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>> DEAN HYDER: I think we are going to get started. Greetings, everyone. I hope you can hear me. My name is Adnan Hyder.

I'm privileged to serve as the dean of the Boston University School of Public Health. Welcome to this public health conversation. This event is part of our special theme on Future of Public Health and also part of a special year, we are celebrating the 50th anniversary of the founding of our school.

This is really important because this topic on improving and supporting maternal health is vital to public health.

And today, we have a fantastic panel that's going to discuss some of the most emerging and innovative technologies, and its associated implementation pathways to solving some of the most difficult challenges in the arena of maternal health.

This, of course, is not only vital to public health but also to the social and economic development of countries around the world.

Including very much here in the United States.

I'm so privileged that so many members of the Boston University community, but also our colleagues in public health and in maternal and child health from around the world are joining us today.

I'm so excited to introduce Lois McCloskey. Here at Boston University School of Public Health. She has been leading HRSA funded center on maternal health for a number of years and continues in the university and outside. Very excited to hand this to you, and I will come back towards the end. Looking forward to an exciting discussion.

>> LOIS McCLOSKEY: Thank you, Dean Hyder, very much.

It's my pleasure to be moderating today's discussion.

It's a key to how society is doing and how we are doing on equity. Women lose their lives from pregnancy complications and illnesses that go on to impact their entire life course. In the past decade, technological innovations have played such a critical role in advancing maternal health. And developing them, implementing them requires breaking down silos. So many silos that we are guilty of. Requires collaborating across disciplines, across sectors, forming partnerships that span government, NGOs, private sector business, academics and communities most affected.

So we are so fortunate today because our panel of illustrious innovators, researchers, practitioners represent each of those sectors and we are working across disciplines. We have experts from clinical medicine, bioengineering, public health. Those who have been involved in design and implementation and evaluating innovations in maternal health.

And those who work in the U.S. and lower resource countries. Our goal is to put our heads together to learn about what the current advancements are, what the challenges are. Get some specific examples and talk through new directions, their benefits and concerns that we have, especially now in such a rapidly-changing environment.

Each panelist is going to take a few minutes, not too long, to present their work, and then we are going to engage in conversation together. I'll pose and lead the conversation at first and then there will be time toward the end, the last 15 minutes or so for you all to pose your own questions, using the Zoom Q&A tool.

Look forward to your questions as well.

So before we begin, I just want to say how important and what a pleasure it is to come together in solidarity at this particular moment of such enormous stress and declining resources for our work. Especially, but not only, in global health. So let's begin.

Our first panelist is Dr. Jane Hirst. Professor Hirst is Chair in Global Women's Health at The George Institute for Global Health, UK, and the School of Public Health at Imperial College. She is an

Visiting Professor in Global Women’s Health at University of Oxford, consultant and OBGYN. She does active research on Global Women's Health, investigating just this, novel approaches to improve healthcare delivery. She is especially interested in preventing cardiometabolic conditions in women after high-risk pregnancies.

So without further ado, I will say I have asked Dr. Hirst

to take a few minutes at the beginning of her presentation to frame our conversation, giving us a broad overview of the current landscape of technologic innovations before sharing some of her own work.

Welcome, Dr. Hirst.

>> JANE HIRST: Thanks a lot. Let me just share my screen. And let me just put it into the right mode. And if you could verbally confirm that you could see the screen in the correct format.

>> LOIS McCLOSKEY: Yes.

>> JANE HIRST: Thank you. It's a great pleasure and honor to be invited to kick off this quite exciting webinar, I think, on this really important topic on innovations in maternal health.

Just to set the scene before we dive into the innovations, I think it's important for us to remember what we are talking about, globally. And that is, the figure you can see here, 260,000 maternal deaths estimated still in 2023. And what I think is notable about this is that this figure has been largely static since about 2016. You could see from our SDG target, per 100,000 live births by 2030 our current mortality rate is miles off the mark. We have got a lot to achieve here.

I think there's a role for technology and innovation and I will outline on the next few slides maybe some ways which this could happen.

When I think about innovation to support pregnancy care, there are many things we could think about across the health system and society more broadly, but what I have chosen to focus on here, are five key areas where I think technology and innovations are making a difference around prediction, diagnosis, better treatments, optimization of care and also enabling our health workforce to train and continuing to support them.

I'm going to give some examples across all these areas. Just not comprehensive of everything but illustrate the sort of things that are possible.

But what I want you all to be thinking about is what is the genuine gap in care or service delivery we are trying to close with these innovations. Remembering that innovations are not a replacement for non-functioning or non-existent health system. Having a fancy app or tool never saved anyone's lives, it's the people around that tool that enables something different to happen. So we need to think about that.

Let's think about prediction, first of all. I have picked here three examples to show different ways in which predicting who’s going to be at risk of conditions can hopefully make a difference and is making a difference in some instances to

outcomes.

So for any of the OBGYNs on the call you would be familiar that the last 10 years or so the business of prediction of preeclampsia has ramped up. When combined with different clinical characteristics can really identify quite accurately who is going to develop preterm preeclampsia. We can give them aspirin and reduce their risk of preeclampsia around 90%. A really important innovation. The issue is this innovation is largely only available in high-income countries. So there's a lot of efforts by Gates Foundation and other groups how we can disseminate this so it is equitably available around the world and in less resourced areas, in the high-income countries also. The next is from middle and low income countries for people in low resource settings by people in King's College London. A CRADLE VSA device. A low-cost, reusable, battery-powered sort of blood pressure device, to track people in shock, if they are bleeding, and equally importantly, hypertensive disorders of pregnancy. And the Kings Group have worked tirelessly for years and rolled this out across areas, including almost a total country rollout in Sierra Leone but it didn't make a difference in the number of deaths. A device itself doesn't save lives, you need the systems in place to ensure referral and evidence-based treatment. We are currently working with the Kings Group to take this to the next step.

The final example is from colleagues of mine in Oxford who have developed an algorithm that could be used at the beginning of labor to predict women who are likely to develop fetal distress and need an emergency delivery like Caesarean delivery or forceps delivery. They show by using AI algorithm they can improve this prediction, saving around eight hours of blood, sweat and tears in labor for women potentially if this were to be implemented. This is at a fairly early stage. Prediction without a response pathway is really just classification. So these innovations need to be seen within a systems environment.

The next area is around diagnosis and probably many of you would be aware of AI-automated ultrasound, really bringing this technology to people who are quite low-skilled. But as a clinician what actually excites me more is when the machines could potentially do this a lot better than what well-skilled practitioners will be able to do. This paper here, if anyone is interested, I have put down the reference is showing how actually a deep learning model can predict gestational age on an ultrasound far better than we can do using current metrics of measuring the head circumference and femur length with accuracy of 2.8 days around 18-24 weeks. To give a comparison, the best we could do with humans is probably within 10-14 days of that gestation. The machines may be able to improve how we are doing

things. The third area I think innovations are hopefully going to really revolutionize what we are doing in maternal care is around offering better treatments to our pregnant people. It will probably come as no surprise that pregnant women and pregnant people which have been excluded wholesalely from trials of therapeutics. With pregnancy-specific conditions you could count on almost one hand the number of new drugs licensed and patented for use in pregnancy. It's really quite a desert and not many things are tested here. Our group, in U.K., message we are trying to rebalance these scales and make healthcare more evidence-based for all. And it's hoped through technology, some examples here, repurposing of existing drugs, finding new molecular targets and identifying new biomarkers may be able to open up some new exciting avenues there.

>> LOIS McCLOSKEY: Excuse me, Jane, I'm sorry to interrupt. We are hearing, your slides are a bit grayed out.

I wonder if there's a way.

>> JANE HIRST: Okay, I see, I see. It might be, I need to press a button here. Just wait.

Hang on. I'm just going to stop sharing and share again. Bear with me for a second. I think Zoom has asked me to do something I haven't said yes to. Sorry to stop mid flow, but let's try again.

>> LOIS McCLOSKEY: No worries. And thank you.

>> JANE HIRST: That's okay. Just as I was getting to the exciting bit on my own work.

[Chuckles]

There, is that clearer now?

>> LOIS McCLOSKEY: That is.

>> JANE HIRST: Excellent.

>> LOIS McCLOSKEY: Beautiful. We are getting good --

>> JANE HIRST: You are missing out on the beautiful graphics. I was going to quickly round out by talking about some of the stuff we are doing around technology to optimize care delivery. As we will all be aware, we know kind of what to do. We don't need fancy new AI and tech to tell us what to do. The great gap is actually in delivering evidence-based care to those who need it.

Our smart health pregnancy program is designed to improve guideline-based screening, referral and management of high risk conditions during pregnancy and the first year after birth for women in India. So this is designed with and for communities living in rural populations in India. It starts with a training session for the community health workers known as ASHA. They have a tablet-based app they can register pregnant women in their community. They do screening. They are trained how to screen for high-risk conditions. There's a clinical decision

support advice, also with automated referral to the primary healthcare center by review by a nurse or a doctor. The nurse and doctor have access to the same data and prescribing data where relevant and this goes on and on through the pregnancy and first year after birth.

We don't have time to go into all the amazing findings of this study. The cluster randomized control trial really high levels of engagement of future (?) good implementation. The main paper is coming. But what I wanted to highlight for the group here today was that whilst the health workers really liked having this app, they have a lot of apps so we are really overwhelming our health workforce at the moment. They needed support beyond one training system to use the system effectively and ongoing support is important.

We are now currently adapting this for use in other countries around the world in seven countries. But I think these are key things to recognize. The final thing I wanted to mention was how we can use technology to try to enable these further to really understand a bit more about health conditions and how they can support people within their communities. A big shout out to two of my Ph.D. students who worked within the smart health trial with the community health workers to develop an AI chatbot for them in their local language and to support them on their home visits.

This wasn't technical at all, it was sitting down with the women listening to the journey, and what they do in a day and understanding where the need was for technology and where that could change knowledge.

Finally, the take-home messages, these innovations have great promise. However, they must be designed with and for and around the users in the context of the health system from the start where they want to fill these gaps. They mustn't increase burden, they are not replacements for non-functional, non-existent system, they are not a shortcut but they could be effectively introduced if there's continuous support, training and feedback. A shout out at the end, just by introducing a technology is not enough, we need ongoing monitoring to make sure they are reaching everyone they should and not reinforcing equity and bias issues. So I'm going to stop there and looking forward to the discussions, thank you.

>> LOIS McCLOSKEY: Thank you very much. That was a great introduction and overview, Jane.

Our next speaker is Dr. Samantha Parker Kelleher. Welcome, Dr. Parker. She is an Associate Professor in the Department of Epidemiology in the BU School of Public Health. Her research understanding the relationship between prenatal exposure and infant and childhood outcomes and effect of pregnancy outcomes

on postpartum on cardiovascular health. She is the Principal Investigator on a R-01 award from the National Heart, Lung, and Blood Institute (NHLBI) to Boston University School of Public Health.

She previously had an American Heart Association grant to examine the social needs, health related social needs and postpartum blood pressure. And has been awarded for her even earlier work in preeclampsia. So she comes to us with a deep understanding of these issues and we welcome you, Dr. Parker. Please, go ahead.

>> SAMANTHA PARKER KELLEHER: Okay, thank you so much for that nice introduction. Let me go ahead and share slides.

All right. If you could just let me know if the slides are visible and clear.

>> LOIS McCLOSKEY: Yeah, that looks good. Thank you.

>> SAMANTHA PARKER KELLEHER: Thank you to Dr. Hirst for that nice overview. I will talk specifically about one innovative program that I've been working on here at Boston Medical Center and BU School of Public Health in the context of the United States. But one thing I will really echo that Dr. Hirst mentioned is really the wraparound supports that are needed, in addition to just the innovation and technology.

So today I will talk about a postpartum remote blood pressure monitoring program we have been evaluating both with quantitative and qualitative data and discuss some of those findings. To just place this in the context of public health, cardiovascular issues are a major driver of maternal morbidity and mortality. We know this is particularly important because women fall often in the gaps of care after delivery. So the American college of obstetricians and gynecologists, women who have experienced hypertension in pregnancy receive a blood pressure check, at a minimum between 7-10 days after delivery. There are major challenges to making this blood pressure check happen. Women are experiencing issues with transportation, child care for older children, potential physical limitations related to their recovery, particularly if they have had a Caesarean section. They may be experiencing mental health related to anxiety and traveling with a newborn to a new place and leaving comforts of home. Our data support there are challenges. At Boston Medical Center we saw 13% of patients deemed high risk met this blood pressure check. If we add two days, plus or minus to that, we get about a quarter of women meeting this clinical recommendation.

So, we designed a patient-centered postpartum monitoring program this was led by Dr. Christina Yarrington. Understanding the population and their needs and meeting them where they were. So this is an urban safety net hospital that has a really high

proportion of non-English speakers, low-income patients and high risk, about 30% of our patients were experiencing hypertension in pregnancy.

So we partnered with a vendor that developed a cloud-based technology. What's really innovative about this compared to other remote monitoring programs is it uses the local cell network. So patients do not have to have, they don't even have to have a smartphone. They don't have to have an app, there's no text messaging requirement, there's no wireless connection they have to have. All they need is this device and then a local cell network. So every time they take a measurement, it's transmitted to a portal that's being monitored by a dedicated nurse that is dedicated to just this program. So she knows all the patients. The patients know her. There's constant communication happening.

One other kind of benefit of this program or modification of this technology is the educational materials and all translations and transmissions that happen are available in the four primary languages that the patients at this hospital speak. There's no English-speaking requirement that we see a lot, in a lot of the innovations developed here in the United States. So our materials are available in Spanish, Portuguese and Haitian creole. After the creation of the program after the 7-10 blood pressure check we saw a huge jump, 91% of our patients were having a blood pressure check within that 5-12 days because of this remote monitoring program.

I also talk about the long-term engagement. This is a six-week program. We see really equal engagement across our patients race and ethnicity really showing this innovation is servicing our patient population. We aren't seeing major differences previously reported in some monitoring programs. So on average patients are checking their blood pressure 15-16 days during that six-week program. And doing so for roughly a month of that six-week program. They kind of taper off after that.

We have also conducted several patient interviews which really have supported major benefits, with some challenges noted. But benefits include things like convenience, peace of mind, reassurance of safety and supportive accountability. This is really coming from that nurse that runs this program and her contact with the patients.

There are some challenges. There might be some issues with instruction retention and competing demands but overall they really enjoy the program and want to see it expand to not just the high-risk women at the hospital.

We started using data to look at clinical outcomes led by a doctoral student Sharon Casey, looking hospital readmission data in relation to the program. Even though this is preliminary we have seen a slight reduction in hospital readmissions related to

the program. Not only showing we are doing a good job capturing blood pressure, we are doing great work in improving the clinical outlooks of these patients.

To recap, we have used a patient-centered approach to this remote monitoring program and demonstrating high rates of program engagement across racial and ethnic groups. High levels of satisfaction and suggestions of improvements in clinical outcomes. Briefly, as you close, I want to acknowledge the Department of Obstetrics and Gynecology at Boston Medical Center. Christina Yarrington who spearheaded. Jasmine Abrams. The nurse Megan O'Brien and doctoral students, Ema Mujic and Sharon Casey. I will stop there, thank you.

>> LOIS McCLOSKEY: Thank you, Dr. Parker, very much.

And now, a little further away from home, at least home for us here in Boston, I'm really pleased to introduce our third panelist, Dr. Tabinda Sarosh, joining us from Karachi, Pakistan. Dr. Sarosh is Pathfinder International's president and CEO and is in fact the first person to lead the organization from outside the U.S.

She has spent over two decades leading transformative innovations that bridge public health, women and young people's rights and sustainable development.

Dr. Sarosh combines experience as a public health practitioner and women's rights advocate and has a very in-depth understanding on how to deliver women's health services across very diverse contexts in Asia, in Africa and the Middle East. She has played a critical role in a number of national policy reforms that relate to women's health in Pakistan. And more broadly is a very strong advocate for grassroots movement building for women's rights across Asia and Pacific region.

Welcome, and thank you for joining us, all the way from Karachi at 10:00 p.m. your time, Dr. Sarosh. Please, go ahead.

>> TABINDA SAROSH: Thank you so much, Lois. Could you just give me an indication if you could hear me and see me and my slides?

>> LOIS McCLOSKEY: Yes. I can hear you. Your slides are clear. And I think you are ready to go.

>> TABINDA SAROSH: Yes, thank you. And congratulations on the 50th anniversary, I'm delighted to be here. And I think my presentation is just that one presentation that comes from a practitioner that works with systems to make innovations work in the field like Jane and Sam mentioned earlier. So when I talk about the future of health, I take a moment and picture the places where that future has to work and deliver. So imagine maternity ward in a conflict zone or rural community, you know, without an ambulance nearby. A settlement missing from the map completely that determines where health workers and clients

actually go to work. These are the front lines where the future has to work. Before that, just a little bit about Pathfinder. So at Pathfinder we have been supporting women and communities across the continuum of maternal care, working alongside governments, health workers and communities and private healthcare markets. We have been doing this for nearly 70 (?) years. Next year we celebrate our 70th anniversary. I won't read them but I invite you to explore our website. As physician and CEO of Pathfinder, the question I keep coming to what does it take for a promising solution to become dependable care. For that, I will share three examples with you. So, let's go to Borno. Conflict area in Nigeria. It's an innovative on ground approach that is saving mothers lives by preventing postpartum hemorrhage. I'm sure many of you know women could lose life threatening amount of blood within an hour of giving birth. That gives little time to recognize the bleeding and treat it. TA connect brings e-motive. For those unfamiliar it's a WHO-recommended approach that combines early detection of PPH using calibrated blood collection plate but rapid treatment bundle including Carbetocin to reduce bleeding and stabilize the mother. In Borno years of conflict disrupted the roads, health services and supply chains so getting e-motive to Borno was not the innovation, getting it to work in Borno was the innovation. Our challenge was to get this into maternity wards when staff could not safely travel for training so midwifes couldn't show up for routine visits. What was needed were training networks and on site peer mentors and that's what TA connect did.

Deliveries timed around safe travel windows and facilities sharing stock. WhatsApp helped by helping health workers seek advice and flag shortages and remain connected to each other. Over nine months the program supported 25,000 deliveries. Borno shows for locally-led training, creative logistics and government ownership, life-saving care can reach women even in the middle of a conflict.

So let's go to Tanzania now. This is rural Tanzania. It's a toll free call which connects a woman to a dispatcher who sends an ambulance or trained community driver to a facility equipped to treat her. Previously taxi drivers would sometimes refuse emergency journeys because payment was uncertain. Now imagine a family trying to negotiate a fare during an obstetric emergency? The system establish reliable payment for drivers. Drivers were happy and Pathfinder help strengthen care on either side of the journey. Community health workers recognizing danger early and facility staff ready to respond when a woman arrived at the facility. This was done in partnership with the government of Tanzania and Vodafone Foundation.

38% reduction in maternal deaths over four years. Now with

the leadership and commitment of the government, this model has been scaled and institutionalized as a nationwide program. The lesson is follow the woman's full journey. My third example we come back to Nigeria.

We come back to Nigeria. This is a simple one and yet very complex.

It starts with a basic planning problem. What happens when hand-drawn paper maps that health workers use become out of date? Whole settlements can disappear from the service plan. Through geo star, Pathfinder and our partners are adapting geo spatial approaches used in immunization to help plan Broden maternal and reproductive services. Satellite mapping and digital tools help teams identify underserved settlements and organize outreach. The tools now support work across 101 wards in Kano. This work is still developing and it's promised giving health workers better information to act on with a pathway to government ownership.

Towards the end I would like to talk about Women & Co adapting innovation for real-time service delivery, Pathfinder founded Women & Co shaped by experiences. We want to give locally grounded ideas a stronger path for early testing to sustainable delivery, including enterprises, where that model makes sense. For those of us financing and designing the future of health, we need to ask, are we investing enough in the capabilities that allow innovation to reach people and endure?

And one last word, across all the examples that I shared with you, the approach has been consistent. Adapt to the conditions. Build local capability. And establish ownership that can sustain the work. The future of health will be determined by what a woman can depend on and rely on when she needs care. And that is the standard we should all build towards. Thank you so much, Lois and back to you.

>> LOIS McCLOSKEY: Well, thank you. Those are very interesting examples, as well as challenges, as you say, get them to where they really matter.

Moving on now to our final speaker, we are going to wrap up with Dr. Joyce Wong.

Who is distinguished professor of biomedical engineering and material science at BU's college of engineering. Dr. Wong's main research interest is in the development of new bio materials and how they interact with living cells in novel ways.

Her research focuses on maternal and child health, tissue engineering, theragnostic, cardiovascular, and contrast-enhanced imaging.

Dr. Wong is going to take us to the other end of the life cycle spectrum for developing innovations that are technologic at root and talk to us about how the design begins at the

engineering stage.

Thank you, Dr. Wong.

Please go ahead.

>> JOYCE WONG: Yes. So for some reason it's saying sharing is failing to start.

I apologize.

Let me see if I can --

>> LOIS McCLOSKEY: Okay, we will take a moment and have the team help you.

>> JOYCE WONG: Let me try again.

Okay, let's see.

Okay, is that working now?

>> LOIS McCLOSKEY: It is. That's great.

>> JOYCE WONG: You can hear me. I apologize for that.

>> LOIS McCLOSKEY: No worries. Yes, we can hear you.

>> JOYCE WONG: Yeah, great, thank you for that nice introduction. Before I start, I should mention that, for me, I'm trained as a biomaterial scientist and engineer. And a little over five years ago is when I decided to pivot my research and efforts towards women's health. And that grew out of my efforts for many years for over ten years I was in the Provost office at B.U., I was in charge of doing the faculty women and STEM science technology engineering and math. My interests in gender equity for stem kind of grew and I wanted to align my research interests. That's coming from that aspect but I also want to mention I really resonate with the other panelists in terms of saying how it's really important to have all of the stakeholders there when you are determining ways to deliver maternal care. In that sense I would like to discuss how that happens in biomedical research and really how that occurs is you need to build teams that have the stakeholders addressing the problem from the very beginning.

So I just want to highlight, so I have a really fantastic group of Ph.D. students and master's students and undergraduates in my lab. And then also I highlight collaborators. It really takes a village to have a lot of collaborators. A key collaborator, Kathy Klapperich now at U.C. Santa Barbara. Wendy Kuohung. And Robin Ingalls, I saw on the call, she is infectious disease specialist. And really, obviously there are many other collaborators, I really wanted to highlight these three people because they have been really great partners in this. Also towards the end I will talk about Workforce Development and highlight the work and efforts we are doing in that area at Boston Medical Center. I feel it's important to have this conversation and talk about how it's really important to understand that research, it needs to be funded. So it takes a lot of money to fund. You have to train your trainees. I know a

lot of my colleagues know this. So it's also, I'm very grateful for the Boston University internal funding but also we are very fortunate in Massachusetts to have the Massachusetts Life Sciences center that is really very supportive of women's health in many different aspects. And also the Evan's Center and I will talk about these in a bit. But also the national institutes of health which has really been important. And the reason I bring that up is maybe we can get into this during the discussion is especially now there's a lot of kind of changes happening in the government and in funding. And I think it's really important to keep an eye on what it is required to fund research projects.

And what I will be basically be doing is talking a little more upstream of what you have heard so far in this panel. More of the engineering and basic science. Dr. Hirst mentioned how it would be good to find drug repurposing or finding mechanisms and trying to find new targets.

So I will basically talk about one project here in detail but just to give some examples, in my laboratory we are very interested in trying to determine how you could identify abdominal adhesion. This could occur from Caesarean section or infection or other factors, instances could lead to infertility but the problem is the only solution to find these adhesions which could also come from fibroids and Endometriosis and other factors, the only way is to do surgery and open up and look and see if there are adhesions, basically bands of tissue that could cause a lot of pain and small bowel obstruction, and infer tilt. You are creating more adhesions. We are trying to work on doing semi non-invasive ultrasound agent to try to detect that in a semi non-invasive way.

We are also working on, this is something with Cathy K, we are trying to collect menstrual affluent, you could do diagnostics but use it for a source of tissue engineering which is something I will get into a little bit later.

This aspect here that you heard talking about postpartum hemorrhaging and things like this, is that one of the cells that is actually responsible for this is the uterine smooth muscle cell. It's a really remarkable cell in that, if it contracts prematurely you could have preterm labor. But then after birth if it doesn't contract properly, could have postpartum hemorrhaging, something called uterine atrophy. You could try to use to screen for drugs. We are doing things like placenta on a chip, trying to look at preeclampsia, which I won't talk about. But essentially these are different models you could build in the laboratory and use that to try to mimic the physiological and anatomical processes that are going onto try to then understand how the disease is progressing.

So I will talk, give you just one example of fallopian tube

on a chip, the reason we call it a chip, it's taken after the computer chip. And because a lot of the technology for computer chips is on the scale of microns which are kind of the similar to the length of your hair, the diameter of your hair. So these chips could also be used at the same scale to manipulate cells and make good model systems. What motivates this is tubal factor infertility actually accounts for a large fraction of infertility. So this is tubal factor and many other factors. So why it really hasn't been so much of a problem is you could do IVF, in vitro fertilization. In this country the success rates are not so good, sometimes have to go multiple rounds and you could require let's say $10,000-$15,000 per cycle. That is really not equitable so you end up having only people that have the means. Because it's not always covered by insurance.

So what can we do in this case? Here again I'm highlighting Robin Ingalls and Wendy Kuohung and Emily Schwartz. We know there are regular surgeries where women, for whatever reason they want to remove their fallopian tube. We need to have laboratory models because we know the fallopian tube in the humans are very different from mice, which are a common animal model that used. You could see here in this histology slide, they are showing in this kind of cross section of the fallopian tube, could see there's two different types of cells, ciliated cells. You could actually see this here, that these cells, the ciliated cells you could see them beating here. This happens to be from whole tissue. But we could also take this laboratory model, put it into this culture device and then we could actually put flow and make it into a model where we are mimicking the structure and we have input obviously from my collaborators Dr. Ingalls and Dr. Kuohung. We are also collaborating with Dr. Ashlee Ford Versypt from Buffalo.

So in this digital twin, let me get back to this lab model. You could culture the cells at the air/liquid interface. You could add a pathogen. Let's say it's Chlamydia or Gonorrhea. You could add flow and different hormones and then you could put this onto a multi-well (?) format. So you could do high throughput screening. You could do this by looking at drugs that have already passed the phase one or phase two clinical trials and use that to kind of accelerate drug screening. But the other aspect is you could use a virtual model and this is my colleague, Dr. Ford Versypt. She could use a computer and take this information and using a computer or virtual model that could inform our laboratory model and we have this back and forth where we can kind of iterate and use, again, this is a term called digital twin, where you could actually have a computer model alongside the laboratory model. And this is what we are currently actively trying to investigate, trying to see

how we could determine factors that could identify factors to address tubal factor infertility. So in my last slide, I just want to talk about how it's really important to build community and Workforce Development and what are we doing at B.U. and Boston Medical Center. My colleagues Emelia Benjamin and Elisha Wachman, the idea is to bring together what are normally siloed, our college of engineering but together with clinicians and also basic scientists in developing these tools. We have our clinical translational science institute looking at sex as a biological variable as a resource. And the idea is together with a training opportunities, can we then build this community? So one of the areas this affinity research collaborative, this ARC, it's open to all investigators at Boston University and medical center, we meet monthly and have pilot funding and we are in the second year of our ARC and we are generously supported. This building interdisciplinary careers in women's health is a national program by the National Institutes of Health, Office of Research women's health, we are one of 23 centers around the nation that are then, as I mentioned, we are promoting early career faculty and helping them become independent. But I will stop there. But the importance of making sure we have Workforce Development as well.

>> LOIS McCLOSKEY: Thank you, Dr. Wong.

Wow, we have heard from amazingly people from bio material engineering, Dr. Wong and importance of cross sectorial village that it takes from people who are clinicians but working at the front end of public health research and evaluation of tools used around the world.

And from a practitioner, really, speaking about Tabinda, thinking more closely at the downstream, how really, really do we get these in the hands of places and people where it matters most. So across the spectrum.

Let us all talk together now in conversation. So please come online, everyone.

We have some really important themes across your talks, the sis stims in place, the training, challenges of training and continued support while these innovations are in the field. Co-design, what that really matters, soup to nuts, engineering to implementation.

And then some hints that conversations about government support, funding. What it really takes.

We haven't touched yet too much on policies that you may be working onto support these innovations. So I want to touch on all of those things but first I want to start with a pretty big picture question for all of you to chime in on.

So we think about maternal health challenges globally and in low-resource countries and what's astounding to me, really,

maybe it shouldn't be, is how much the resources, there are stark contrasts in the level of resources. But the systemic gaps, and the inequities are shared. Maybe to different extents and in different ways but common across. The U.S. certainly and across more lower-resource countries.

So let's think about this tension between innovation and inequity.

And access.

From each of you, if you could say a few more words about what you've learned about how we can assure these technologies are accessible to work towards equity and not leave the most vulnerable and marginalized people on the front lines out.

So, I might turn to you first, Jane, to get us started.

>> JANE HIRST: Sure, thanks, Lois. That's really a critical challenge that I think we all face. And I think Tabinda outlined that idea going to the hardest places first is an important step in that journey.

I think what I've also found through the work that we've been doing is making sure that innovations are genuinely built and designed with and for and around the communities where you want them to be used. So I think if you just talk to, me as a clinician, if I just talk to my colleagues in the hospital, I'm sure we could design a great program for things but if we aren't talking to the community, talking in their language. We heard from Samantha's presentation, making sure the language is accessible to people, all of these things are essential. But I think, critically we need to have some accountability in systems, so it's not just a matter of developing something and handing it over to the government. We also need to develop accountability structures, make sure things remain equitable, that people aren't excluded. This concern about digital exclusion, when we talk about apps, WhatsApp this number and you will get support but what if you don't have access to a phone. We need to be considering all situations and particularly, designing things for people who have the least options and advantages in life, would be my reflection on that. I'll stop there.

>> LOIS McCLOSKEY: Yeah, others, chime in as you wish.

>> TABINDA SAROSH: Thanks. If you don't mind, I'll go ahead. Because I actually deeply agree with what Jane just said. I think equity has to be at the center. Because who are we serving. Or who is the innovation serving at the end of the day? I think the type of experience that organizations like Pathfinder have had with health systems over the decades, we know how marginalized or remote communities or communities with special needs, you know, they have the various barriers they have to face while accessing services. And affordability is also

a big part of it. I really like the example, for example, that Jane gave around digital access, right. I remember during COVID days when Pathfinder was programming and basically training midwifes and leading health workers and providing services uncovered. Many of the ladies didn't have smartphones to have those trainings on. This is a question that needs to be addressed right at the design level. And you know, one of the things that really helps us in our work has been the human-centered design approach which we have been employing even before Women & Co came into being. The drivers of the innovations isn't even needed. What's needed when innovation is thought of. It has to be needed. It has to be demanded and then it has to be designed with the communities in the drivers seat. That works for us and often helps kind of address the equity challenges that the communities might face. Thank you.

>> LOIS McCLOSKEY: Thanks. You have each talked about that. So continuing this part of the conversation, Sam, Joyce, you both talked about kind of co-design and getting feedback along the way.

Talk to us, towards equity, right? That's what it's all about. Talk to us about how you did that and any particular insights you have gained.

>> SAMANTHA PARKER KELLEHER: I'm happy to give an example of something we struggled with a little bit. Was after the initial roll out or implementation of the program one thing we found was important was going back to the patients after the initial implementation to say, where is this working and where is it not? To keep reiterating and refining the program. So, initially all the automated texts for reminders were in English. And that was one area, even though we were producing educational materials and how they should take their blood pressure and instructions, automation was all in English. So we worked with the vendor to improve the automation, so it was available in different languages to really make sure we were targeting the right groups in our patient population.

One other thing I didn't talk much about too was, once they had a high blood pressure, there was this algorithm developed that kind of gave them different, depending on the blood pressure, kind of their next steps. Like you need to go to the hospital, you need a medication plan or titration on your existing one. So one thing that was really innovative is they worked with the hospital pharmacy to be able to write these prescriptions with the hospital pharmacist quicker than having to wait for sign-offs from the very busy obstetricians. So they developed this really nice procedure for pharmacist to take some control over managing the medications. And even one point they were piloting a home delivery program. So the patient was

receiving the medication within 24 hours on their doorstep. I don't know if that is still ongoing, it was something they piloted. We are a tight urban center. That's not going to work everywhere. Understanding who your patients are and what their barriers are, not only treating blood pressure but the next steps. Not only here is our program but after you put it in place, what do you still need? What's still not working?

>> LOIS McCLOSKEY: Yeah. Important reminder. Joyce?

>> JOYCE WONG: I would add, I agree with Tabinda and Jane that the user-center design is critical and that's something we try to emphasize with our students. But coming upstream a little bit too, it's really important if you are developing these models. You really have to have cells from patients that are really diverse and representative. You don't want to have from a homogenous population. I feel lucky at Boston Medical Center we have a diverse population. Just to broaden the conversation a little bit, many of you know probably better than me, for example, cardiovascular disease or even kidney disease, a lot of the treatments were developed, the innovations were based on training from like, let's say white male patients, right? So not even for women. That's why sex as a biological variable is so important. Let alone adding in the different ethnicities.

So I think it's really important to then get those cell sources, I think that's a big challenge right now for women's health is getting cell source. That's a big issue for us right now.

>> LOIS McCLOSKEY: And how do you do that, Joyce, I'm curious, because I haven't given much thought to that as a public health person. How do you do that with respect to patient's knowledge and engagement in that?

>> JOYCE WONG: So you have to have an IRB, right. Or in our case, we actually have discarded tissue IRB where we can get that. But then we and others have gotten consent IRBs, so you have to consent the patient but obviously you have to then reassure them this is meant to then find out research -- I mean, I think there's a lot of evidence from before, like Henrietta lax, make sure you aren't doing that. We have to work together with communities. I think the B.U. clinical science institute is focused on community health too. So I think you have to work with the community.

I can just tell you, our engineers, our young engineers love it. They really want to interact. So I feel like people want to work together. But we really have to come together to try to solve the problems together.

>> LOIS McCLOSKEY: Yeah.

Anything else to add before we move on?

>> JOYCE WONG: Sorry, IRB is Institutional Review Board.

The jargon, somebody asked.

>> LOIS McCLOSKEY: I would like to touch on workforce training you touched on this from upstream and downstream levels. From each of your perspectives, what are the biggest needs right now and the biggest challenges? I will just open up that very broad question. To get the technology developed. To get it to the places and in the hands of people who are actually in the communities working closely with women. And yeah.

Who would like to start on that one? Tabinda, I see your hand. Please go ahead.

>> TABINDA SAROSH: Yeah, thank you. Thank you. I won't take a lot of time because I'm so deeply interested in what others also have to say. But health workforce is one area that, of course, my work, Pathfinders work has placed us closest to. We also know that 65% of all health workforce globally is actually women. So this is a lot of women serving other women for reproductive health. I think working with the health workforce, understanding where they are situate in the health system and supporting them is very important. Many countries I've worked in and I continue to work in, health workforce does not find a lot of support when it comes to training, when it comes to systems that motivate them. I remember that we did a study on provided bias towards young people on contraception in Tanzania, Pakistan. One greatest barriers were health systems themselves when it came to providing services to young people.

So I think training, mentorship is very important. One-off trainings are never going to work. But also, how do we take advantage of technology and connection. So for TA Connect we use WhatsApp which is just a smaller part of the bigger TA Connect, but it helped develop this connection and peer-to-peer, you know, education sessions or you know, coordination between the health workers. Especially in a conflict-ridden area where you actually had to have safe windows for traveling and commuting. So working with the health workforce is very important. Looking at their career trajectories.

I live in a country where community midwifes often do get their trainings but of after that are not able to find jobs to do the work they need to do. So building a clear career path is very important for them. It's important to have these kind of conversations as well. I'm sure my colleagues will talk about the upstream health workforce, which is needed at a more higher technological level. Thank you.

>> JANE HIRST: I completely agree, Tabinda. I think our experience working with community health workers are often, they are paid, you know, they are not regulated within the health system. They are often paid on incentives or not paid at all and just expected to do work. That's not a clear career structure

for them. If they do this training, does it necessarily give them an advantage to somebody who is not, maybe not. The one-off training is not effective for anyone. And I could say as a health worker, working in a high-income health system, e-learning one-off training is not effective to change behavior. People look at behavior change interventions know adult learning is far more complicated than that. We need to situate what we are learning, understand why we are doing it, have the resources and motivation to carry those things out.

I think understanding what's motivating health workers. I work with design engineered Imperial College, Rafael Calv sexual orientation, I like his approach, our innovations to technology and healthcare should always be making the jobs of people easier and better to do and people want to do them because they are such cool products people are like, oh wow, if I did this my job is suddenly easier. Oh great, I have to enter everything in the app and write it on the paper and put it in the birth registry. You have just given me another task which will take me more time. It's not thinking about it from the user's point of view and that of course when it comes to training, people don't engage with the training because they see it as another job they aren't being paid to do. Yeah, 100% hear what you are saying around supporting the health workers across those steps.

>> LOIS McCLOSKEY: And yet that takes yet another level of resources to keep that kind of support going. And to integrate it into the systems, as you're suggesting, Jane. So it's not just an app sitting over here that adds to the already app overload, already work overload.

So could anyone speak to that either successes or failures in trying to get enough resources for that continued support and training, ongoing training?

>> JANE HIRST: It's really hard. And I think this is where we need to think right back to the first steps of training. How could we regulate this into nursing schools, midwifery schools, community health worker training packages. So it has to be from the start, things have to go. Obviously you have a workplace in place. If you are going to introduce new things you have to think about how it will be sustained. But it hard. I can tell you a lot of the funders, short fundings in research, they want to develop and you put it out there and it's meant to change the world. That just doesn't happen. Particular funders are particularly gadget-focused. I'm concerned something you see in "New York times" tech bros are wanting to fund global health now. But it's very intervention focused. Oh we have smart people who can invent something clever and we will dump it on communities and it's on them to take it forward. Sorry, I'm probably veering of course.

>> LOIS McCLOSKEY: That is very on topic.

>> JANE HIRST: It concerns me quite a lot. The way things could go in the future and if we don't have the supportive supervision that is sort of embedded within the system, you know, we risk a graveyard of innovations being left behind that are not used and don't improve health.

>> LOIS McCLOSKEY: Yeah. Yeah.

>> JOYCE WONG: I'm so glad you brought that up, Jane. I think that's so important to recognize that is not the solution. But it gets headlines, right? So I think I also want to take this opportunity just to share with the audience here that, at least in our country, we are really under attack right now in terms of the number of graduate students, I don't know if people know this, they are actually decreasing even by half or more, just because of the funding at National Science Foundation, NIH is being cut. So I'm really worried about that. I know what to do is to vote in the midterms. I shouldn't get political, but, I don't know where else, if this is really the forum to say it. I hope I conveyed that it really takes a village and we need to train this next generation of scientists and engineers and healthcare and everybody. And I'm just really worried that we are not investing in that.

>> LOIS McCLOSKEY: Yeah, I mean, we are uninvesting, we could say, regressing in that regard. And it's a whole other level you spoke to, Joyce, this cross sectorial village, not just each silo on its own. Across disciplines but also cross levels of workers. Top and across. So all of that takes more ingenuity and more resources.

Yeah.

Sam, how about the hospital, or a place like BMC, in terms of training?

Your monitoring has the great advantage you talked about only requiring a cell network. The individuals don't have to have any fancy gadget or anything.

Has training been a challenge and workforce, it's really nurses in this case on the front line. Has that been a challenge, finding people to connect the monitoring to the women? To the pregnant people, postpartum people and also getting the referrals to happen?

>> SAMANTHA PARKER KELLEHER: Yeah. I would say maybe not so much the training but the support piece. That you know, this program generates an enormous amount of data because women are checking their blood pressure sometimes they are instructed to check it once a day. But sometimes they are nervous, they are concerned they are checking it multiple times a day, so it generates a lot of data into the portal that needs a full-time nurse staffed just to do this. I think, we were very lucky to

have the support of the department, the hospital, a clinician that really wanted to spearhead this and she did a lot of this on her own time. Really fighting for the staffing support to keep it going. Long term there are questions about sustainability. How long will the hospital be funding this? I know there's a big conversation right now about reimbursements for medical devices and remote monitoring devices. So that could really shift the landscape of remote monitoring programs here in the U.S. and maybe make them more accessible, if those become easily reimbursable. So I think, there's a lot of the economic health systems pieces that need to be in place to make this more successful across institutions. But we were kind of at this really nice point in time where we had a very invested clinician doing this in a department that was supporting it. But yeah, definitely support and resources, yes.

>> LOIS McCLOSKEY: Thank you for bringing up that policy piece, reimbursement piece.

It's not only important in the U.S., I think, the direct insurance reimbursement is especially important here. But how about in other contexts? What are some of the policy pieces you are making sure in place, policy or systems pieces to be sure are in place so that these are sustainable parts of improving maternal health?

>> JANE HIRST: This is really critical. There could be perverse for doctors to do too much intervention or somebody that is hard to access or expensive when you get there. The classic example in maternity is Caesarean sections. We get paid more to deliver a baby Caesarean section that takes 30 minutes instead of waiting around for hours for a baby to come out naturally. Operative deliveries are becoming more common. But this does happen when we look at task shifting and task sharing activities like what you have described, Samantha. You have the patient doing some of the work that maybe a health worker would have done or come to the hospital to get that done. And it may be hospitals are only paid when someone fronts out to get some treatment in care so the motivation and model is hard to show. We tried to do not a dissimilar thing to your program in gestational diabetes in England and we developed an app to help women monitor their diabetes at home. We were able to reduce the number of times people were coming to the clinic, everybody thought this is a good thing, the way maternity reimbursements work in the U.K. it's a block fee you get for maternity care, it doesn't matter if they come once or 20 times get the same amount of money, so it was hard to make an economic case but we are keeping them out of the clinic, isn't that great? Well we still have to pay the nurses and doctors, so not really. It can be quite challenging to have to work around these things. And I

guess we have to provide the evidence in academia to say we should shift some of these policies and it would be better for our patients and health workers as well.

>> LOIS McCLOSKEY: Thank you.

I'm going to take a couple more minutes for questions coming from me and our conversation. But I want to give the audience a chance to formulate your own questions, put them in the Q&A part in Zoom and we will get to you very shortly.

I guess we can't stop without addressing AI directly. I guess its inherent in some of the things you have described. So when you are thinking about it these days with all of the conversations going on in a political context, in a big tech context, what do you see as the promise of AI now for maternal health, especially when we are talking about those most at risk to suffer from preventable deaths and illness. And in promoting the development and scale up of technologies, what excites you and what worries you about where we are with AI right now?

Tabinda, I see shaking your head.

Or nodding, should say.

>> TABINDA SAROSH: Because I guess that was a question, you rightly said nobody can avoid in these times. I guess the biggest worry for us working with sensitive data in AI is the data. Respect for the privacy and confidentiality that always hovering over our heads. But definitely using AI has actually made many things accessible also to where people getting trainings, you know, are people who are doing mentorship themselves. So mentors and mentees both are taking advantage of that. So from there you could see that, in a way, that also addresses equity, especially when it comes to lower resource settings where people do not have access to knowledge and lots of resources AI is making that possible.

But at the same time, how to do it in a way, which is deeply humanistic.

But also very much conscious about preserving the integrity of data and privacy for client is very important. And that's the way we are going about it. But you're right, it is a part of lots of applications that we are using. Especially the GeoStar (?) project that I talked about.

>> LOIS McCLOSKEY: Yeah, thank you. Anyone else want to chime in on that one?

>> JANE HIRST: I'll just say, echoing the sort of risk of not just privacy of patient data but of bias being reinforced through training. You mentioned, Joyce, not having diverse samples but this goes into data even more. Genetic data and things, it's heavily biased toward Western European populations. So I think that's a big challenge. The other thing that worries me a little bit, sometimes when I go out and visit clinics in

the field, there are many places where they don't have any running water or electricity. And I honestly think is AI the solution here? Seriously is that what is going to lift this, or bring them up to the minimum standard that the rest of the world has sort of reached. I don't want to deny populations of access to these amazing new technologies but I think we also have to see them maybe within a sensible context. If you don't have electricity how is AI actually going to help you on the ground. Yeah, I think it should be taken with a bit of a grain of salt in that we need to see what the needs actually are for people on the ground. And where AI could close some of those gaps. I agree with what you are saying, Tabinda, knowledge gaps and things, huge potential. But let's make sure we do it in a safe and equitable way.

>> LOIS McCLOSKEY: Anyone else on that?

>> SAMANTHA PARKER KELLEHER: Maybe just one last thought on AI. I agree that, you know, it's wonderful to be able to use it to improve prediction and develop some of these technologies. But I think doing so, especially when we think about pregnancy and postpartum without compromising the importance of social connection in that time period.

One thing we saw in our interviews of our patients, the patients that were most engaged in the program were ones that had social support at home. It was either their mother staying with them or a sister saying, remember to check your blood pressure, that's really important.

So even when these technologies are present not doing so at the expense of the importance of human connection and social support that is so important in this period.

>> LOIS McCLOSKEY: Yeah. Thank you, Sam. You are bringing us back to that core principle that Jane started with, these are not replacements by any means, health system and delivery but also of human connection.

And that actually is going to be my last question, as I peruse questions from the group. I'm seeing lots of great comments. But no questions yet.

Though Erica, maybe you could point me towards some. But that is what I really wanted to ask, at the end of the day, how are we doing on assuring that these "Technologic solutions" aren't disrupting that connection but perhaps are enhancing it. And are there ways you are particularly introducing it in the field or building in components that ensure that human connection and trust, which we all know, whether it's in the U.S. or across the world, trust, I will say, especially in maternal healthcare settings, OB settings is a challenge. And has, in this country, you know, historic record of distrust, especially with communities, Black and Indigenous women and

pregnant people.

So address that while I peruse for other questions in our last minutes together.

Disrupt trust or enhance it? Or how can we ensure...

>> JANE HIRST: I can give an example, I mentioned the project which my students were doing the chatbot we had as part of our smart health project, what we did with co-design we filmed encounters where the community health workers were actually using the chatbot with real patients just to see how would they actually use it in an encounter. What does it actually look like? What we found, I'm ashamed to say, it was really disruptive and it didn't work very well in the encounters. If you could imagine we have all used ChatGPT and similar things. Imagine you could go and see your doctor and you say to your doctor, oh, is it safe for me to eat blue cheese in my pregnancy and the doctor says I'm not sure, is it safe to eat blue cheese in pregnancy, wait a few seconds, maybe 10-30 seconds and this whole big spiel of stuff comes back. Oh where do I go from there?

So it actually disrupted, we felt, the flow of the encounter between the health worker and the patient. And of course the most important thing with those community health workers is they have a high level of trust with the women in their community because they are part of the community. They are known in the community. They are very highly trusted.

So what we realized from that is perhaps we need to wind back slightly and think where is this best used? I guess where we sort of landed, it's probably better as an educational tool for people before or after they see people or, if they have questions themselves, they get sent a result, I need to see this patient because their ultrasound shows baby has no water around it, I don't even know what that means.

But during the encounter itself, it can actually be disruptive. You do have to look at that human-centered use case and how it's being used.

In terms of trust itself, this is a massive challenge for all of us in science, public health, COVID obviously brought that to the fore. We are still battling that. But I think through clear communication, good evidence, well-designed studies, bringing communities along with us, hopefully we can counter the harmful narrative which has emerged.

>> LOIS McCLOSKEY: Thank you.

>> TABINDA SAROSH: And Lois, I would love to say something here because I totally agree with Jane. I think we are still in very early stages of actually seeing what are going to be the facts, not just image but long-term effects of using AI which is probably not as well-educated for global scenarios. I think the

need is continue watching, observing, documenting, creating evidence and course correcting as we go.

Will we completely be able to remain isolated from AI or completely divorce from it? I know that probably not going to happen. But because the communities are going to be using it, but how do we design and educate AI to serve that purpose and how do we document evidence, I totally agree with Jane that's what we need to do. Right now it might be a bit early to answer that question.

>> LOIS McCLOSKEY: Yeah, it's a good reminder. There's two questions I'm seeing, at least for starters. We have five minutes left, so I want to get in the audience questions here. One is saying please comment on the challenges of implementation for new innovative approaches, some of which you have talked about already.

In my experience, this person says, there needs to be a champion who can really effect how much that innovation accepted.

That is something we haven't touched on. Perhaps you can say a word or two.

>> TABINDA SAROSH: I would love to start and then I'm sure others can add to that. But absolutely, it's a lot of challenge and it starts right from get-go, which is money, the finances, I think we talked about that and what gets financed. Especially when it comes to innovations that are related to women and women's bodies that women know better, right?

And actually, that one of the challenges that Pathfinders keeps seeing working with those who have great ideas but perhaps not the financing for it. That's the challenge. But also, what kind of materials, logistics are going to be needed? And are they going to work in the fields? Are they going to actually be practical for the field? So testing it in the field and the logistics and the language issues also. How to make that easier is very important as you are innovating. And one of the things I have to say is not taking a project approach to innovation is very important. If you think this is going to work, if it matches the health systems and the national priorities, if there's something that is doable and can go and fit into the health systems very easily, then it needs to be scaled up. It needs to go hand-in-hand. And building trust for the community and meeting the unmet demand. And unless you don't do all of that, as Jane says, it just becomes, we have a graveyard of innovations behind us and we might get another graveyard soon, so yes.

>> LOIS McCLOSKEY: Thank you, Tabinda. Dean Hyder, if it's okay, I will ask everyone to say one thing in response, it's a tough one. What advice do you have for early career individuals

trying to break into the maternal and women's health space? Especially given that funding cuts and less opportunities it would seem.

Top the head advice.

>> JANE HIRST: I give up, we need you. And like everything in life, if you are passionate and determined about something you will succeed. We all get knocked back. I have applied for many grants I haven't got but just keep trying.

>> TABINDA SAROSH: Absolutely, don't give up. And stay connected with each other, with us, you know. It's sometimes just knowing each other and being connected to each other can create a lot of visibility in what the paths could look like.

>> LOIS McCLOSKEY: Go ahead, Joyce.

>> JOYCE WONG: I would just add absolutely to not give up because we definitely need you to stay in it. I would just say that there's many, many groups of people that are working in this area and then also, especially if you are doing more basic science you could find a way. It may not directly be in women's health but supporting it in some way. So there are different ways how you could just kind of pivoting, I guess is one way. But there's a lot of foundations out there and ways to get it done. Yeah, I think if we all work together we can kind of effect change.

>> LOIS McCLOSKEY: Good and to wrap us up, Sam?

>> SAMANTHA PARKER KELLEHER: Agree with persistence and be involved with women's health and maternal health, I think it takes a lot of fields, some represented here but not all. So don't feel like you have to be a midwife or an obstetrician to impact maternal health. Could do it through engineering, data science, policy, law, economics.

>> JANE HIRST: Social sciences.

>> SAMANTHA PARKER KELLEHER: Yes, there's so many places where we all come together and it's a very collaborative group, so. Yes, we need everybody.

>> LOIS McCLOSKEY: Thank you. Wonderful way to end. Dean Hyder, over to you.

>> DEAN HYDER: Thank you very much. First Lois, thank you for moderating such an exciting discussion. You learned a lot myself. First thank you to Jane and Samantha, Tabinda and Joyce for coming together, bringing the power of this field. And the beauty I'm recognizing right now is that we have school of engineering, we have School of Public Health, we have Imperial College and the George institute and major governmental organization all coming together on this topic which is so critical and so important. That's one of the features of Boston university, we believe in convergence, to solve real world problems. The Boston University School of Public Health is so

privileged you spent this time with us. Thank you to everybody who joined not only our dear panelists who presented their knowledge and expertise but also to nearly 200 people, as I was watching the screen who joined this webinar today. Thank you for that. We look forward to having more of these conversations. And sometimes difficult conversations that are badly needed. Thank you, Lois, for moderating. I wish you the best in your work, all the best and looking forward to seeing you again in a future webinar. Thank you.

>> LOIS McCLOSKEY: Thank you, all. Bye-bye.

[End]