The COVID Chronicles: On the Role of Masking
Podcast Transcript

Host: Satchit Balsari, Assistant Professor in emergency medicine at Harvard Medical School and Beth Israel Deaconess Medical Center

Guest: Mushfiq Mobarak, *Professor of Economics at Yale University and Co-Chair of the Abdul Latif Jameel Poverty Action Lab's Urban Services initiative*

In the inaugural episode of The COVID Chronicles, Dr Satchit Balsari is in conversation with Mushfiq Mobarak, Professor of Economics at Yale University and Co-Chair of the Abdul Latif Jameel Poverty Action Lab's Urban Services initiative. Mobarak has collaborated with the government of Bangladesh, research institutes, major telecom providers and other stakeholders to devise evidence-based COVID-19 response strategies for Bangladesh and other developing countries. Tackling the question of whether masking works and how to get people to wear masks, Mobarak calls mask adoption a more complex problem – both a medical science and a social science issue – than it seems at first glance. The discussion focuses on the challenge of getting people to wear masks consistently, how to change mask-wearing norms, and establish consistent norms in a community. Mobarak points out that the focus must now shift beyond whether we need universal mask adoption to how policy-makers can achieve it – and what the actual expected benefits are.

<u>**BEGIN TRANSCRIPT:**</u>

Satchit Balsari: Hello and welcome to Covid Chronicles, part of the 'India in Focus' podcast. My name is Satchit Balsari.

We have reached the one-year mark and there are still conversations around the world about masking. In the US, the use of face masks was intensely politicised, precluding the application of what may have been a simple yet effective mitigation tool. In January 2021, an op-ed in the Washington Post called for everyone to have access to N-95s. Masking, say scientists, serves two purposes: it prevents those with infection from spreading the virus and prevents the uninfected from breathing in large doses of virus when exposed to it.

Early in the pandemic, Siddhartha Mukherjee, most well-known for his book 'The Emperor of All Maladies,' had written in the New Yorker that inoculum is likely to play a large role, that is, the bigger the exposure, the more devastating the illness is likely to be. It turns out that he was probably right. In an article in the New England Journal of Medicine last month, authors went so far as to suggest that masks may, in fact, be quietly helping herd immunity by resulting in low-grade or asymptomatic infections where people may otherwise have had a more serious illness. That is a lot to process for most of us. At this critical time in the pandemic, when we have run out of other options and the virus has spread across the urban and rural South Asia, is it wise to be speaking about masking?

To answer this question, we have with us today Mushfiq Mobarak, Professor of Economics at Yale University and Co-Chair of the Abdul Latif Jameel Poverty Action Lab's Urban Services initiative. Their team is examining this very question, does masking work? Mushfiq, welcome.

Mushfiq Mobarak: Thank you for having me, Satchit.

Satchit Balsari: Mushfiq, why is an economist looking at masking?

Mushfiq Mobarak: The problem of masking and how to address the low usage of masks that we see around the world, it's both a medical science and a social science problem. So, the reason is that we need to establish whether masks actually improve health outcomes as you were just talking about. But it turns out we've also learned that it's equally challenging for us to figure out how to get people to wear masks consistently, how to change mask-wearing norms and establish consistent norms in a community because it's the community-level mask wearing that works.

It's not yet clear from the data whether the masks are protective for the wearer and how protective they are, but it is quite widely accepted that community-level mask wearing are protective of each other. We reduce transmission rates. We started thinking about this problem back in April as the pandemic hit and initially we had an agreement with a funder who was really interested in studying this problem at large scale. So, if we were to distribute masks to large numbers of people in South Asia, would that reduce Covid infection rates? After that discussion, we started collecting data in Bangladesh, rural Bangladesh to figure out what's happening, rural Nepal as well, with respect to masking and other social distancing behaviors. And something we learned that was quite surprising is that between say late March, late April, as Covid-19 became well known in the South Asian community, the masking rates shot up, people reporting to us that they had masks, that they were wearing masks, shot up from essentially zero percent say in mid-March when nobody was wearing masks upto like 80, 90, 95 percent in some communities by late April.

And so that was a big surprise. Once that happens, I actually started thinking about things a little bit differently that 'oh maybe this is a problem that we don't need any external intervention to solve, people have already figured it out and they have gone in and addressed the problem for themselves, so no external intervention is actually required here.' So, we actually paused and said 'okay, let's not implement this because this money might be better spent elsewhere.'

Satchit Balsari: Well, we know that masks work. There are all these YouTube videos of folks spraying aerosols on masks and showing that they don't cross the barrier. Why do you need to go out in the field and observe people? Don't we already know that masks work?

Mushfiq Mobarak: Here's the interesting thing that happened. So, we started getting other anecdotal information from other research groups like ICDDR, B, there's another group at Stanford Medical School headed by Steve Louby, and we learned that they were finding that 'no actually masking rates don't seem that high. It's curious that you are seeing such high rates in your inner data.' So, we then said, 'okay, maybe it's something like social desirability bias,' so when I ask people, 'are you wearing a mask?' they say 'yes' even if they are not. So we then started re-asking the question as 'Oh, do you see other people around you wearing masks?' not asking about their own behavior but others' behavior but even then we're seeing people saying 'yeah' other people seemed to have said 'no.' The numbers came down, maybe at 75 percent or 80 percent rate, they seemed to have masks.

Okay, and then we went a step further and said, 'okay, let's go and do some direct alteration ourselves.' So we basically stationed hundreds of people at thousands of points around the country, at mosques in Bangladesh, at mosques, in markets, at village entry-exit points etc. and then what we observed was something quite different. This is now in May, we see that maybe about 30 percent of people were wearing masks. So, essentially, it was true that most people had a mask but about two-thirds of the time, they were just keeping them in the pocket. So, actual mask wearing rates were actually a lot lower and that's what you really need to address the public health issues. And as we continued collecting data,

the rates actually started coming down even more, right. And then if you start doing a bit more sophisticated analysis, where you say, 'let's see if people are properly wearing masks.' The proper wearer would have to have both the nose and mouth covered and not just covering their chin. Once the use of criteria being properly wearing masks, it appears that the rates are in the teens, so maybe ten or fifteen percent of people are properly wearing masks.

So, that led to us reopening the trial and saying, 'okay, look. This is a problem that still needs our attention. So let's think about how we can get people to wear masks,' and that's where the idea for the study came from.

Satchit Balsari: Wow. That's a huge difference between 80-90 percent folks saying they are using masks, and then an observation that concludes that less than one in five people are masking. So, Mushfiq, the logistics of this sound daunting. You mentioned deploying hundreds of observers at thousands of locations, how do you actually go about doing this? How do you know that your observers are in the right locations, not biased? What is the scale of which you are talking about, did you do this on one day, did you do this on several days? Because if you are going to turn around and tell policymakers or the government of countries that only 10 or 15 percent of their population is masking, how do you ensure that the recipients trust your message?

Mushfiq Mobarak: So, in order to answer these questions, these are, of course, hit on the right set of challenges. These are very complex challenges, how to get people to wear masks, how do we measure whether their masks are actually effective, how do we make the norms stick. So, we needed to address all these challenges all at once, and do it on large scale and I'll explain the importance of scale in a second. So, we implemented large-scale, randomized controlled trials all over rural Bangladesh in order to answer these questions. And, so a randomized controlled trial, just like in the medical sciences you give some treatment, such as a pill to a treatment group and you have a controlled group that doesn't receive the exact same treatment, and then you track their outcomes. It could be health outcomes, it could be mask-wearing outcomes overtime. This is a method that was popularized, started in the medical sciences, popularized in the social sciences and most recently honored with a Nobel Prize to Abhijit Banerjee, Esther Duflo, and Michael Kremer.

So, what we learned is that, look, to solve the masking problem, we do need to answer the question, 'are masks reducing Covid transmission?, we also need to answer the question, 'are masks protective for the wearer?' So those are kind of public health epidemiology questions, and therefore, in our team, we have representatives from Stanford Medical School and also engineers who are experts at mask design and testing of filtration efficiency of masks etc. So, for the medical questions, we have the right set of experts leading that work but there's another problem here, which is, we also need to get people to wear masks because masks are going to be effective only to the extent that they are actually adopted and used regularly. And there's a important set of social sciences question there, which is, 'how do you change behavior?' because as we know from a broad class of technologies, products, behaviors like improved cookstoves, insecticide treated bed nets, or even toilets in rural India, right. That is very difficult for us to change behavior, get people away from what they used to do like open defecation and into using toilets, or moving away from stoves that use biomass and produce a lot of smoke and into using cleaner burning stoves that are healthier for you and your family.

And masks are a similar problem, like how do you get people to move from not wearing masks to wearing it. And so we have been doing a lot of research to understand what are the set of conditions we need to put in place in rural communities to encourage mask usage consistency And, it turns out that challenge is quite complex, it's because it's not enough for us to just distribute masks. So, you might think people aren't wearing masks because they don't have one, but it turns out that's probably a small

part of the challenge. It would be useful for us to go door to door and distribute masks and we are doing that but you need to do a lot more beyond that.

So, beyond distributing masks, we are also employing mask promoters in all these villages. So people who are members of the community and sometimes outsiders, wearing uniform for the implementer, you know who's distributing the masks, and reminding people they should wear it, reminding people about the importance of doing it, standing at the village entry-exit points and as people are walking out, reminding them why don't you have a mask or if you have it in your pocket please put it on or here's a replacement mask, a cheaper one, which you can use this time but please don't forget next time. Then there's also enforcement that needs to happen at high-risk places, such as at markets and mosques. So, there we are working with Imams at mosques as team, saying during your khutbah, the sermon that is given before prayers start, can you mention the importance of wearing masks and that it's required for people who come into this mosque to keep their masks on. You also need to catch people at the entrance and make sure that everybody coming in is wearing a mask.

At the market, which is another high-density, high-traffic area, you want to make sure people are wearing masks there. So, we worked through the local committee, Bangla's Dukan Malik Samiti, which is the committee of owners of the stalls at the market, making sure all their staff, the vendors are consistently wearing masks, and again, standing at the entrance and exists and making sure people are wearing masks. So, it's a combination of distribution but also encouraging behavior change and some information, programming around why it's important and explaining people why it's important and then doing some monitoring and then enforcement. So, that entire package seems to be necessary. So, the ultimate trial is going to be very large-scale, we are working with a sample of 700,000 people in Bangladesh with half being in the treatment group, so about 350,000 households will be getting all this programming and then the other halves will have status quo, like many people will be wearing masks but we are not going to be intervening in any way. And then within, there's a lot of other questions that are unclear still and we'd like to delve into through this trial.

So, one is what type of masks are most effective and cost-effective. So, you have these cloth masks that are reusable and the fact that they are reusable and washable means that people can hold on to it for a long time, maybe that's the right solution. However, cloth masks are also about five times more expensive than surgical masks and also they are about 50 Takas as opposed to 10 Taka, and the surgical masks, we've done tests in our engineering labs to show that you can wash these surgical masks up to five or six times and their efficiency is broadly retained. So, it's possible that we might be able to reach a lot more people quickly if we use a mask that is one fifth that expensive but still effective. So, that's one question that we are trying to learn about and the way we do it is in the treatment group, we randomly separate them into two different subgroups. One group's villagers receive surgical masks, the other group receives cloth masks, and then finally, you might think that there would be cheap, simple interventions you can add to this that can get people to wear masks consistently. So, just as one example, what happened if you were to ask people to make a commitment, a verbal commitment saying 'yes, I'm going to wear a mask.' And what happens given that social norms will need to change if we then publicize that commitment, saying that okay, you made a commitment, we are going to use your name and tell other households of the village that this person has made a commitment to wear a mask and here's a sticker that we'll put on your, like a poster we'll put on your wall that shows to others that you are a mask-wearing household, right.

Satchit Balsari: Even if folks see the value in wearing masks nine months into the pandemic, there seems to be a lot of fatigue around wearing masks and folks getting lazy and pulling their masks down and wearing chin masks than face masks. How do you address the issue of incentivising people to continue

to wear masks, are there examples where this has worked in other public health interventions elsewhere in the world?

Mushfiq Mobarak: We are trying out many different little interventions, in some villages we are trying out providing certificates or monetary incentives to the village or to the leaders depending on the village to see if incentives are paid on the basis of yes, this is a village where we are monitoring and we've learned that mask wearing rates have gone up a lot, does that help? These ideas are coming also from some other interventions that we already tried on in India, such as certificates for open defecation-free villages. So, we are trying out all these things to learn what works and what doesn't work. And the reason to try this out is, we want to ultimately come up with the most cost-effective package, so that when this project gets replicated in the rest of Bangladesh, hopefully gets scaled up in the rest of Bangladesh or other parts of the South Asia or Africa, that we have some rigorous knowledge of what works and how to cost effectively invest in these.

Satchit Balsari: Mushfiq, from what you're describing, the simple act of wearing a facial covering, a cloth mask or a surgical mask, that seems like a very simple and elegant public health intervention, now seems, as with most societal behavioral change interventions, more complex. How much does this cost, what you describe is straight out of implementation science, textbooks, you incentivize people, you have promoters in the community, you have societal prompts, economic prompts to encourage people to change behavior. You mentioned that 350,000 people will be the recipients of these thorough interventions to promote masking, but if one were to scale that across South Asia, we are looking at nearly two billion people, is it scalable? What does it cost? A surgical mask or a cloth mask may cost 10 or 15 Takas but what does this package of interventions that you talk about costs, for say, an average sized village in South Asia?

Mushfiq Mobarak: Yeah, so in public health and in economics, we also calculate what is dollar cost per life saved or per year of disability-adjusted life saved and based on our current knowledge of how effective masks are, this would represent, I think even accounting for all the costs associated with getting people to wear a mask and getting all that behavior changed, this would end up representing one of the best buys in public health. And in terms of the dollars, it costs us the same to save a life. So, I think if this project demonstrates that masks are effective at reducing Covid transmission then this would be a highly cost-effective way for us to address this important public health challenge even relative to other good ways that the world has already invested in trying to protect human life. And now, in terms of the costs, overall of course if we could get away with only distributing masks, the cost there is very, very low, it's peanuts. So, we're talking about a surgical mask, which is about less than 10 US Cents, 10 Taka, which might be about 8 or 9 Rupees in Indian Rupees, and the cloth masks is 50 Takas, so we're talking about less than 50 US Cents and something like 40 to 45 Rupees. But if we could get away with that, that would be awesome, however, what we've learned so far is that it is unlikely that distribution is going to be sufficient, that we also need to add all these other behavior change interventions and monitoring and enforcement at the same time. And therefore, the net cost of implementing this program will be higher than just distributing masks. But on this, we've already started working with the Bangladesh government, in fact, the Associate Director General of Health is part of our research team now and the DG of Health in Bangladesh has decided that they do want to think about addressing this problem at large scale and they have a plan to distribute 80 Million masks.

Through this project, we have also developed a lot of expertise now on proper mask designs through the Stanford labs' work, you know what type of material should be used, how do we measure filtration efficiency, what are the types of material and masks that are more effective than others that are much less. And we've seen that the readymade garment factories in Bangladesh who are producing these masks for us in large scale, the same factory sometimes produces masks that have 95 percent filtration

efficiency but also down to like 15 or 30 percent efficiency. So, it's important for us to do some of the basic science work to make sure that we have identified high quality products.

Satchit Balsari: So, how do you actually measure whether your experiment is working, I mean, you will see people wearing masks but all that answers is whether people are wearing masks or not. How do we know whether that has actually made a difference in the community?

Mushfiq Mobarak: If you want to measure Covid transmission then you have to do something called seroprevalence, you need to look for antibodies among the population of these communities to see that in treatment areas we have, we are experiencing zero antibodies and other control areas. And those types of tests are quite expensive, but of course that's not something that needs to be repeated as we scale up the program. In terms of the cost of the study, yes, doing a study with 700,000 people is costly but we should keep in mind that most of the cost here is about measurement, it's research cost that doesn't need to be replicated when you think about scaling up the program once you establish that the study actually produces useful outcomes.

Satchit Balsari: The results of the study have significant public health interventions, not just for Bangladesh or South Asia but for the entire world presumably, both low and middle income settings as well as highly developed countries as economies are rearing to get back to work. What are you finding?

Mushfiq Mobarak: So, we are proceeding very, very carefully. Getting ethical permission both from Yale University internationally but also getting it from Bangladesh Medical Research Council and from the administrative permission from the Director of General Health. And so, it will take a little bit of time for us to report a full range of results and by little bit of time, I mean maybe 8 to 10 weeks. But as I mentioned earlier, this is kind of a two-stage study, the first stage is how to get people to wear masks and the second stage is do masks actually protect public health and do they reduce transmission. And the second stage takes longer, the reason is that we have to take blood spots in the beginning of the study and then we have to take blood spots at the end of the study to compare the antibody rates and figure out the treatment areas where we are seeing systematic differences. However, the first stage of the study, how do we get people to wear masks, so that's much quicker because we run those interventions first, all these behavior change interventions I described, and then we can immediately report in a few weeks what the change is mask-wearing rates were. And that we have already piloted for a couple of rounds to refine our approach and what we've seen so far is even without those additional interventions as I described about commitments and publicizing the commitments or providing incentives, even holding those aside, just doing monitoring and enforcement, the reminders etc. has led to about a 40 percentage point increase in mask wearing. So, we're talking about something like a tripling or more, that's something like a 300 percent increase in mask wearing. So, we feel like we have the basic set of intervention we've thought through now but hopefully with the incentives etc. we can get that rate even higher.

Satchit Balsari: You know Mushfiq, as I'm listening to you, I can't help but think how some of these implementation challenges are very different here in the United States, where both you and I live and in South Asia where we're from. The trust is sort of a government intervention that varies widely from society to society and at this point in the United States, trust in government is probably at its nadir in at least recent decades. Vaccine hesitancy is not just any public intervention but one that the public health community may need to address very quickly in the Covid pandemic as well. Is this an issue in South Asia? You're talking about behavioral change, getting people to wear masks and what I'm hearing is that it's more of a knowledge gap rather than a hesitation or a resistance to masks. What have you been observing, you've worked in the region for a long time now.

Mushfiq Mobarak: Yeah, so you're actually right that there are huge differences between North America and South Asia, but I'll also add to that there are pretty large differences between different countries in the regions within South Asia. So, for example, as Amartya Sen, the Nobel laureate from West Bengal has written eloquently about that Bangladesh while being much poorer than several north and western Indian states, in terms of GD per capita much poorer, but our health indicators, our social achievement indicators actually look more promising, much more favorable numbers compared to those states that are richer. So, this is in terms of childhood vaccination rates, maternal mortality rates, infant mortality rates, being able to avoid deaths under the age of five. So, it's clear that public health interventions like really simple low-hanging fruit somehow has had much better success in Bangladesh than some of our neighboring countries. And I think a lot of the credit goes to very large-scale NGOs who've done impressive work in Bangladesh and also credit to the government for allowing the NGOs relatively free rein to do that work. Many of us I'm sure have heard of BRAC, the world's largest NGO, which started in Bangladesh but also operates in many countries including several sub-Saharan African countries.

Even back in the late 1970s, at BRAC's inception, I still remember that they went around, visited 10 million households individually in order to given an Orsaline substitute in the hands of and in the knowledge of mothers, so that if the kid has diarrhea disease how to at least to suppress those symptoms such that the disease doesn't leave to a mortality event. So, in Bangladesh, overtime, since the 1970s, a lot of trust has developed. I still remember, and I grew up in the 80s, and I still remember some of the jingles that we saw on TV, both by the government and NGOs on exactly what you need to do in order to protect a life, say prevent a death from diarrhea disease. We are earning some of the rewards of that long-term trust that has developed. But it also tells us that look, the work that we are doing with masks in Bangladesh and the way we are getting people and encouraging people to use masks and if we are able to successfully change their behavior, it doesn't necessarily mean that the exact same intervention will work in the exact same way in India, let alone the United States or in Africa.

So, it's important to us, for at least the first stage of our study, which is about how to get people to wear masks, we do need to think creatively and carefully about in any given context how to do that well. Whereas the second stage of the study, it's kind of an expensive part measuring seoprevelantial blood spots, so that's about the behavior of the virus and how it interacts with the filtration of the masks, and that we think should work everywhere, so we don't necessarily need to repeat that expensive part of the study everywhere.

Satchit Balsari: That's fascinating Mushfiq. So, are you looking at other countries in the world to see what kind of behavioral nudges may be more effective in other cultures and in other contexts?

Mushfiq Mobarak: Yes, so as we're doing the Bangladesh study, we've already sped up May preparations for a similar study on the first stage, how to get people to wear masks, in Mali in West Africa. And, I've also started conversations with the team that's advising the West Bengal government on the mask-wearing work we're doing at Bangladesh because a lot of our material, including behavior change materials, given the exact sameness of language in West Bengal can be easily transferred over to West Bengal as well.

And then another area that your question really hits at in terms of hesitation that we're going to have to grapple with soon is on vaccine acceptability. So, are people going to be hesitant about taking a new vaccine for Covid when one such vaccine appears and here we are worried, including in countries like the United States, where we know there's going to be lot of hesitation on an imperfect and incomplete

vaccine coverage. And, the reason is, as you mentioned, that masks have been politicized in the US, which really shouldn't have been and even vaccines are becoming a little bit political where the leadership of the country is thinking about using vaccines as a political took as yes this problem is going to be solved so don't let it affect our re-election chances. Once that happens then people start viewing a public health intervention through a political lens as opposed to a medical lens, which is not great. So, we need to also work on reestablishing trust in public health officials, and in pharmaceutical companies that are releasing the vaccines but also putting it through very careful clinical trials to make sure that it's safe and effective.

So, I've been collecting some vaccine acceptability data, with the team collection around ten different countries in the world but we have some data coming back from Sierra Leone already and here we see that the rates of acceptability seems to have gone down relative to baseline, in the sense that in Sierra Leone, like 95 to 98 percent of people report that children have been vaccinated in the past against other disease but right now when we ask about their willingness to take a vaccine for Covid if one were to appear, less than four in five households say to us that they would accept a vaccine. And given such numbers from similar questions we've seen around the world that appears to be quite low. So, we do need to think carefully about compliance, people in Sierra Leone are also reporting to us that they're not willing to pay very much for such a vaccine, so we need to think carefully about compliance and acceptability of vaccines as well. I think that's the next big challenge that we will jointly face as social scientists and medical scientists.

Satchit Balsari: What I'm hearing from you is worrisome and it reminds me of Professor Heidi Larson's work in the UK, where she has for a long time examined this question of vaccine hesitancy and she concluded early on that this wasn't really a mishap or accident bad outcome that typically starts off spirals of vaccine hesitancy but often they are just rumors, and digital technology with this easy access to excess information at everyone's fingertips seems to be fueling such misinformation. Have you faced this or do you have suggestions as to how this may be countered either in Bangladesh or elsewhere?

Mushfiq Mobarak: Yeah, I think trust in some official or leadership voice is critical, maybe there's now too many disparate source of information and unless there's very clear, consistent messaging coming right from the top, from a trusted voice then you can see these social network effects of rumors spiraling and people learning different pieces of information from different sources and you don't have perfect clarity from the official sources that ends up undermining public confidence, where people are like oh, it's not clear what I'm hearing, what I'm learning and there might be some risk here, so maybe I should just play it safe and not vaccinate.

So, I think clear, consistent messaging, allowing trusted expert voices, like people who are epidemiologists and medical researchers lead that conversation, I think it's going to be really, really critical.

Satchit Balsari: This is an important lesson that we could have all used in this pandemic as there was such a clamor of voices and opinions at the decision making table, frustration that many scientists have felt around the world is that they did not have a seat at the table where often consulting companies did and had, often undue influence on policy making and governments.

Mushfiq Mobarak: And I think it wasn't just a failure of political leadership, it was also a collective failure that we all had, which is that even the World Health Organization, let's say going back to the masking question, their guidance for a long time was not very, very clear. And the reason is that sometimes people worried about oh maybe we'll see a masking shortage and PPE shortage amid healthcare workers, and medical science voices were saying oh, maybe we shouldn't encourage too

much mask usage among the general public because then you'll face a mask shortage or we might worry that in the absence of clear evidence, like a randomized control trial that masks actually work, this might provide a false sense of security to people and they might end up behaving in worse ways in other dimensions, including not social distancing etc. And that's where this kind of research becomes critical in order to make sure that even on the scientific side, we have absolute consensus and we all speak with a unified voice.

Satchit Balsari: Mushfiq those are very important points. I think we all remember the CDC's guidance here in the United States and the early days as well inadvertently discouraging people from wearing masks to prevent shortages. There are several of us who work in the developing world who couldn't help but think why masks only meant surgical masks and why to channel a BRAC, or SEVA, or Vision and Mission in India for example, one would have thought of alternatives to industry produce surgical masks as a bridge to industry standard masks being available at scale.

Mushfiq Mobarak: Absolutely, great point.

Satchit Balsari: Your study is most likely to show that the most effective public healthcare interventions, just like the oral rehydrating salts that you earlier alluded to are the simple and the elegant ones. They are not necessarily technologically challenging but implementation is of course complex and simplicity does not mean that they are easy to scale. Until a vaccine arrives, masking maybe all we have, we very much look forward to hearing from your team once your results are out. Thank you, Professor Mubarak.

Satchit Balsari: Thank you, Professor Balsari.