

*Make Me Care About...*

Make Me Care About...Poop

Podcast episode one transcript

**Jen Hatmaker:** All right, listen. I never expected to spend my workday talking about or being fascinated by poop. All right? Come on, most times we're happy to just flush it away and be done with it. However, this conversation really taught me that there is a coming crisis around human waste everywhere and yes, even for you. All right, Shannon, you've got one sentence to Make Me Care About poop.

**Shannon Yee:** Great. Well, in the next several decades, everyone in the world will be confronted with the problem of having lack of access to safe and inclusive sanitation.

**Jen Hatmaker:** So Shannon, I want to care if that counts, but let's be honest, I also have a toilet that flushes everything away. So, can you help me understand how this is going to actually affect, well, literally all of us in the world?

**Shannon Yee:** Great. So this is an important problem because really, keeping people away from each other's poop is a cornerstone of living a healthy and productive life. Unfortunately, right now in the face of climate change, our aging infrastructure and dense urbanization really can't keep up with it. Our waste treatment plants are very expensive and we won't be able to afford replacing them. And lastly, about half the world's population, that's 3.6 billion people, don't have access to safely managed sanitation in their homes. And as a result, they're encountering diarrheal diseases that really should not be a problem.

**Jen Hatmaker:** Created in partnership with the Bill & Melinda Gates Foundation, this is Make Me Care About. I'm Jen Hatmaker, and with me is Dr. Shannon Yee, professor of mechanical engineering at Georgia Tech. And today, Shannon is helping us care about poop. Hi, Shannon.

**Shannon Yee:** Hello, thank you for having me.

**Jen Hatmaker:** Now, let's start here. Why have we never heard of this being such a major global issue if it is something that could affect us in our lifetime wherever we live?

**Shannon Yee:** Well, I think the short answer is we just don't like talking about poop. Right?

**Jen Hatmaker:** True.

**Shannon Yee:** We always just want to flush and forget about it. It's not a conversation we want to have over the dinner table.

**Jen Hatmaker:** So let me ask you this question, because this seems like for the average person, that like here in America, for example, it's working.

**Shannon Yee:** Right.

**Jen Hatmaker:** Our toilets are working, the system's working, it's been kind of the same way our whole lifetimes. And so, why is it that our existing toilet systems, as they are, are not sustainable?

**Shannon Yee:** I would argue, our toilet systems have never been sustainable.

**Jen Hatmaker:** Okay.

**Shannon Yee:** We use a copious amount of water, clean water, to flush waste away to a centralized treatment facility. It accounts for about 25% of your household water consumption. Taking clean water, mixing it with waste is a terrible use of that resource. And it's been that way ever since the advent of the flush toilet. We've gotten a little bit better. Right? The first flush toilet that I'm aware of used about 7.5 gallons to flush. We're now down to about 1.9 gallons of water. So, we've been using the same unsustainable technology for well over 150 years.

**Jen Hatmaker:** Right. When you say it that way, that makes perfect sense. That is not a good use of our water.

**Shannon Yee:** Right.

**Jen Hatmaker:** So, when do you say that most of us here in the US are going to start experiencing the effects of this problem?

**Shannon Yee:** I would actually say many people are already experiencing the effects of climate change and the strain it puts on our sanitation infrastructure. For example, whenever we have a major hurricane like Hurricane Ida that swept from Louisiana all the way up to New York City, we saw flooding in our streets. That flooding in our streets whenever that water is there, it's coupled with a sewage. So we just don't think about that water being actual raw sewage that can cause people to become sick. This is true whenever we have any major thunderstorm that is coupled with a release of sewage into our rivers, streams, and streets.

**Jen Hatmaker:** You mentioned this earlier briefly, but can you parse out for us what exactly climate change has to do with the issue of modern sanitation?

**Shannon Yee:** With climate change, we are seeing an increased frequency of what are oftenly considered rare events. Think of this as either floods or droughts.

**Jen Hatmaker:** Sure.

**Shannon Yee:** Right? Our centralized sanitation systems, our sewage treatment plants are placed at low points because water flows downhill. And during a flooding event, those centralized plants become flooded first and so we have raw sewage that is released into the environment. We also have the problem in drought scenarios. When we don't have access to water and we flush so much water down the drain, that presents another problem. So the short answer is our infrastructure is not set up to be able to deal with some of these extreme climate change weather events.

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**Jen Hatmaker:** All right. Let me just speak for the common people. It's gross to have poop in the streets. This is agreed upon. But can you explain a little bit more about why it's more than gross, it's actually life-threatening?

**Shannon Yee:** Oral fecal transmission is probably one of our leading causes of disease transmission. How we keep people away from their poop is a cornerstone of our society. And if we can't do that in a sustainable and effective way, we'll have a lot more disease and health problems. So, it's all about really keeping people away from poop.

**Jen Hatmaker:** What are the primary kind of diseases and health risks that this poses?

**Shannon Yee:** You actually don't think a lot about the different diarrheal diseases that you could have. Just think back to the last time you experienced food poisoning. We don't even have to go to the extreme of like cholera or something like that which we don't even worry about so much because of our modern sanitation systems. But diarrhea diseases are a reality for a large portion of the world's population.

**Jen Hatmaker:** So this is not sustainable, but globally, who currently faces the problem of lack of access to modern sanitation at all?

**Shannon Yee:** Well, the poorest of the poor suffer the most. Infrastructure for safely managed sanitation is expensive and the poorest of the poor will have equity issues getting access to that modern sanitation.

**Jen Hatmaker:** This is Make Me Care About. I'm Jen Hatmaker and with me is Dr. Shannon Yee, professor of mechanical engineering at Georgia Tech. And today, Shannon is helping us understand not just why sanitation systems are important, but why we should care. So Shannon, this is a problem we all either already face or will, what's the solution?

**Shannon Yee:** So essentially, we need to move our centralized sanitation system, our sewers, away from a centralized point where we distribute waste to these treatment facilities. And instead, we need to treat that waste at the source. We need to start treating your poop in your house. So we need to create technologies. These are referred to as reinvented toilets that can do what a sewage treatment plant does but in something that's the footprint of your washing machine. So if you think about appliances in your home, a dishwasher or a washing machine, appliances clean things, right? Your dishwasher washes dishes, your washing machine washes clothes. What we need is an appliance in the bathroom that treats your waste.

**Jen Hatmaker:** Is this technology in process?

**Shannon Yee:** Most certainly. This is one of the most exciting things. The Bill & Melinda Gates Foundation, I think was one of the first to realize the pivotal need that sanitation plays in lifting people out of poverty. And a little over a decade ago, the Reinvent the Toilet Challenge was launched in order to create this sanitation technology. So over the last 10 years, there's been a lot of great work done coming up with new processes, new technologies to do this. And over the last three years, we've really been bringing the teams together in a global collaboration to turn this infrastructure into an appliance.

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And we're now at the point where we're testing these single toilets in people's homes around the world that treat waste right there on site.

**Jen Hatmaker:** Wow. Just a major, major change across the globe. Can you describe these new toilets for us?

**Shannon Yee:** Yeah. The toilet itself is just another piece of ceramic and it looks like a regular toilet. Now, what happens is on the backside that the user doesn't see, that's where all the magic occurs. So the backend of these toilets looks like a box, just like a washing machine or a dishwasher. It's just an appliance box. Inside this box, there are different modules that process waste in different ways. In one case, we have a module that makes these pathogen-free cakes, and those cakes are kind of like dried leaves. They don't smell anymore, they're pathogen-free, they're just a little compostable leaves. In another case, we actually produce ash and that just comes out like you would have ash from a campfire from your fireplace. The back end of the toilet for both of these cases looks exactly the same. It operates in the exact same way. It's just there are different modules that are inside this unit that produce different products.

**Jen Hatmaker:** So obviously, this is going to be a massive water savings, and saving water is nice and it is important. But what does hand washing look like in these new bathrooms of the future?

**Shannon Yee:** Yup. Hand washing is so incredibly essential to being able to, well prevent oral fecal transmission. These bathrooms of the future, you really don't need to think about the water that you're using. We still want people to flush toilets. You can still wash your hands. We just want to treat all that water on site, not reliant on centralized treatment facilities. So just like you have a cell phone, which is a distributed communication tool so we no longer have to connect via telephone lines and just like we have solar cells that you can put on your house and have distributed electricity generation, we really need to move sanitation off grid and treat waste at your home.

**Jen Hatmaker:** That's a great example. When you put it like that, it seals possible. I mean, there was a time where we would've thought, "How can we speak to each other if not through a line buried under the ground connecting our houses?" But here we are. It is possible. So let's get down to brass tacks.

**Shannon Yee:** Okay.

**Jen Hatmaker:** How much will these new toilets cost?

**Shannon Yee:** For the overall cost, what we're targeting on the design is about \$450 for the entire unit. Now, that's a very aggressive target. We may not get there. But to put it in perspective, cost parity right now for some of the most sustainable sanitation toilets available are about \$15,000 per toilet. We readily expect that we can get below 5,000, possibly even below \$1,000 per reinvented toilet. We're just not there yet. And a lot really depends on the business model and the business plan to get it out to the rest of the world.

**Jen Hatmaker:** The good news is, we're deep in the bag here on innovation. In your opinion, how close are we to actually having these toilets in our home? Because this is a pretty big overhaul.

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**Shannon Yee:** It is a huge overhaul. And right now, we already have toilets in our homes so we have to transform a current market sector. Right now, we have built a number of prototypes that work and treat waste in your home, but those prototypes need to get through scaled manufacturing. A competent manufacturer should be able to get a business plan, a market together, and being able to sell toilets in about three years. And it may take an additional year or two to become profitable after that. But it really comes down to taking that next courageous step and going through a design for manufacturing, industrialization, and really bringing the prototype technology to a product.

**Jen Hatmaker:** Now, as a poop expert, which is I'm sure where you always dream to speak, do you know where the term crap comes from? Did we invent that?

**Shannon Yee:** That's a really great question. So by some accounts, the term, "I need to take a crap" is associated with a gentleman by the name of Thomas Crapper who popularized the flush toilet. So by one account with the logo of Crapper and Company, people would say when they needed to go to use the toilet, "I need to go take a crap" in honor of Thomas Crapper. So more recently, it has been said, given that my last name is Yee, that when you need to take a pee, people may start saying they need to go take a yee.

**Jen Hatmaker:** Ah, how lovely, how wonderful. There's your legacy-

**Shannon Yee:** That's great.

**Jen Hatmaker:** ... right there.

**Shannon Yee:** Exactly.

**Jen Hatmaker:** Be so excited about that. Thank you, Shannon. I learned more about poop today than I expected to when I woke up this morning.

**Shannon Yee:** There you go. My pleasure.

**Jen Hatmaker:** So fascinating. And it's just so funny because I think, "You know what, Jen, here are probably the top four, five things scientists are working on right now to create a more sustainable earth. And then along comes Shannon and teaches me something I didn't even know to worry about. And not only is he teaching me about it, he's already coming up with solutions. And so now, I know about poop and sanitation and I have a really interesting talking point from my next party.

To learn more about Shannon's work, please check out the show notes. And if you liked this episode, follow this show and share it with a friend. Make Me Care About is produced by Jesse Baker and Eric Nuzum of Magnificent Noise. Our production staff includes Sabrina Farhi, Hiwote Getaneh, Julia Natt, and Kristin Muller. Our executive producer is Eric Nuzum, and I'm the host, Jen Hatmaker.