, because you will see the benefits.

And what they found was exactly the opposite. Which is the more friends you had who had been a chance to get dewormed a year before, the less you are likely to take up the deworming once you got a chance. And what are the possible interpretations for that somewhat weird results? Yeah, Zach?

AUDIENCE:

One possible interpretation is that it depends on how you get the worms. The fact that your friends are being treated for you might be less likely to get it, like in the case of malaria. If everybody in the community's using the bednet, you probably don't have to.

PROFESSOR: Exactly. So that's a first possible interpretation, which is worms are, in fact, highly contagious. So if most of your friends are treated, then they probably don't have worms anymore. You might feel, well, I don't need to go to the trouble of getting dewormed because they did, therefore there are fewer worms around. And there is some side effect. Why would you take the trouble? Yeah, Norm?

AUDIENCE: Maybe people also, since people get dewormed, and then their problems decrease, people don't think it's as much of an issue, because it's not as prominent. So it's the externality just decreasing, they just don't realize that it's such a big threat anymore.

PROFESSOR: Exactly. So that could be another thing. Which is, people learn that-- So people say, oh, these other kids got dewormed, but they are not much healthier than me. And the fact is, you don't realize that you are healthy because they are healthy, and they made you healthier. So you are now comparing the benefits of you as a control child-- you are not yet treated-- to the other kids who got treated.

And the difference is not that large. It's not that large precisely because of the contagion effect that Zack mentioned. But so you're trying to learn the effect, and so it's not that large. And even if you don't understand that it's due to the externality, so you don't do this calculation, saying, it's not worthwhile. You just see it and think, what did they sell me? This thing doesn't really make any difference. And so you decide not to do it. Yeah.

AUDIENCE: I was going to say that, even if you don't really have any change in your health status, maybe the change that the other people have is not so great as to convince you to get it. You see that the medication quote, unquote, doesn't work.

PROFESSOR: Right. That also could be the case. Could be that, even without this mechanism-- which is a very nice one-- but even without this mechanism, you could see the other children and say, well, first thing, they got sick when they ate the deworming pill. So the side effect is immediate. It's getting worse and worse. But as the worm dies, this make you pretty unwell for an hour or two, as your body gets rid of them. And then you get better.

But the side effect is salient and immediate, and the benefits are a little bit less apparent. And this, of course, is reinforced by the point that Norm made. Which is that the externalities make it difficult to compare treatment and control.

So for all of these reasons-- so this is one example of why it's very difficult for people to learn about relatively subtle nutrition mechanisms. And so what is happening with deworming, that's maybe made a little bit harder but the externalities, which, A, gives [INAUDIBLE] like strategic reasons not to do it. So worms give Norms' difficulty of learning explanation.

But that's could also be at play with iron pill, or supplementing your flour with iron. Where you're like, really not that much is. happening.

So these are possible reasons why you wouldn't do what the good man, or well-meaning NGO tells you to do. You don't have the information. Learning is difficult, because the effects are subtle. This implies spending more money. And maybe those foods are not even available for you in a convenient way.

What else could be going on, potentially?

AUDIENCE: If the wages are set wages, then even if you eat more stronger, you're still going to get the same amount of money. So there's no point in being more productive.

PROFESSOR: Right. So another possible explanation is you could realize that it's going to make you a bit more productive, but you might wonder, what's the use of me being more productive if, in fact, the wages are not piece wage but day wage? And you are a little bit more productive.

But you need to go and convince your employer that now I'm a little bit more productive, so you need to pay me more on a daily basis. But your employer is not behind your back, checking what it is you're eating every day. And so your consumption is an upsell from the point of view of the employer.

But there is a more moral hazard issue, where you could go and say, I'm telling you I've eaten so much. I'm very strong. You can monitor, you can see. Unless your

employer can really be monitoring your output in a very close way, which might not always be possible, then they might say, whatever. I'm just assuming that you are the average person.

And there is one study that shows that shows employers recognize that taller people are more productive. Taller people usually have been better fed, maybe, when they grew up. And they are stronger. Taller, maybe stronger, more muscles. People are more productive, they pay them more.

But how much you've eaten and how well you've eaten previously does not affect wages. And that is because that isn't observed from the point of view of the employer. And if they can't see the output either, it's he said, she said. How do I know you're actually more productive?

So of course, the solution to that would be for the employer to feed people iron supplement on the job. And why they're not doing that, I don't know. But that would be an interesting thing to consider. Because then they could know. They could say, yeah. I can pay you a bit more, as long as you are eating your iron supplement.

So let's go to all of this in a little more systematic way. So the first thing we need to check is, all of this learning is going to be-- I think people are very naturally associating more calories with more strength. Even we have this in mind-- to a point, until we eat too much. But this is probably harder to learn about-- micronutrient deficiency. Because that's not something that is as obvious, and you don't necessarily know which foods have what nutrients, et cetera.

And so the first thing we need to establish is that micronutrient deficiency actually matters. And in particular, that the poor and even the not-so-poor could become more productive if they got more micronutrient supplementation in their diet.

For that, of course, we could compound the wages of people who have more hemoglobin in their blood and the wages of people who have less hemoglobin in their blood. If we do that, what do you think we will find? Most likely? We look at the data set, and we look at the wages of anemic people versus the wages of non-

anemic people? Richard?

AUDIENCE: Of course, the non-anemic people have more strength to go to work, so their wages are higher if they are paid by the [INAUDIBLE].

PROFESSOR: So the non-anemic people, when we do this comparison, will make more money. That's sure poverty in every data set, we're going to find that. But once we find that, can we for sure say it's the effect of being anemic?

AUDIENCE: Not necessarily. It could be environmental factors. You could be anemic because you don't make [INAUDIBLE] enough to have a proper diet, or you could not have wages because you're anemic.

PROFESSOR: Right. So there's two things. So first, they could be a reverse causality at play. Which is, you could be anemic because you don't own enough to buy spinach. That's one. And what else could be at play? Even if we manage to shut down this mechanism, or assume that specific mechanism is not there? What could be other things that would explain this correlation between anemia and [INAUDIBLE]?

AUDIENCE: It might be some other third factor that causes both. For instance, your social status, perhaps, means you can only get a certain kind of job. And it also means that it's harder for you to get good wages and then get better diet.

PROFESSOR: Right. There could be something that explains both. For example, your social status, or for example, how well-educated you are, or the types of opportunities you have access to. Or anything like that would both effect your anemia and your wage. So we don't know.

So that's something which is actually relatively easy to organize as a randomized experiment, because you can pretty much cure anemia, at least temporarily, by giving people iron supplements. So that's almost like a medical study you can give some people. So this was done in Indonesia. The WISE stands for Work and Iron Status Evaluation. They

They worked with several thousand households. And they provided them with either

an iron supplement or a placebo in a randomly-selected way. So they randomized the household. And once they pick a household's treatment, they give everyone in the household the iron supplement.

It takes a few months for people to absorb the iron and to become iron-replete. Once you're not anemic, you have enough iron in your body, you get rid of the rest. So anemia is something which is, either you are anemic or you're not. And once you're not-- that is, once your hemoglobin is above 13 for men, and for women it's between 11 and 12. That's gram per deciliter. You just stop absorbing it.

So what they found when they gave this iron supplement is that there is no effect of comparing the people who got the placebo and people who got the pill if they were not anemic before. There is no impact on them. That's exactly what you would expect, because once you have enough, you have enough. There is nothing more we can tell you.

On the other hand, the more anemic you were before-- that is, the further you were from 12 grams per deciliter of hemoglobin in your blood-- the larger the effect, in terms of the increase in hemoglobin in your blood. That is, what they found is that the people who got the supplement almost all got to 12, or close to 12. So the further away you were from 12, the bigger the effect.

And so, once they do that, they can separately at people who were anemic at baseline and people who weren't. And they found that if you focus on people who were anemic at baseline, and people who were self-employed, those people made substantially more money after they received the iron supplement. So they looked at the wages eight months after the iron supplement starts. And then there is another end line a few months later.

And they find these people to make more money. So about \$40 more per year. Which is not nothing. This is not an enormous amount. This is not a doubling of the wage or anything. The yearly wages of these people may have been around \$500 or something like that. So it's maybe a little less than 10% increase.

But this is very cheap. Because if someone wanted to-- well, actually the experiment itself was very expensive. Because they had to go behind people's backs and make sure that actually eat the pill. And they had so many nurses, and they were really controlling that they were following the protocol.

So for the experiment itself, costs much more than \$40 per person. But what they argue in their paper is that that's not really interesting, because if someone wanted to do it, they could just buy 45 fish sauce. And that would cost them only \$6. Yep.

AUDIENCE: In the experiment, do they control for the fact that people usually earn higher wages as time passes? So next year, my wage is probably going to be higher than this year, because I have more experience. It means I can get a better wage. I'm better at catching fish.

PROFESSOR: Right. That's an excellent point. You're saying you would want to control for the fact that as time passes, you earn more money. So how would they be able to do that in the context of this experiment?

AUDIENCE: Maybe there's a historical [INAUDIBLE]. I'd like to figure out how much people would earn over their lifetime in that region, and then control for that percentage. And they can account-- maybe in the \$40 increase, there is \$22 into that that is perhaps due to the [INAUDIBLE] average increase in wages.

PROFESSOR: And so you're saying what they could do to control for an historical trend is to try to find out what the historical trend would have been. And in particular, what is in their data that tells them what the historical trend would have been, directly free of charge. Not free of charge, because that was in the design. But once you have the experiment. Yeah.

AUDIENCE: The control group.

PROFESSOR: The control group. There is a placebo group. So half the sample gets nothing. So what they actually do in the experiment is they compare the wage growth of people who got the program to people who got the placebo. In fact, here they compare the wage growth of the self-employed people who were anemic at baseline in the

treatment group and in the control group.

And you are exactly right that those wages increase in both cases. But they increased faster in the treatment group. And the \$40 is the difference in the growth. So it's already accounting for that.

So what I say is that, well, if someone wanted to do it on the own, that wouldn't cost them so much money. That would just cost them \$6 per year for a gain of \$40.

So this is a case where you would think it's something that starts looking like an S-shape. Which is, if you become rich enough for spending an extra \$6, you actually get a return which is much higher than \$6. So you may have this increasing return that is necessary for the poverty trap to emerge, where the slightly richer people get the fortified fish sauce instead of the regular fish sauce that costs them \$6, and they make \$40 extra.

So you could say, well, there is something. Except that, of course, you have to ask. \$6 is not all that much, so what is preventing these poor people to pay \$6?

So that is the first place where, if we compare this, 40 to 6 is the first place where we can see a poverty trap. Except we'll have to explain why it's there. We'll have to explain why it seems that the poor people are less likely to spend the \$6 on fortified fish sauce in their reach. That's for adults. So already, we saw that for calories, we don't see such a big return to calorie consumption. By for iron, we see it.

Now, another place where we do see, potentially, very large returns of investing into food is when you're trying to invest in the nutrition of your children. So why is it that, even though if we're talking about calories-- even more micronutrients, but any kind of investment in your children-- may have a larger impact than the same investment for an adult?

AUDIENCE:

Because children are still growing and developing. Their brains are still growing, and their bones. Basically, the frame for who their going to be is in development at this point in their life. So it's important that they can reach their potential by giving them the nutrients that they need now.

PROFESSOR: Right.

AUDIENCE: [INAUDIBLE].

PROFESSOR: Exactly. So the first reason, pure health reason, is that when you're investing into a child's nutrition, be it calorie or micronutrient, you don't only make the child more productive tomorrow, you are changing the adult that this child is going to be. You are making this person reach their genetic potential in terms of height, for example, that they might not otherwise be getting. You are helping this person reach that potential in their brain. You're helping this person develop the muscles that they would have gotten.

And some of these, you might not be able to recover later. In particular, some of the nutritional deficiency that you get as very small children, in between weaning at about six months and two years, would be very easy to catch up once the child's actually gone. Even once a child is more than two. Yeah.

AUDIENCE: There's no access to things like education at this point. So if they're better nourished now, then they can focus on that. Versus an adult probably wouldn't be thinking about going back to school at that point.

PROFESSOR: Exactly. So the second reason is that, even if we forget this biological phenomenon, the job of a child is typically to be in school, or to learn things around them. Not necessarily in school. Some can be outside of school. They are still getting all the information in the world. That's what children do.

And if you do this job better, then you are building your human capital. Really think of it as like, the capital of each of us is our health, which is affected by how much we eat directly. But also what we know, our experience, our education, et cetera.

And if we do this job better as children, we'll have a better stock of education for the rest of our lives. Education and knowledge generally. And we are going to get the return from that every year. So when we do our job better as an adult, we earn a higher wage and that's it. When we do our job better at your age, or even earlier,

when you were a child, when you were a small child trying to learn things, since your job is to develop, that means you're better developed.

AUDIENCE: Is it more important to have good nutrition when the mom's pregnant, or after the child's born?

PROFESSOR: Both are important. We're going to get to the mom in a minute. But both children are important, and in utero is very important. Both of them are important.

So for these reasons, if you take a child and you say, I'm going to feed this child better, if only between the time of six months to two years-- or let's say, even if you were going from six months to ten years, when they are in full development of their body and their mind. I'm going to then, on return, potentially, for his entire life. That means the size in difference in investment in how much you're going to get in the future compared to the investment you are making is much, much larger.

And that can, again, give you the potential for an S-shape. Where a poorer person is going to invest a little less. And this difference at this points can be-- this difference in slightly smaller investment at critical range could translate into much, much smaller lifetime earning for a child. So let's see some examples of that.

So the first one is the deworming example that I was talking about. And this was done, also, in a randomized experiment. That's the one I was talking to you about, where they realized that the more people you knew who took the deworming, the less likely you were to take it. Well, it turned out that was actually a mistake. Because being dewormed is extremely helpful.

So what I did is, this is the region where they worked, where you had a bunch of schools. This is a map. You can see that the region is close to Lake Victoria. Worms, particularly schistosomiasis, is something that you're much more likely to get if you are walking in the fresh water. Particularly when it's not that clean, but when it's not salty.

So ones basically climb from the sole of your feet inside. So when these kids go fishing in the lake, or just go hang out in the lake, much more likely to get worms. So

this region is infected by worms. About a quarter of the worm children suffer from worms.

One thing with worms is that they've never killed anybody. At least, not these worms. There are some worms that gives you very spectacular, big legs. And those worms are a little bit more fashionable. But these little hookworm, schistosomiasis, doesn't kill people. You can't really see that someone has them.

So as a reason, it's not a disease that anybody's particularly excited about. I want to make you excited about worms for about, like, at least 15 minutes. You can come back and say, well, these worms, there is something with them.

So the researcher went to this area, and they separated to schools into three groups randomly. Why did they pick the school? Why did they decide to randomize at the school level instead of doing it within school? For example, if you remember the bednet experiment, the bednet experiment was done at the individual level. Here, they treated all the children in the school. All the children was left as control. Why did they decide to do it at the school level? Yup.

AUDIENCE: So kids may affect one another. So if one child in a classroom is dewormed and the other is not, they may be learning better. And because they're learning better, the other child may also be increasing their understanding. If you do it at a school level, they can cancel out that effect. So they can compare schools where all children are and schools where all children aren't.

PROFESSOR: Right. So kids' education could affect one another. What else? In what way could they also affect one another?

AUDIENCE: Isn't there the externality, because they're very contagious, you said?

PROFESSOR: Right. There is the direct deworming externality that Zach and Noah mentioned earlier. Which is actually, worms are hyper-contagious. So if you compare, when they have done randomized experiments before within schools, they were very surprised, because they're saying, we are deworming these children, and we see no

effect on anything. And the thing is, the control kids were re-infecting the treated kids, and the treated kids were also making the control kids less sick. So the effect was zero.

So here, they decided, let's go and randomize the at the school level. And the first thing they did is that they went into the schools. So they did the school in three groups. They dewormed Group 1 in '98-2003, and then dewormed the Group 2 in 1999-2003, and dewormed the group three in 2001-2003. So the Group 3 three children got, on average, less two fewer years of deworming compared to the Group 1 and 2.

There was a first study they did, which was they collected data in 2000. And in 2000, they compared children in Group 1 and 2 to children in Group 3. So children in Group 1 and 2 had been treated either one or two years, and children in Group 3 had not being treated yet.

And what they found at this time was children, of course, were less likely to have worms if they had been dewormed. Otherwise, it's not much study to talk about.

Number one is children who had been dewormed [INAUDIBLE], they are less likely to be anemic. And importantly, they are less likely to miss school. So they find that there was an increase of about 15%. So 1/6 of a year in participation in school.

So what this study that we are doing now does is that it's tracking the children who were in primary school at this time later when they go up. So the date we're going to look at is in 2007-2009. So a kid who was 10 in 1998 is now 20, and is therefore usually doing something, working. And therefore, they can start looking at whether these people are now earning more money.

So it's a big project, because these children have gone all over the place. So they have had some difficulty finding them. One of them was in London, and they went and interviewed a person in London. Many of them had moved to Nairobi or had moved to Mombasa or had moved to Uganda.

So what they did is they did a first wave of it where they tried to track everyone. And

they found about 60% of the people. And that's not enough, because the 40% you don't find might be the ones that have the bigger effect. They might be the one that have moved to London, because of the extra education they are getting.

So then they decided, let's take a smaller number of kids, and track them wherever they are. Really find them. And when you do that, they found a quite a large number of them. So that altogether in the sample, they have about 85% of tracking rate, in treatment and in controls very similarly. So therefore, we can now look at what happened to wages.

So this is the empirical distribution of log wages. So what this tells you is, roughly, if you take any line here-- for example, it says log earning of 7. So wages tend to be log numbers. So we like to show logs. So in the treatment group, about 10% of people, a log of 7. And in the control group, that's about 21%, 25%, something like that.

So what does this mean? This What happened to the distribution of wage between treatment and control, and what does this mean? How do we read this? You can do it. You've seen a distribution, any distribution before. I know that. Just describe what happens to these two curves.

You, you, you, you. I was talking to you. Just describe what happens to these two curves. Just tell me, physically, what happens to these two curves.

AUDIENCE: [INAUDIBLE].

PROFESSOR: It moved right. Right?

AUDIENCE: Yeah.

PROFESSOR: Right? That was hard. They moved right. Now, what is hard is saying, well, now that they move right, what does this mean? Noah.

AUDIENCE: Well, I think two things. Well, first of all, the on average peaks higher, which means that the distribution in any case, on average, people [INAUDIBLE]. And also, it looks

like it's narrower, which means that more people are also earning more, as opposed to just the average also earning more.

PROFESSOR: Right. So those two things are exactly true. So what we see is, number one, here is the peak. So this is where, in the control group, we get 45% of people earning about a wage of 8. That's the mode of the distribution. Then, the nice thing with wages is they're going to be log normal, which means that the mode is about the medium. It also means that 50% of the people in the control group earn less than 8.

Whereas here, we find that, if we want to find 50% of the people earning less than something, it's closer. So for the control group, it's like 7 and 1/2, and the treatment group is 8. So in the control group, 50% of people earn less than 7 and 1/2, and in the treatment group, 50% of people earn less than 8.

And in fact, we could transform this graph into a cumulative distribution function instead of density. And we would find that, given this graph, given that it's nicely shifted to the right and it's also a little bit less valuable, as Noah pointed out, we would find that at every percentage, we have more people in the control group who make less than that at every level. We have a more people in the control group earning less than that than in the treatment group.

Which means that-- Well, it has to mean that the people in the treatment group earn more. And not only that, but-- not every single person, but statistically-- everybody in the treatment does somewhat better. So we are saying the distribution in the treatment group statistically dominates the distribution in the control group. If you had to choose which society to live in, without knowing, you would pick the treatment group. Because the chance that you are earning more is better in one place than the other.

So that's what happens with this distribution. We can just look at them and say, yeah, we have more people earning less and we have here more people earning more.

So now we can say, well, how does it look like? This could just all be nice in graph,

but there is no standard error here. There is no confidence interval. Maybe this is not really very solid. So we can look at that in a regression. So this is a simple regression, which gives us directly the difference-- what you can read here is the difference between the log earning of the treatment group and the log earning of the control group.

That means I could have plotted bar charts like we had with the bednet. It's saying, this is the mean here. The mean wage in the control group is 7.8, which corresponds to above the median and above the mode of the distribution, 7.8. And the mean wage for the treatment group is log.18. So that means about 18-- 19, sorry. 19 percentage points higher than the mean in the treatment group. So when we run regression in logs, the advantage is we can read the coefficient directly as the percentage point increases.

So if we wanted to know, what's the mean log wages in the treatment group? What do we need to do from this graph? So make sure that you have it well. Yeah.

AUDIENCE: Take the median and multiply it by 1.19.

PROFESSOR: No. So what you would do-- This is the mean of the log. And this is the log point that they get. So if we wanted to know the log wages for the treatment group, all we would need to do is to add 0.19 to 7.8. So that would be about 8. And then if we wanted to know the level then we would take the exponential of 8. Right?

So when you have experiments, you can just take the mean, and you can calculate the mean in the treatment group or the mean the control group. But in the papers in studies, what you generally see is people running a very simple, ordinary [INAUDIBLE] square regression on wages of whether you are a treatment person. And the way we'll read this is just saying, this is the difference between treatment and control. And this is the mean for control.

And then, once we've done that, we can add other things that absolves the noise, and we'll get slightly different results. But not very different, because everything is randomized.

What is this one? Over here? What is this little [INAUDIBLE] in [INAUDIBLE]? Sorry?

AUDIENCE: Errors?

PROFESSOR: The standard error. Exactly. This guy is the standard error. So this is saying there is some noise around these wages. So the difference, the mean, because we have the distribution of wages. So there is some variation around the estimate. And therefore, there is some noise around our estimate of the difference between treatment and control wages. And that tells us the standard error.

So now we need to know, well, how do I know whether this effect is just due to chance, or if it's a real effect. Once I give you the coefficient, and the standard error. Yeah.

AUDIENCE: If it's more than two standard errors, isn't it significant?

PROFESSOR: Right. So if you divide the coefficient by the standard error, it gives you something we call the t-statistic. For the hypothesis that the effect is 0. So when we divide the coefficient by the standard error, we get the t-statistic, and the t-statistic is for the test that the coefficient is not 0. So the hypothesis is, is this coefficient 0? So each test goes with a level of confidence, which is the probability of a type one error. That is, the probability that you are saying there is an effect when in fact, there is not.

Generally in economics-- I don't know in other fields, but in economics-- generally we go with sizes of 5%. So we accept to say that something has an effect when in fact it doesn't with a probability of 5%. And 5% corresponds to a t-statistic of 1.96. So when you see regression table like this, it's very simple if things are randomized. When you see a regression,

looking at these effects, gives you the difference between treatment and control. Divided by it's standard error. And if it's above 1.96, it tells you that the effect is significantly different from 0. That is, there is a real effect. Not an effect due to chance.

So here of course, it's much above 2. And it's about 19%. So it tells you that the

wage of the treated guys is 19% higher than the wage of the control guys. Which is a fair amount.

So why do I say that 19% wage is high? What was the economic growth in Kenya over this period, give or take? An order of magnitude?

AUDIENCE: 10%?

PROFESSOR: 10% would be nice.

[LAUGHTER]

PROFESSOR: I don't know if they had any single year where they had 10% growth.

AUDIENCE: Like 4?

PROFESSOR: Yeah, 3 4. 3, 4.

AUDIENCE: Do you know what inflation is?

PROFESSOR: So that would be in real time.

AUDIENCE: Adjusted. All right.

PROFESSOR: But this is, remember, we are comparing treatment to control. So there is no inflation here, because our treatment people were measured at the same time. Take real growth. If we are saying 3% to 4% a year, we are being generous to Kenya for the average.

So that means that these guys got the equivalent of several years of good economic growth, except there has not been many years in Kenya where there has been several years of good economic growth. So that's why I wanted to get you excited about worms for five minutes.

So this thing corresponds to giving the kids a pill which costs about, including the delivery cost and all of that, about \$0.60 of delivering the pill. You need to do that twice a year. And this is a difference between doing it for three years versus one. So

this is your investment, it's probably a good investment, that was delivered by society here in the form of this NGO, was a [INAUDIBLE].

And that's 19% per year. That's a lot. Even people, if they are to do it themselves, maybe they have to do to the shop so they don't get it for \$0.60. They have to pay \$1. Then they get several years of good growth for the entire lifetime of the child.

So we are talking about, for a lifetime [INAUDIBLE] of several thousand dollars of extra wages. And we can see it here. So what this is is these are the benefits that you're getting from this 19% increase in earnings. So imagine that you get 19% increase in earnings. Take the GDP of Kenya, or the average wage level of Kenya. Multiplied by 19%. That's how much you're getting every year.

Then you have to compute the net present value. Because the benefit that you're getting if you have to pay the investment today, but you're starting to get the return when you're 20 and then over your lifetime, it's not as valuable. So we are using some [INAUDIBLE], let's say 5%. And we are computing the net present value of those earnings, like we would for the investment in a stock.

So when you do that, you get over \$1,000 increasing in your lifetime earnings. So this is that. And this is how much it cost. So you need to deliver the pills, \$0.65 per year, and then they wanted to-- so that would be a huge benefit of, like, \$1,500 or \$1,100 divided by \$0.65. That would be pretty gigantic. That's why worms are exciting.

Well, they don't want to make it too exciting, so they are saying, well, let's see what all the costs we need to add. Well, these kids have gone to school a little longer. They've gone to school more every year. So while in school, they are not playing, or they are not earning some wage.

So they are making some assumption of what is this opportunity cost. Other wage, unskilled wage. All of the day they spend in school, they assign them the wage. That's an over-estimate, because usually the kids are just doing nothing, because they are sick. So this is being very generous for the cost of being in school.

And then, they also add the fact that if you have more kids in school, you need to have, maybe, a little bit more teachers and all that. So they also can create how much that can be. So these things, you might want to put them, or you might not want to put them. But the bottom line is that when you do that, this bar is pretty huge, and this bar is pretty minimal. Yeah.

AUDIENCE: If they're so clear, why doesn't Kenya's government support it?

PROFESSOR: Well, the answer is they do. Because until this study, it wasn't so obvious that the benefits are so large. Because how would you know? You only had those experiments where you were comparing people within the same school. And you found no effect of deworming.

So this study came. That's an interesting political economic story. This study came-- the first one, not even the second one. And showed that it basically costs nothing to put kids in school. The cheapest way to get kids to attend to school more regularly.

So the researchers and us here at Poverty Action have started to advertise this as, you might not have thought it that way, but deworming is the cheapest way to get kids in school. We went to Davos. Davos is this world congress of rich people. And we presented this kind of data, and showed to them, you know what, you might not think deworming is so exciting, but in fact it is. Because it's a great investment.

So they kind of liked the idea. Well, we started an organization called deworm the world. And started just diffusing these kind of results. We didn't even have the wage results yet. It was just education results, saying, deworming is a sensible education policy. It's a very cheap way to get kids in school. And started working with the government to get this information out.

One complicated thing with deworming from a political economic point of view is that it's a health program that you want to do in school. The reason why you want to do it in school is you have all the kids there. That's why it's cheap. But when you want to do a health program in school, you need the Health Ministry and the Education Ministry to collaborate, or you need the Finance Ministry to tell them, you do it. So

that takes some effort, but that effort got done. And in fact, in Kenya they are now deworming everywhere. So that's millions, millions of children.

And then this is also moving up and down. They're going to start doing it in Bihar, which is a state in India where they also have a lot of worms. They have started doing it in Andhra Pradesh, where there is not that many worms, but they have subregions in Andhra Pradesh with a lot of worms. And in this way, the information gets out, and progressively it's taken up.

AUDIENCE: In Kenya, did the government sponsor the deworming program, or was it outside donors?

PROFESSOR: In Kenya, the answer is yes and no. The direct answer is yes, but it is subsidized in part by the Fast Track Initiative, which is international money that government can access to do things that help education. So Kenya can elect to use Fast Track Initiative money to do textbooks, or to do computers in school, or to do blackboards, or to pay teachers more. And what they did is they took some of that money to do deworming.

The thing is, deworming is cheap enough that once you realize that it is a good thing to do, money is less the issue than getting everybody on board and organized. Yeah.

AUDIENCE: And so I'm thinking there's probably other developing countries that have significantly worm issues. And then why aren't those countries doing it? You mentioned India, but I'd imagine there's a lot more.

PROFESSOR: Yes. So the answer is slowly, slowly they are getting into the bandwagon. But that's a very good question, which is, number one you need to have the evidence out. And until fairly recently, in particular until this experiment, the evidence wasn't out. And this is not something that people could just make up on their own.

I think in particular, the effect on education, I don't think the first thing that comes to an education minister, or the first thing that would come to you, if I'd asked you in principle, how would you increase education? What's the cheapest way to do it? I

don't think deworming would have been very high on your radar screen. It's not very high on anybody's radar screen, precisely because worms don't kill. So people think of HIV as being important, which it is. But people don't think of worms. So that's the first reason.

Once the information is out, then it needs to be percolated. People need to absorb it. And I think this is happening, actually. This is one of the pretty hopeful stories, in terms of that the evidence can make a difference.

AUDIENCE: I can understand where you argue with government about education effects, especially in children. But when you get something as long as wage effects, pretty long time. Are you assuming that no other health hazards would offset the gains which can be obtained from deworming.

PROFESSOR: Right. So the question is whether I'm assuming that there are no other things that will happen. And the beauty of this is I'm not assuming anything. In fact, I didn't. But Ted Miguel and Michael Kremer dewormed the children in 1999. And then they had the foresight of deciding, we need to continue to track them to find out whether or not there is a wage effect. If you want to know my prior when they started this exercise, very honestly, is that you're wasting your time. All of these other things will be happening. You're never going to find an effect.

And so when this came up, I was very surprised in a positive way. But these results were not even used to sell the deworming to the government, because we didn't have them till very recently. Only the education results were used, which are very immediate.

But the point here, you see, you don't assume anything. Whatever things would have happened, happened. And surprisingly, didn't offset. That's what the standard error tells you.

So deworming is an interesting policy, because it's a good policy that's not obviously good. So it is nobody's first choice. So you have to make it people's first choice. The evidence plays a role, and then some convincing. And what is interesting is that the

parents themselves, they could do with them as well. And so the second question we want to ask, which is the individual version of the same, why don't government do it? Is why don't parents do it? Which is the same question as, why don't people buy the fish sauce. We'll get to it in a moment, we'll collect the thing. Unless you want to have a--

AUDIENCE: For deworming, could you just treat the water that the children walk in, so that the worms don't go in the water, so the kids won't get worms.

PROFESSOR: So the question is, could you treat the water instead of treating the kids? I think that's an excellent idea, because you could do it. Except that Lake Victoria is really big. So I think for Lake Victoria it would be a bit difficult. It's really, really big. It's almost like a freshwater sea in the middle.

AUDIENCE: It's not just a lake, right? It's also puddles and things like that. People walking through there with no shoes.

PROFESSOR: Yeah. It's any body of fresh water that creates the problem.

So that's general nutrition. There are other examples of effective [INAUDIBLE] of nutrition. But now let's skip to the third one, which is the nutrition in the womb, which is what you were asking. Whether it's not even more important to feed the pregnant woman. And the answer is that it is.

So there is a doctor in the UK called Dr. Barker who this hypothesis has his name. It's called the Barker Hypothesis. What he found is that basically, he found that the region which had the highest child mortality, infant mortality, neo-natal mortality, were also the places where people, once they were born, had the lowest life expectancy. And he concluded that this was a sign that your condition of life in utero were really important.

Of course, that was not convincing at all, because the regions that have the highest infant mortality also are pretty bad in many other respects. And you will expect that these people live less long. But still, he's the first one who formulated the hypothesis. And despite the fact that his evidence was weak for it, the hypothesis

was right, as we subsequently discovered.

I'm going to give you a few examples where it was seen very clearly. One of the big names in this is an economist at Colombia named Doug Almond. And the first thing that Doug Almond found is that he looked at people who were born just after 1918, which is the period where there was a big, big flu epidemic in the US. So many people died of the flu. Adults died of the flu. But many people didn't, and still had it. And in particular, a lot of kids were born from moms who had had the flu.

And the paper here was very simple, which was to compare the life outcomes of people who were in utero during the period of the flu. He doesn't even know whether their mother had the flu. It just makes it quite likely that their mother had the flu if they were born during that period.

And they found that children who were in this period during the big flu pandemics were sicker as adults. They were more likely to have all sorts of diseases. Name a disease, they have it. Or they are more likely to have it. They were earning less money. They were less likely to have gone to college. And they died earlier, they died younger. So that was one of the first people. So particularly if your mom had the flu when you were in utero, that's not good.

That's not nutrition. Other effects-- still a paper by Doug Almond-- is that people who are born during or just after the Chinese famine-- or even just after is a better number.

Children who are born just after the Chinese famine, so who were in utero during the famine, they of course live less long. They are shorter. They have lower wages. And even the children of the children of these people are shorter and doing less well in life. So there is even a second generation that's let's productive, fertile, et cetera if you were born in the famine.

There is, of course, a bias in this, when we look at the children who were born just after the famine. Which comes from what?

AUDIENCE: They probably also experienced ramifications of the famine afterwards.

PROFESSOR: Right. So it was afterwards. The famine was very brutal, and ended and started very brutally. So we might expect that there is not so much effect after. That but on the other hand, what do you expect happens during the famine?

AUDIENCE: Probably disease.

PROFESSOR: A lot of diseases in particular. A lot of adults died. We are talking about 59 million adults dying. And a lot of people probably were never born. And in particular, there were stillborns or miscarriages. So the people who made it despite the fact that they were in utero during this period, the babies who managed to get born are probably pretty good genetic potential to start with.

And despite that, they are doing much less well in life. So there is a bias, but it goes in the direction of not finding an effect of the famine. Because surviving during the famine already indicates that you're a pretty feisty child.

So that's quite extreme. You would say, yes, of course being in utero during a famine is a bad idea. You should avoid it at all costs if you can. But maybe it's not particularly relevant. Because after all, we are not talking about famine for most poor people. We are talking about malnutrition and ill-nutrition.

So here is one example of that. Is that children who were in utero during Ramadan-- and Ramadan shifts, so it's not a particular season. So we can look at kids who were in utero during Ramadan who were born in September, who were born in October, who were born in December. All over the year. This is a paper that looks at Uganda. Children born of Muslim mothers and who were in utero during Ramadan, in particular in the first trimester of pregnancy during the Ramadan, are less educated. It's many less educated and earn less as adults.

And with Ramadan, it's not even that you are not eating. You're not eating during the day. But people eat during the night. But these long periods of fasting are no good. That's interesting, because you don't have to observe Ramadan when you're pregnant. You could not do it. And if you're really observant, in fact, you have the

option of not doing it and doing it later. But pregnant women tend to do Ramadan anyway because other people around them do it.

And what is interesting here is that, in terms of policy implication, it could be encouraged to say, you can not observe the Ramadan. Not everybody does it because it's acceptable not to observe it, potentially. But most women do. And this is not good for their children. And even though it's not something massive, it's this shift in the consumption. The calories probably stay relatively constant.

Another example-- which, again, is nothing extreme-- the paper by Erica Field and Maximo Torero, which looks at one particular micronutrient, which is iodine. So iodine deficiency in adulthood create this thyroid insufficiency, so it makes you a bit slow. So in French, the expression "cretin" comes from that. In French, we say "cretin of the Alps," because people from the Alps were very far from the sea. So their salt came from the mountain, not from the sea. So it wasn't iodized. So you had more thyroid problems due to iodine deficiency in the Alps and elsewhere.

So now, iodized salt is available on a large scale. But before that, when it was not available on a large scale, at some point governments realized this problem and tried to have programs of distribution of iodine. And what these people look at is they look at the program in Tanzania, which attempted to reach every pregnant woman, but failed.

So some kids, normally you would have five waves of the program. A pill is sufficient for several months. So they were attempting to reach people frequently enough that all the pregnant woman would have a pill covering them for the duration of the pregnancy.

But they failed to do that because they were not particularly organized. So in some districts they went in sometimes, and some district they went in some other times. So what you can look is kids who were lucky enough to be in utero when their mother was covered. Compared to kids who were not lucky, and who where in utero, in particular first trimester, when their mom was not covered.

And what they look at is education down the line. And they found that the covered kids have about a third of a year more education than the uncovered kids, for receiving this iodine supplementation. So again, a pretty small intervention makes a big effect down in life.

So all of these create potential for poverty traps, because if the poor-- these are investments that are not costly and that have high return. Even micronutrients for adults, childhood pregnancy, in this order. You are asking, pregnancy is a very short period of time. Then it will affect the child for their entire life. So if the poor are less likely to undertake the investment, then there is a potential for a poverty trap here.

So is it the case that the poor are likely to undertake this investment? And the answer is yes. Most of the poor still consume a diet that's very poor in Iran. The vast majority of the quarter of the world's children who should get worms are still not dewormed. The WHO estimates that 40% of pregnant women worldwide are anemic. Not all of that is due continue to iron deficiency anemia, but probably at least a half.

So these are three examples of saying, these investments are not undertaken, even though they are potentially highly productive. And so you are saying, well, maybe it's not undertaken, but it's not because of poverty. So is money an issue? And it does seem to be that a very small cost, even a very small cost, seems to discourage people.

Asking the question that you were asking before. At the level of government. If 45 fish sauce costs only \$6, it seems the investment is worthwhile, and yet no poor family does it. In Kenya, in the deworming program, in the first group of schools, at some point the NGO wanted to do the sustainable thing. And the sustainable thing was to ask people to cost-share. So they had to pay a little fee for their children. Small fee for the entire family. And this is believed to be help maintaining the program, et cetera.

The moment where they introduced the cost sharing, the take up of the program went to zero. Nobody took it up. So that goes back to this. They didn't know the

effect, maybe. Interestingly, it means asking people to pay is not sustainable.

Because it's the costlier thing about the deworming program is to drive your car to the place. So once you're there, you want to do all many people as possible. So if the take up falls down to zero, you've really lost a lot of chances.

Another example. It's not only money. The thing is that it's not only money that is the problem. So it's not only poverty, as in lack of income. Because in India, we tried something so to fight anemia. We said, OK, fine. People are not going to buy iron pills. But let's introduce a program where the local miller who mills the grain of everyone, will add the iron.

But we only had money to install the machine and pay the miller to do it for one minute a village. And what we saw is that-- so people who were already walking with that miller continue to do so. But the other people didn't switch. So the people who happened to be close by benefited from the program. But no one was willing to work the extra five minutes to benefit from the program.

And moreover, the miller thought it was a lot of effort to add the iron. So even though the rules were you're supposed to do it unless the family asks, they switched to do the opposite, which is you're supposed-- they wouldn't not do it if the family didn't ask. And the family didn't really ask. They didn't say no, but they didn't say yes.

To the [INAUDIBLE], which was very high at the beginning when the miller did it by default, it progressively went to a very low number, and the program collapsed. Which suggests that it's not only money, it's any form of costs.

Which brings to these other issues. One is what Steve said earlier, which is are the workers going to reap the benefit, or is the employer going to reap the benefit? And one sign that it might be the employer rather than the worker is that in Indonesia, it's only the wages of the self-employed that increased. Not the wages, the earnings of the self-employed that increased. The wages of people working for a wage didn't go up.

In Kenya, it was different. But in Kenya there is all this education effect. And one thing that we have in Kenya is that people switch sectors. The young kids just started working in different sectors altogether. But for adults, it's too late for them. They're just going to do the same thing a little better. And they are not really rewarded for that.

The other thing are the information things we discussed earlier. It's very difficult to find out on your own what makes a difference and what doesn't. Is it iron? How do you know that iron matters? Until recently, scientists didn't know. In the '70s and '80s, scientists were still convinced that the big problem was proteins. And protein is a problem. But they didn't think of micronutrients as an issue.

So number one, the information is very difficult to acquire. So you need to trust outsiders. It's not very clear you would trust them.

Finally-- and I will finish on that-- is that consumption is a decision. And people are not machines. So they are not maximizing their productivity, they are maximizing their utility. And their utility is made of other things than our productivity can be. There is the food that you have to eat every day. And if you don't like it, then this is horrible. Because eating is the only thing that we are doing day in, day out. So if we don't like to eat, then it's kind of awful.

And in particular, this may be one reason why it's particularly difficult to have people switch their diet. This is something where this is so ingrained into our habits. And if we are used to eating in a particular way, we may know that the best way is to eat something else, but we may be very reluctant to switch.

Now, this is a pattern that we are seeing of course in this country, as well as anywhere else. The second thing is you may care about your social status. Which might be related to how big a party you throw for your son's birthday or for your daughter's wedding, or even for your dad's funeral. Which may be related to some goods you may want to have, like a TV or things like that. People can care deeply about these things, which may mean that they decide to forego nourishing their [INAUDIBLE] to make sure that they can actually do the things.

It's not like-- and finally, to diversity of goods you have. Like cell phones, TVs, et cetera.

And all of that means that it has very important policy implications, of course. Because it means that it's not going to be trivial. It's going to eventually be quite difficult to get people to convince to switch the type of their diet. And also, because of what we saw last time, it's not such a great idea to try and subsidized grains or things like that. Because it's not going to lead to an improvement. It's not so much of the quantity of food, because it's not that useful to it more. Nor in the quality of food, because it's not the fasting people will want to do with the extra income.

That means that you would want to do things that have a chance directly to affect the quality of the food people are eating. And in particular, children and pregnant woman are eating.

So one is making it as easy as possible to do the right thing. So invent foods that people want to eat, but the micronutrients is in them. So there is something called golden rice, which is rice which is already fortified in iron. But that's GMOs, we might like that or not. But it's also like hybrids foods, like yams, which are very rich in vitamin A that can grow in Africa.

So there are organizations that work on this. So the organizations that work on this bioengineering-- like HarvestPlus, these types of organizations-- historically have been focused on making the food more productive. And what is needed is a shift to making the food higher-quality from the point of view of nutrition. And this is happening, but slowly, slowly.

Other thing is when you have the kids, you should invest in the quality of their food. Because the parents might not know or might not do it. But you have the kids right in front of you. So it's easy to do. So deworming. Make the school meal nutritious, for example, by sprinkling micronutrient on them. And the parents are not going to compensate for that by giving them less, because they have no idea what you're doing anyway.

And then you can think of other things. I'm going to let you move now.