UNIVERSITY OF PITTSBURGH
CENTER FOR
Behavioral Health +
Smart Technology

Core Faculty Member Tamar Krishnamurti, PhD is an Assistant Professor of Medicine at the University of Pittsburgh and an Assistant Research Professor in Carnegie Mellon's Department of Engineering and Public Policy. With a diverse background in biological anthropology, psychology, business, and engineering, Dr. Krishnamurti's research now focuses on risk perception and communication, specifically within the field of maternal health.

The Center's Julia Holber had the opportunity to talk with Dr. Krishnamurti about her MyHealthyPregnancy app, new collaborations, and advice for healthcare providers when communicating risk.

Julia: Tell us about your background and training.
Tamar: I have a Bachelor of Science in Biological Anthropology and advanced degrees in Psychology and Behavioral Decision Research from the Social and Decision Sciences Department at Carnegie Mellon. Prior to being recruited to Pitt School of Medicine, my postdoc was in the Tepper School at CMU, and I was subsequently a research faculty there in the Department of Engineering and Public Policy, where I now hold a courtesy position.

Julia: How do all these fields actually intersect and contribute to your work?
Tamar: Behavioral decision research tries to identify the aspects of judgment and choice that influence an individual's decision making. To do that well, we have to have knowledge of human psychology. We have to understand the sociocultural context in which people are living. We have to learn about their constraints of time and knowledge and the social structures within which they're operating. For example, years ago I did work on adolescents' emergency contraception decision making. For this research, I needed to understand the cognitive capabilities of adolescents at various ages, the social influences on their beliefs and behaviors, the underlying mechanism by which emergency contraception actually works, and the regulatory and legal framework for emergency contraception provision. For me, any question we tackle that involves human behavior necessarily includes thinking about all these fields.

Julia: Like you mentioned, your research has focused on decision-making in health. What do you see as the biggest challenges in this area, and how do we overcome them?

Tamar: One of the current challenges is reconciling our interest in big data with our interest in having a more respectful and shared decision-making approach to healthcare delivery. These two things don't necessarily have to be at odds with each other, but they can be. I think academic medicine still operates in silos, so as much as we're interested in the work that each other are doing, it's still hard to translate scientific advances, especially in the big data algorithmic space, to actionable, respectful, personalized patient care space that takes into account people's individual values. We need to have incentive structures in place to conduct cross-disciplinary research that will allow us to look at the whole trajectory of the work we're doing.

Julia: Your current work focuses on maternal health. How did you become interested in this field?
Tamar: I became interested in maternal health quite a long time ago, actually. I took a gap year part way through college, and I travelled to India to work in a big, urban hospital and a rural clinic with obstetric patients. I've always been interested in sexual and reproductive health, but there's also a "me-search" part of my research. I started working on MyHealthyPregnancy after having my first child. My experience really highlighted to me the needs of good information and support during pregnancy.

**Julia: What about your experience inspired you to create this app?**
Tamar: Pregnancy is this time of great uncertainty. We're thrown into a huge responsibility without necessarily understanding all the experiences we're having. A lot of medical care is focused on problem solving when a crisis emerges, but there's much less time dedicated to reassurance and understanding the individuality of everybody's pregnancy journey. I wanted to be able to honor that in a scientifically rigorous way.

Julia: So, tell us a bit about the app. What does it aim to do?

Tamar: MyHealthyPregnancy is a mobile health platform that is viewed by patients and physicians. The app faces patients, and we developed a portal for physicians. It combines clinical data from big data sets with inputs that the pregnant woman enters into the app throughout the course of pregnancy, and it provides her with tailored risk messages and feedback on the normalcy of the progression of her pregnancy. It also links her to personalized resources, support, and education during pregnancy. The overarching goal is to minimize preterm birth risk, but because preterm birth risks are fairly rare, a lot of the focus of the app is on reassurance when no risk is detected.

Julia: Do you have any feedback? How do people like it?

Tamar: We've done pilot testing with the first prototype of the app, and we have really great feedback from debriefing and talking with patients about how they used it. Many felt it was a valuable form of social support. We also found that we're able to pick up on risks that were entered into the app that weren't detected at routine prenatal care appointments. Since that first prototype, we've been working on evolving the app and developing machine learning algorithms with models of prematurity so that we can really make the risk prediction we're embedding in the app more precise.
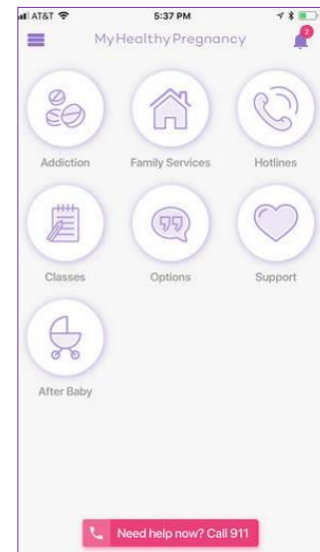
Julia: What other projects are you working on and excited about?

Tamar: I'm really looking forward to new collaborations I've been forming as part of the Pittsburgh Study, which is an Allegheny County-wide community-partnered intervention study aiming to increase access to care, personalized risk education, and social support for pregnant women. It will be following cohorts of infants and pregnant women over time to better understand and address social and biological determinants of health. There are many things that are special about this study, but one of the things I'm excited about is that it will be co-designed with community members. We're hoping to create scientifically rigorous research that's cognizant of and integrated with the needs of the community members that it needs to serve.

Julia: You are doing very important work to improve risk communication. What advice do you have for healthcare professionals for communicating risk to patients?

Tamar: There's a whole body of literature on health-risk communication, and I often wonder whether it trickles down into actual practice. A lot of the time, we think people are bad at understanding risk, and, in my experience, that's not necessarily true. Risk needs to be framed in a certain way. For example, there was a classic study conducted in the 70's by Dr. Sarah Lichtenstein in Oregon. She asked people to estimate the number of deaths in the United States from multiple different causes. People are pretty good at determining the relative risk- whether you're more likely to die from a car accident or botulism, for example. But they're not great at absolute risk. Healthcare professionals tend to communicate absolute risk, which I think is problematic. For example, I recently worked on a study led by a CMU grad student that looked at how physicians communicate prognostic information to patients. I can tell patients they have a 70% chance of dying in the next 3 years or 90% chance of dying in the next 5 years- these things are essentially the same, statistically. We found that people tend to weigh the time frame of their prognosis more heavily than the percentage. They think they'll live longer if you only give them the 5 year time frame, rather than the 3 year. This is a small bias that really changes people's perception. I'd advise healthcare professionals to understand a patient's perspective and to then let them unpack the risk information you're giving them. Give them multiple reference points and scenarios that are relevant. Providing more context and allowing an absolute risk to become more relative should help decrease this bias in how we as humans understand risk.