



## Headlines of the Future

A podcast by Bayer

Episode 2 – The New Health Awareness:

**Kate Hayes (host):** Welcome to Headlines of the Future, brought to you by Bayer.

Fascinating clues to help solve some of the most pressing global challenges from climate change to feeding a growing population to curing diseases can be found in science and innovation. I'm Kate Hayes. And I'm your host of the podcast, headlines of the future brought to you by Bayer. In this podcast, we get to hear from visionary scientists, thought leaders, and entrepreneurs to learn more about how the science of today may positively impact our lives in the future.

In this episode, we're going to be talking about the future of health or more specifically our own personal health awareness. The coronavirus pandemic has put both individual and collective health at the center of attention and has accelerated advances in digital healthcare in many ways. Is this new level of science-led self-care going to last and how will digitalization help us to take care of our personal health in the future?

I'm sure that the two experts joining us today will have interesting perspectives to share on these questions. First, ***Karen Hackney, External Innovation and Partnership Lead for the Consumer Health division of Bayer***, welcome to the program. And I'd also like to welcome ***Daniel Nathrath, co-founder and CEO of ADA Health***.

Thanks so much for being here.

**Daniel Nathrath:** Thanks for having me, Kate.

**Kate Hayes:** As we get started, I think it's always interesting to learn more about our guests' backgrounds and particularly what led you to a career in science. So, Daniel, you're a lawyer and an entrepreneur with a passion for technology and artificial intelligence or AI.

So tell us a little bit more about you. Were you always interested in science?

**Daniel Nathrath:** I think it's fair to say that I got more and more interested in science over the last 10 years since we started with Ada. My two co-founders are actually the scientists in our endeavor. One of them is a practicing medical doctor, pediatrician, and geneticist who worked in the NHS in the UK. She did her Ph.D. in neuroscience at Cambridge and my other co-founder is actually a grandson of a Nobel prize-winning physicist and seems to have science in his genes. He is a theoretical neuroscientist as well. I was basically meant to be the business guy in that founding trio. But I have got more and more and more interested over the last 10 years, and I pretend to be a scientist sometimes.

**Kate Hayes:** So can you tell us a little bit more about how this partnership came together to form Ada Health and what it is that Ada Health does?

**Daniel Nathrath:** We were introduced by mutual friends and former colleagues. I had some friends who work with me as far back as 20 years ago. And about 10 years later, they approached me and said, we've met these amazing scientists and they have this idea about reducing misdiagnosis in the world. We think it could be a good idea if someone could help them commercialize what they're developing. And I said, what do I have to do with it? Because up to that point, I had mostly worked in e-commerce. I also spent some years in strategy consulting and before that, I was a lawyer. So, you know, I never claimed to be a scientist, but then when I met my co-founders I was really fascinated but what they were telling me. I only understood maybe half of it, but that was probably a part of the appeal. We're still going 10 years later, which is probably longer than some marriages would last.

**Kate Hayes:** That is definitely true nowadays. So we're going to come back to this in just a few moments, but for the short term, can you just give us a brief description about what ADA Health does?

**Daniel Nathrath:** Ada Health today is a digital health platform that allows people to understand and manage their own health and basically puts a lot of medical knowledge at the fingertips of everyone who has access to any kind of smartphone. The way it works is pretty much as if you could have a 24-7 WhatsApp chat with your trusted family doctor. So if you wake up in the middle of the night and you have these weird symptoms and you don't know what it means, you can use our app and put your symptoms in there. And after a series of questions, which is very comparable to a family doctor taking the patient history, you get two main things. One is an idea of which condition might be causing your issues. The second thing you're getting is some advice on what to do next. This can range from, "no worries, it's most likely something that you can treat at home with over-the-counter drugs," for instance, or not taking anything, all the way up to "please go to the emergency room immediately."

And our technology helps to basically triage people to the right next step in the care journey. That's the product we have today. And I'm happy to tell you more about what we're working on toward the future.

**Kate Hayes:** Fantastic. Let's come back to that in just a minute. In the meantime, Karen, I'd like to know a little bit more about you and your background. So what was your path into a science career?

**Karen Hackney:** I'm a fully-fledged scientist. I'm a white lab coat type person. So I was fascinated by science, just from an early age. I'm supernaturally curious. And I think in science, you're just constantly learning. Like there are unlimited possibilities. It's about how do you find out answers?

And in the world of healthcare, everything is constantly developing. So as someone who loves learning, I think it was just really interesting for me. I studied medical microbiology at university,

so anything that was small, that caused diseases, was really interesting. And then, funnily enough, my Ph.D. was in Coronavirus. So very topical.

I've been working for Bayer since 2003 in all science-based roles - in medical and regulatory looking after pipelines. I'm super fascinated by this crossover with science and healthcare and it's a really interesting world to be in.

**Kate Hayes:** Absolutely. So I have to go back and ask, I mean, I, can't not ask about the Ph.D. in Coronavirus.

I know there are a lot of different types of Coronaviruses, but what exactly did that mean? What were you studying?

**Karen Hackney:** It was actually in chickens. I was studying immunology and virology; so how the immune system reacts to the virus and actually whilst in chickens, it's still a respiratory disease. It actually has a commercial impact because it caused them to lay soft-shelled eggs.

So if they caught Coronavirus, there was then a big impact on the amount of eggs that our chicken would produce. So there you go. But still very similar to today's Coronavirus in that they all belong to the same family.

**Kate Hayes:** Did you ever imagine the scale of global devastation that a Coronavirus could cause?

**Karen Hackney:** So I finished my Ph.D. in the early 2000s so I'd kind of ignored all that. And then when it kicked off last year, I went down into my cellar and dug out my Ph.D. from the shelves, and actually about the first 20 pages was about the role of Coronavirus and its impact on human health. So I hadn't even remembered that from 20 years earlier. Um, but no, by no means did it was ever thought to be a pandemic potential.

You know, we know about the common cold and Coronavirus. The power of hindsight was not there 20 years ago in my chicken studies.

**Kate Hayes:** I know that Bayer recently invested in Ada Health. So I'm wondering, were you instrumental in this partnership?

**Karen Hackney:** This was mostly led by what's known as LEAPS, which is our equity investment arm. We've got more involved from a division perspective and consumer health since the investment's been made, then we are working with them to look for a partnership, but in terms of digital health, you know, we really believe in a future where people are able to take increasing responsibility for their own everyday health. And we want to be able to partner with helping people take care of themselves. But as I said, we don't have the answers to everything.

And in fact, you know, consumers don't even want a one-stop-shop for their, either an individual solution or brand, to help them with all their wellness. So we really look to partner with the best and the brightest like Ada so we can bring both our strengths to Bayer for our consumers and get them better solutions.

**Kate Hayes:** So one more question for you, Karen. What do you think is driving this trend of people wanting to take more ownership of their personal health?

**Kate Hayes:** That's a big question, Kate, and I don't think what we're seeing is so much a trend as much as an evolution that probably kicked off when we first got access to the Internet and people suddenly gained access to practically all the information that's out there in the world.

And we all became aware of Dr. Google and it became, and still is commonplace to do a quick check of your symptoms, and get a whole wealth of information back relevant or otherwise to what you might have. I think before we started this recording, we were talking about wearable technologies and Daniel trying out one of the glucose monitors.

I think those coming mainstream took this to the next level by really giving people the ability to track a whole range of vital measurements anytime and all the time. So this really raises your consciousness of your everyday health. It's a constant physical reminder, either on your wrist or on your phone in your pocket.

It also gives you a sense of uniqueness. So people started to create personalization for their products because of the data out there. And then as you mentioned in your intro COVID, I think this is accelerated this beyond imagination, making people hyper-conscious of their everyday health condition and really wanting to take some control of it given so much is going on in the world that we can't take control over. Couple this with an even more virtual world, the coming of age with things like artificial intelligence, we have this incredible convergence of fulfilling, a massive consumer need in ways that were probably unimaginable just a few years ago.

Daniel, any thoughts from your side about individuals taking ownership of their personal?

**Daniel Nathrath:** I think the need has always been there. But technological developments have really enabled people to take this kind of ownership and people are probably not even actively thinking about it as taking ownership. But, if I think back to my own personal story when I was 16, which shows you how old I am, that was before I had access to the Internet or knew that it existed. I had a very unnecessary surgery because we just believed that this professor with white hair, you know, having the authority and being right. And then a few years later when I was in university, that was still, unfortunately, before I had access to the Internet, I went to the medical faculty and did a little bit of research myself and I realized that surgery shouldn't have been done anymore since the 1920s. So, I wish I had had the possibilities that you have nowadays, where you can kind of become an expert - to some extent - on your own condition. And I think Eric Topol, whom you've probably heard - professor of cardiology - based in La Jolla, whom I've known for years, he describes this very well in his book 'The patient will see you now' how like the proliferation of smartphones and Internet access really makes it so much easier for the patient to be more at eye level with the physician and be able to support the physician more in an ideal scenario for all these new possibilities.

You mentioned Dr. Google, that of course can be a great help. But it can also be overwhelming because you get hundreds and thousands of search results and you can't be very sure what you see at the top is actually the truth. So that's really what Ada tries to help; really structure on this information and kind of mimicking how a good doctor would collect the information to then support both the patient and the doctor and trying to get to the best solution.

We think there's a huge opportunity by combining this with not only sensors and wearables data, but also direct-to-consumer diagnostic tests, which are becoming much more accessible. We've seen this with people, partly for COVID, they're realizing I could do cell tests. I know for some things I don't really need to go to the doctor's office and wait weeks for an appointment. I can just test this myself. And then all the way up to possibly a full genome sequencing, which can be incredibly insightful, and the cost of which is continuously going down. We at Ada, we think there is a huge opportunity to empower consumers and patients much more even than they already are. By connecting the dots and putting all these different sources of health information together and computing them against each other and making that easily accessible and understandable for the patient.

**Karen Hackney:** Just to add Daniel and not to sound like quoting, but I was reading a Deloitte report about the future of health just the other week. And two facts struck me just from what you've

just said then. Last year, so 2020, 42% of US consumers used tools to measure their fitness and track their health care improvement.

And then what you said about at-home diagnostics, the same report said around a third to a half of consumers are comfortable using at-home diagnostics, whether this is blurred or genetics tests, for whatever reason. And if those that use these things, half of them actually share it with their doctors. So it's becoming super commonplace nowadays.

**Kate Hayes:** Using things like pedometers and I mean, I know they're digitalized now, but things that tell you how much water you've drank that day or how much you've walked that day. If you've had enough steps, those are examples of personalized health or taking ownership of your health?

**Karen Hackney:** If you do something with it - absolutely. So it's a lot of data. And I think that where some of these digital tools at the minute, people don't know the 'so what' behind them, and that's what's brilliant about Ada is that it gives you the 'so what' from what you put in, but the rest of these things that are trackers it then depends on what do you do with that information? So really useful if it's to do with a condition about sharing with your doctor. If it's more about healthcare/self-care if you're not doing enough steps in your day or enough exercise, or you're not drinking enough water, it's clearly down to yourself to have ownership and make a change there.

So it doesn't make you make the change, but it gives you information to understand if you maybe should do.

**Kate Hayes:** Yeah. Well, I think just that awareness is somewhat new compared to growing up in the 80s, I think back to the TV commercials that were constantly bombarding us. And there definitely wasn't an awareness about what was good for us to do or eat and what wasn't. So I think we're all kind of at least thinking about those things now. What are some other examples of how people today could take ownership of their health in a way similar to Daniel's example that might really prevent them from having an unnecessary treatment or help them find a treatment they really need and may not have otherwise?

**Daniel Nathrath:** So we see this even at Ada. So the app has been out there just four and a half years and has been downloaded over 11 million times. And we are at this stage, an app in the medical category, in the Google PlayStore, in the iOS app store with the most five-star ratings ever globally.

And every day, there are people who write into the review in the app store "this saved my life" or "this saved my child's life. We would not actually have thought it was serious, but this app told us to seek medical attention right away. And this is the only reason I'm even still able to write this review." So we see this really all the time. One other thing that we see, when it comes to rare diseases, as you know, these often take a very long time to get diagnosed. I think about seven years on average, or even longer. What we're seeing is that people say "I have a rare disease that took over 10 years. I've seen more than 40 doctors. Finally, last year I found the specialist who gave me my diagnosis. So I just wanted you to test your app. And now I'm sitting here crying because the app told me in five minutes, what I had been looking for over 10 years." So we have countless examples of that kind. And certainly, this is really just the beginning.

So when you mentioned steps, pedometer, and these things, I would say that's kind of version 0.7 of all of this. I basically started testing a lot more of this stuff for professional reasons as we are looking to integrate all these different data sources. Now I have a sleep mat under my mattress. I'm wearing all kinds of smartwatches, a ring that measures my vitals, also glucose monitoring. So where it gets really interesting is when you start understanding - and I need to get it explained to me because remember I'm not a scientist, but fortunately, I have a lot of them around me - when you start understanding how the different things are related. So you could have an example where because of your genetic makeup, you could have eight times higher risk of

developing certain diseases. It doesn't mean you definitely get it. But Ada would, in this case already have this as kind of the foundational data in your profile. And then it could recommend, for instance, you should do the earliest screening for this condition. Not like for the general population. Maybe you start at 50 years and you do it every five years, but in your case, you should start at 35, and every year you should do a little blood test to make sure things haven't gotten worse. And then you can recommend very tailored checks, screening, and possibly, steps towards addressing the issue. So I think this is really the key to it is making the data actionable and personalized. It's not just about collecting data that sits there and is siloed and people don't really know what to do with it. Our ambition is really to connect the dots and make sense of the data to create something like an early warning system for your health. That's really the ambition and making that accessible, ideally for free to everyone in the world, so that at some stage a billion people or more use that technology and it really changes the way people can access healthcare and understand their own health that is our ambition.

**Kate Hayes:** So Daniel, what is the patient experience when using Ada Health? Can you walk me through what it does? You know, what do you do when you download the app?

**Daniel Nathrath:** When you download the app, you do the usual thing. You have to register and tick a few boxes, of course, you know, all the usual, since we're based in Europe, specifically in Germany, you were very aware and it's a big topic for us to make sure that privacy and data protection rules are adhered to, which means you need to take a lot of boxes, GDPR, MDR, all these things. So you have to do that. And then it's really simple as I mentioned, I mean if you basically think if your family doctor was such a good friend of yours that you could wake her up at 4:00 AM in the morning, you can just start a WhatsApp chat and you'll get immediate responses.

And the next question is always dynamically computed. It's not a static decision tree. So based on the information you've given so far, then the next question, we'll try to narrow it down and get closer to the most accurate suggestions on what it might be. That's causing a problem. And what you should do to address it.

The whole process is basically just like, a WhatsApp chat, but it's with a bot. So the answers are immediate. It doesn't really take longer than five minutes. And then you will hopefully be able to make a much more informed decision on the next steps to take. That's the current user experience.

**Kate Hayes:** So on the backend what's happening with the app is based on other data? Artificial intelligence?

**Daniel Nathrath:** So we've hired over the last 10 years, hundreds of doctors, and then we basically trained them to become a medical programmer. As we call them, medical knowledge engineers, we've developed our own domain-specific language in which they codify a state-of-the-art, medical knowledge. And then behind that is a probabilistic reasoning engine that helps compute pieces of information. It's all proprietary software that we've developed. As I mentioned, it's really very strongly physician and scientist-led and we have a big medical safety team that's constantly making sure that patient safety and medical accuracy are at the top of the agenda.

**Kate Hayes:** So the more data you collect, does that mean the better the insights?

**Daniel Nathrath:** Yes. So that's a great question. So that's the other bit. So what I just described was really the way we built the system originally, which was a relatively hand-curated and really an expert-led approach. But of course, what we're then trying to do is to create as many feedback loops as possible, like a virtual cycle of feedback loops through which we continuously refine the system so that it becomes more and more and more accurate.

That's exactly what we're doing right now. Every two or three seconds, someone somewhere in the world is entering a new case in Ada. And we always try to find out if someone ended up seeing

the doctor afterward, what diagnosis did the doctor give the patient. So we can then sort of sharpen our medical knowledge base against that. Lab tests are an even better feedback loop because there is no human or less human, error involved in that. We think doctors are amazing, but it's a known fact that sometimes, they can be wrong.

**Karen Hackney:** Daniel, just to add on that one. I remember when we first started talking to you, you shared that data about how correct that your app is versus doctors. Can you talk a bit more through that? Because I remember at the time thinking this was good.

**Daniel Nathrath:** Yeah. So the key thing I should say beforehand is that it's never our ambition to replace the doctor in any way. Very much on the contrary. The idea is to help the patient make a more informed decision on next steps and then hand over that information to the doctor to then also support the doctor. That said the more accurate our solution is the better we can do that job. Right? So our ambition has to be at least as accurate as a human doctor would be that's fulfilling the same task. There are various studies out there. There was one that was published in the British Medical Journal some months ago where professors created 200 case vignettes and determined a gold standard diagnosis for those, and then ran them through various automated systems, people who are trying to do something similar to what Ada is doing, but also put them in front of seven practicing UK GPs.

**Kate Hayes:** And by GP do you mean general practitioners?

**Daniel Nathrath:** Oh yes. Sorry. In this case, actually, I should be transparent that the GP still came up a little bit ahead of ADA on the diagnostic accuracy. Then there was a huge drop-off between Ada and the other automated solutions though.

And in terms of medical safety, which means the triage advice, is it safe? Is it accurate on that metric? Ada was already on par with the doctors.

**Kate Hayes:** So, how do you think that these tools are going to change people's relationships with their doctors in the future? I know we've talked a bit about how it's starting to change right now, but Karen, what do you think you're going to see in the future?

**Karen Hackney:** I think it's important that the consumers will want to take more ownership of their everyday health. But as Daniel shared earlier, this doesn't mean it's about substituting for their doctor's care advice, but it really gives them more tools to both improve their own health, between doctor visits, but also to make the doctor visits more robust and have a complete interaction because they've got the bigger picture. But even then, you know, the information received, they have to then trust it's accurate as well, because we talked about Dr. Google, you can have apps that you hopefully trust like Ada Health, but you know, they need to really have a trust and credibility that the information they're receiving from whichever digital tool it is, helps them make a smart decision and then they can, if they need to choose products for their own health care that they're taking the right ones. And as we alluded to earlier, this can be really complicated and nerve-wracking for individuals.

I think no question, but they should really just think about trust and credibility and for us as 150 year old, company, we've been around a really long time. Credibility is super valuable for us. And we use that when we either develop our products or the partners we work with. So we really go above and beyond. So anything that we developed with the Bayer cross on or partners like working with Ada, we really make sure it's something people can trust. So I think back to your question, it would just be about enhanced doctor visits, but also definitely from our perspective in the consumer health world, thinking about wellness, not just about illness. How do you keep yourself in a better place or even anti-aging, etc., in between those doctor visits?

**Kate Hayes:** So I can tell you that I know that some of our medical health records in the US started to go online more than 13 years ago, when I worked in a hospital, yet all of my health

records are still not connected. The different doctor's offices or healthcare organizations aren't communicating. Do you see this happening at some point in the future? And then all of that information, being able to be integrated into an app like Ada?

**Daniel Nathrath:** Yes, I think it'll eventually happen. You're still, probably ahead in the US compared to Germany where a lot is still done, unfortunately, with pen and paper. Very often, data protection is kind of used as a pretend reason to stifle innovation I have to say. But there are examples if you look for instance, in Scandinavia, there are some private health systems where this is all already happening. In the US, we see it happening as well. We work with two of the most innovative health systems in the US and what we're seeing there is that Ada can really already help free doctors time.

One health system we're working with is Sutter Health in the Bay area, in California, where they've integrated our technology on their homepage and also in their app. And people are using it, especially outside of clinic hours to figure out if they really need to go see a doctor. If that is the outcome they can, at the end of the assessment, share the results of this pre-assessment with the doctor when they book their appointment.

And the doctor thereby already basically has a briefing before they even exchange the first call with the patient and this has the potential to save - what three to four minutes per appointment - which really adds up if you have 10 million patient appointments per year. If you could save a few minutes every single time, then the doctors can really focus more on what they will always be better at compared to a computer, which is showing empathy and really trying to understand even the nonverbal cues the patient is giving all these kinds of things. And of course, doctors love it when they can take this automated patient history, do a couple of confirmatory questions, or checks, and then they press a button and because all structured data, it goes into the documentation.

So in this direction, this is already happening. So from the patient side into the health record and what I foresee happening eventually is that this will also be possible in the other direction.

**Kate Hayes:** So Karen, if you look into the future, what excites you the most about the possibilities for digital tools transforming personal health? What headline would you like to read in 2050?

**Karen Hackney:** So I think I would go for 'Digital helps consumers to take ownership of their everyday health.'

**Kate Hayes:** 'Digital helps consumers take ownership of their every day.' Excellent. Yeah, that's a good one. That might be even sooner than 30 years from now. Maybe next year?

**Karen Hackney:** For me, we've been talking about true ownership of your everyday health and I'm not sure that that's there in the wider population right now - that people understand that they are the owners and accountable for their health. So as we continue to get even more technology and information into the general population's hands I think that's going to increase and given that self-care and everyday health is about living the healthiest, longest, most fulfilling life possible and digital tools. I really believe are going to help to make that happen. I think that's truly exciting for everybody to be healthy for as long as possible.

I think for Bayer and the future of digital tools, I think ultimately in the future it's really going to transform the ability of our science to develop better products, faster, and more tailored. We talked about personalization earlier. We're really just scratching the surface about what it means to inject so much data and information into our innovation engine.

So to be able to get feedback practically in real-time, as Daniel talked about, you know, every three or four seconds more information going in and insights are in real-time. I think that's super



exciting for us to develop both new products, but also for us to be able to talk to our consumers in a really meaningful way because we're going to have so many insights about what's going on.

**Kate Hayes:** That would be very cool. And Daniel, what about you? What headline would you like to read 30 years from now?

**Daniel Nathrath:** 'Average healthy lifespan extended by 10 years. Across the world. Using digital tools.'

**Kate Hayes:** Yeah. That would be great to see a report come out in 20 or 30 years that says that. And, across the board, not just for, you know, currently developed countries, but even in places that it's hard to get good healthcare right now.

**Daniel Nathrath:** Well, 30 from now, I'm not sure I would still be around to read that headline, but if I were, I would love to see that people's healthy lifespan has gone up significantly and that hopefully, digital tools, including those we develop at Ada will have played a significant role in that.

I think there is an inflection point and a huge opportunity to improve access to healthcare, especially for those who currently don't have great access. And I don't know if many people are aware of that, but this means billions of people around the world – and not only in low and middle-income countries - but even in the US and the UK and Germany, access to health care can be improved for parts of the population. To get there, I think we have to make it as easy as possible to use these tools. We have to develop them always with patient safety as a top priority and I'd rather take more time to develop a solution responsibly than sort of throw something out there and not have the medical accuracy and patient safety in mind. And I think there is such a great opportunity by bringing all the different sources of data together. That's really top of the agenda for us at this stage. And this will empower people both to make better decisions about when to use self-care versus seeing a doctor.

So all the way, like if I think of Bayer from using the vitamin supplements, which I successfully did a couple of weeks ago, it seemed to have helped me to, you know, when it gets really serious. And, I think having the underlying data and turning it into actionable insights and doing it in a way that is easily accessible, even if you're not a digital native. I think when we're at that stage, then we're going to see extremely widespread adoption. And then we're going to see a positive impact at scale for everyone. And that's our ambition. That's what we're working on. And, our friends at Bayer with the mission of Health for All, Hunger for None are very aligned with what we're trying to do at Ada. So I'm very excited about this part.

**Kate Hayes:** Excellent. Well, thank you so much for what you're doing and I can't imagine how many people will benefit from it. So that's really, really exciting.

I'd like to thank you both so much for this great conversation. I feel like I learned a lot. And I'd like to thank all of our listeners for tuning into Headlines of the Future. We hope you found our excursion into the world of new health awareness as exciting as I did. If you want to learn more about the science and innovations that help to address some of our most pressing global challenges you can visit [Bayer.com](https://www.bayer.com) Listen to our next episode and subscribe. And if you want to share the podcast with others or leave a rating and review. Thanks again for joining us. And we hope you'll tune in for the next episode.