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| Diana | Hi, I'm Diana. |
| Paul | And I'm Paul. |
| Diana | And we've been married for about 13 years. Our journey began 12 years ago after trying to conceive for a year without assistance. We were referred to a fertility clinic where we endured vigorous testing and were devastated with the diagnosis of PCOS and cryptozoospermia. |
| Paul | But that didn't stop us. We had high hopes that IVF treatments would help us grow our family. I endured my first varicocele removal surgery about 10 years ago which was unfortunately not successful. Our fertility doctor informed us that with such low semen parameters, IUI and even conventional IVF wouldn't work for us. Instead we were advised to pursue a then novel way of fertilizing eggs, intracytoplasmic sperm injection, also known as ICSI fertilization. However due to antiquated BMI restrictions at our local clinic, Diana was not allowed to move forward with an egg retrieval. They explained that the anesthesia team did not perform these services on larger bodies. That, we believe, is one of the many ways the clinic artificially inflated their success rates. If we wanted to move forward with an IVF at our local clinic, Diana had to lose weight first. |
| Diana | Spoiler alert, it took me nearly 10 years to finally lose enough weight to qualify for treatment in our hometown, which resulted in wasting a decade of my fertility. Once we were finally able to access the care that would hopefully help us grow our family, we were warned that I likely had bad egg quality due to my age, which was 39 at the time. After enduring 10 rounds of IVF and countless tests over the past three years, we now better understand that our greatest obstacle all along was not my weight, my age, or my egg quality. |
| Paul | Our biggest obstacle has always been my sperm which had gone ignored by almost every fertility doctor we worked with. More specifically, our biggest impediment was the very high level of DNA fragmentation present in my sperm, something that we discovered after our own research and had to strongly advocate for and convince our REI to even test for. This is why after multiple failed rounds of IVF I decided to move forward with another varicocele removal surgery to help overcome our DNA fragmentation issues. This time with a reproductive urologist who successfully improved all our semen parameters and as a result improved our final IVF outcomes. |
| Diana | Over the past three years we have researched and tried everything related to improving our fertility, including losing 100 lbs, trying experimental treatments such as different protocols, fresh embryo transfers, reproductive immunology, acupuncture, red light therapy, ovarian PRP, uterine PRP, and so much more. We have worked with multiple clinics, traveling out of state for the best care for our unique needs. In fact we record this audio from a tiny studio apartment in Manhattan as we work with the clinic in New York City. |
| Paul | We've retrieved 100 eggs from Diana's ovaries through 10 extremely brutal egg retrievals. We have 47 embryos which resulted in 10 blastocysts that were genetically tested. Six of those are frozen in time just like Han Solo, ready and waiting to be transferred into Diana's uterus. |
| Diana | Throughout this expedition, we have learned so much about the fertility industry, the insurance industry, and each other. |
| Paul | The biggest and toughest lesson that we have learned while immersing ourselves in the world of fertility treatments is that efforts do not equal outcomes. |

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| Diana | Still we publicly share everything that we have learned so that others may learn from our mistakes. |
| Paul | More importantly, we share our story so that others suffering through infertility will know that they are not alone. |
| Anonymous | When I turned 38, I decided to have a child on my own. I'm a single lady, I had just gotten out of a pretty serious relationship and didn't really want there to be the pressure of a baby hanging over another. So I went in for a consultation to find out what was going on with my body. Turns out I had pretty good follicle count. I went pretty quickly and found a donor. In the meantime, I did my own genetic carrier screening and I found out I was a carrier for two rare diseases. And he, the donor I selected, had only been screened for one of them. One of them was not included on most screens. So he actually ended up going back to the sperm bank with those results which was great. So this was an anonymous donor, although we did do open ID. So my daughter, spoiler alert, can reach out when she turns 18. So that decision is up to her to reach out if she wants. |
| | So I had one round of IUI which was unmedicated. And then that didn't work. I was pretty disappointed and just didn't want to wait any longer, just given the amount of time that went between each cycle. Of course it's every month, kind of aligning with your menstrual cycle. I went to IVF right after that. And at the beginning of that second attempt, I got COVID and my follicle count was really terrible when we went to check at the middle of the month. And so we waited for another month, which was like that's eight weeks then from the start. I did about two weeks of shots and I had one not so fun episode where I had to go on a Sunday to a city nearby, I didn't have a car at the time and had to take a bus and a train and had very sore ovaries and was super swollen and feeling awful. But I had to get one more Gonal-F pen for I think it was the quarter of the remaining dose that I needed for that night. And then I did my trigger the next week, two days later, which was also nerve wracking. |
| | So after that I got about 20 mature eggs. We used ICSI and I eventually ended up with a fair number of embryos that were PGT normal. I had two that were abnormal that were discarded and a couple that just didn't make it. So I let the embryologist decide which embryo to implant because I didn't want to get the sex of the embryos revealed. I did not want to make that choice. And I wanted to keep as much of it kind of normal as possible. That this totally bizarre journey to have my daughter, I guess it's not bizarre but it was just different than what I expected. So we did a frozen embryo transfer in November and I found out I was pregnant right after Thanksgiving and I had her last August. So I have my beautiful baby and I have several embryos on ice. |
| TPWKY | (This Podcast Will Kill You intro theme) |
| Erin Welsh | Thank you again everyone so, so much for sharing your stories with us. It really means so much. And Erin and I have been talking about this sort of off the air and just about how appreciative we are and how amazing it is to get to learn this wide range of experiences and feelings that people have about this and how grateful we are that we get to share these with other people as well. So thank you. |
| Erin Allmann Updyke | Yeah. I think we maybe all have an idea of what we think IVF might be like. And so many of us have absolutely no idea. And it's so different for so many of you. So thank you all so much for taking the time to write in, to record your stories, and to be willing to share such a difficult and vulnerable time with so many people. We really appreciate it. |
| Erin Welsh | Yes. Well said. Hi, I'm Erin Welsh. |

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| Erin Allmann Updyke | And I'm Erin Allmann Updyke. |
| Erin Welsh | And this is This Podcast Will Kill You. |
| Erin Allmann Updyke | We're coming to you with our third of three episodes on IVF. |
| Erin Welsh | Yeah. Yes. If you have not listened to the first two episodes, you should go listen to them, you should go check those out. |
| Erin Allmann Updyke | You probably should. |
| Erin Welsh | But just for a little bit of context in case you're like I'll do that later, after this. |
| Erin Allmann Updyke | Yeah. Afterwards. |
| Erin Welsh | Yeah, afterwards. This is what you could expect to find in episodes one and two. Episode one, we were primarily focused on infertility, sort of the concept of infertility and how it has changed over space and time and how we evaluate infertility today in a biomedical setting. |
| Erin Allmann Updyke | Yeah. And then our second episode was focused really on IVF. How did we do it? How did people come up with IVF? What kind of science was required for us to be able to make that happen? And what are the steps of IVF today? - |
| Erin Welsh | And then- |
| Erin Allmann Updyke | We get to today's episode. |
| Erin Welsh | Today's episode is sort of a very... I would say a very surface level overview of the current landscape of IVF. Technology- |
| Erin Allmann Updyke | I thought you were going to say a surface level deep dive just to be contrary. |
| Erin Welsh | I do feel like that is like our shtick. |
| Erin Allmann Updyke | It really is. |
| Erin Welsh | Yeah, yeah. This is mostly about like from innovation to industry essentially, how IVF has become the thing that it is today and then also where it might go in the future. |
| Erin Allmann Updyke | Yeah, yeah. But before we get into all of that- |
| Erin Welsh | Yes. |
| Erin Allmann Updyke | It's still quarantini time. |
| Erin Welsh | It is. And it's still the same quarantini as our first two episodes. |
| Erin Allmann Updyke | It's A Work of Art. |

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| Erin Welsh | It is. And if you would like to get the full recipe for the quarantini and non alcoholic placeborita, A Work of Art, you should check out our social media channels, we've got it posted there. Check out our website, we've got them posted there. Also on our website, lots of cool, great stuff. Transcripts, we've got links to merch, links to Bookshop where you can find all of the book club books as well as the books that we reference for all of our episodes. You can find Goodreads lists, you can find Patreon, lots of things. I know I'm forgetting stuff but you know what? |
| Erin Allmann Updyke | You did a great job. Check it out. |
| Erin Welsh | Thanks. |
| Erin Allmann Updyke | Thispodcastwillkillyou.com. |
| Erin Welsh | Let's get started. |
| Erin Allmann Updyke | Let's. |
| Erin Welsh | Okay, okay. |
| Erin Allmann Updyke | Please, Erin, tell me about this global landscape because oof, I have some ideas about it but I don't really know. |
| Erin Welsh | Yeah, that's sort of how I ended up. So we'll see the journey that I took to get there right after this break. |
| TPWKY | (transition theme) |
| Melissa | Hi, my name is Melissa. I'm 41 years old and my fertility journey started 10 years ago. My husband and I tried to conceive for two years without success before being referred to a fertility clinic. We spent the next year undergoing various tests to determine possible causes for our inability to get pregnant. We found out that we both have fertility issues. Our physician recommended that we try intrauterine insemination to improve our chances. We tried several rounds of IUI and were finally successful with the birth of our daughter in 2018. In 2022 we decided to try again, so we went back to our fertility clinic. We tried two unsuccessful rounds of IUI and then moved on to IVF as by this time I was nearing 40. We underwent our first egg retrieval process last summer. |
| | To say that I was unprepared for the difficulties of undergoing IVF was a huge understatement. To prepare for the retrieval, I had to inject myself with fertility meds multiple times a day. I had to do several internal ultrasounds so the clinic could monitor the growth of my eggs. On the day of the retrieval I was so hopeful but again, totally unprepared for the experience of the procedure. I was given pain medication but the process of piercing through my vaginal wall to aspirate the eggs from my ovaries was excruciating. The retrieval resulted in four embryos which were frozen and sent for PGT-A testing but only a single embryo came back as viable for transfer. |

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| | So I began the process for embryo transfer which involved daily intramuscular injections of progesterone in oil. I had a reaction to the oil and ended up with painful, red hot lumps on both of my thighs. We transferred the embryo but unfortunately it didn't survive. I was devastated. Our doctor had us try again, this time with a huge increase in medication dosage. I went through the awful process of injections, ultrasounds, and egg retrieval yet again. And this time we got six embryos. We were so hopeful that it would work this time. Unfortunately none of the embryos were viable so we couldn't transfer any of them. We were told that my eggs are too damaged and we shouldn't try to do any further retrievals. Our best hope now is to buy eggs from a donor egg bank with the hope that we might get a healthy embryo that has at least my husband's DNA. This journey of IVF has been an emotional roller coaster. I've been heartbroken again and again. And now we are left unsure if we will ever have another child. |
| Sarah | Hi, I'm Sarah and our journey to having children was a complicated one. My husband and I began trying to fall pregnant shortly after marriage. After nearly 18 months with no conception, we went to the GP for preconception testing and discovered that my husband had azoospermia. Viewed in conjunction with deranged hormone levels, the GP recommended follow up genetic screening. So two months later we received the results that he had 47 XXY Klinefelter syndrome, a condition that often results in infertility. We were then referred to a fertility clinic where we decided to try testicular sperm aspiration to see if they could find any viable immature sperm. None were found. We now knew a sperm donor would be required as the only treatment option for non obstructive azoospermic male factor infertility. |
| | In Australia, organic donation has to be altruistic so finding local sperm is very difficult. Our specialist suggested we look at known donors, specifically a family donor. We decided to approach my husband's brother as a potential donor and we're very grateful that he agreed. A known donor pathway is significantly different to a purchased sperm pathway and required further genetic screening of myself, the donation and freezing of the donor sample, mandatory counseling to ensure all parties were aware of the legalities and potential emotional mine fields of the situation, and a six month cooling off period post-donation which served for testing of the donated sample and allowed for change of mind of the donor. After those six long months we were ready to finally begin treatment. |
| | As is the case with all male factor infertility, after that sperm aspiration procedure all further surgeries, medication, and treatment was for the carrying parent. Our first collection cycle and fresh embryo transfer was unsuccessful with no additional embryos to freeze. Our second collection cycle and fresh embryo transfer was also unsuccessful, however had also produce two embryos to freeze. Here we took a break for a few months before returning for a frozen embryo transfer which was thankfully successful and resulted in our gorgeous baby girl. 12 months after her birth, we returned to the fertility clinic to transfer the remaining frozen embryo. Whilst it felt strange trying to get pregnant again when it felt like we still had a little baby, the knowledge of how hard the fertility treatment was meant I wanted to rip off the Band-Aid, complete the last treatment cycle, and know with certainty what our family would look like. |
| | We repeated the same successful frozen transfer protocol which was again successful and this time we had a beautiful baby boy. We're 20 months between the kids so we're deep in the two under two club and extremely grateful for the treatment options that we had been able to utilize to have our family. Seven months after having our son, we heard from the clinic asking us about the remainder of our frozen donated sperm. This is when we decided our family was complete and we would discard the remaining samples and close the door on our fertility journey. Fertility treatment is emotionally, physically, and financially taxing and we're very thankful to have come out the other side with our two gorgeous little kids. We are acutely aware that not everyone walks away from fertility treatment having had a child. |
| TPWKY | (transition theme) |

Erin Welsh

Last week I left off sometime in the 1980s after the number of IVF clinics began to grow rapidly, leading to technological improvements, wider applications, and questions about regulation, about access, and about the ethics surrounding this technology. Any new technological advancement is going to carry with it ethical considerations, especially those that are widely used and that have a great deal of impact or potential. And what often happens is that these technologies and their applications develop faster than our regulation of them or even our ability to know how we feel about them. What do we think about them? IVF is no exception. IVF is an incredibly powerful technology that has enabled millions of people around the world to fulfill their dreams of having children. I mean think about that. It is truly amazing.

Erin Allmann Updyke

It is incredible. Like it is so cool and incredible.

Erin Welsh

Yes. It absolutely, this is not hyperbole, revolutionized reproductive technology around the globe. Like before IVF, after IVF. Very clear line. And so of course a technology as powerful as IVF will carry with itx substantial ethical implications and questions of regulation. Just as we're still working out the kinks of IVF technology, we're still figuring out how to best regulate this industry and how to protect everyone involved and where the future might take us. And today I want to go through some of the ethical considerations or questions of regulation of IVF that have emerged over the history of this technology.

I'm not going to present pros and cons, I'm not going to make value judgments. I just want to touch on a few areas, not all of the areas, not comprehensively, because I think that this story in general, the regulatory landscape of IVF is an important... It's a necessary part of the story or history of IVF and its future. This is a really complex topic with so much nuance and we're not ethicists or policy experts or anything in IVF. We're just going to try our best like we always do. And I'm going to focus primarily on the regulation, access, and innovation side of things.

If you live in the US, I'm sure you've come across recent headlines about the Alabama Supreme Court ruling in February of this year that frozen embryos can be considered children in that state. The short term and long term implications of this ruling are not yet clear and I'm sure that in the next few months leading up to the election, we'll see more discussion about this and about the other ways that political groups and religious organizations are trying and sometimes succeeding to push an agenda ultimately aimed at controlling people's bodies and choices. Banning IVF is just one part of this wider movement to reaffirm gender roles, restrict access to healthcare, reinforce cycles of poverty, and control people's bodies. And it feels truly dystopian to be watching this unfold and gain traction. Like I both can't believe but also sadly can believe that it's happening right in front of us.

But today we're not going to debate when life begins or what should or shouldn't be considered a child and be granted personhood or even what an embryo is because there are actually many definitions of embryo that vary globally. And we're not going to debate these things because first, you can't really debate what comes down to essentially fundamental disagreements over closely held beliefs. Like I believe to my core that abortion is healthcare and that IVF should not be banned. I cannot imagine entertaining any argument trying to convince me otherwise. And secondly, in the rest of the world, discussions of the ethics of IVF have moved beyond the question of whether or not IVF should be done and onto how it should be done. And so that's what I'm going to touch on today.

But first let's go back to the early years of IVF to see how it grew, with a special emphasis on the US because that will get us to the current landscape of IVF. The early 1980s established that IVF seemed here to stay. And by the end of the decade, nearly 200 clinics offered IVF in the US and an estimated 30,000 women in the US had sought pregnancy using IVF. By the end of the 1980s.

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| Erin Allmann Updyke | Thank you. |
| Erin Welsh | Yep. |
| Erin Allmann Updyke | I was like wait, wait, wait. What year again? |
| Erin Welsh | But attempts to develop clear federal regulation for IVF fell short. Other countries had come up with licensing bodies to regulate research and treatment with committees consisting of people with varying backgrounds and expertise. And the US tried this but didn't get as far as formalizing the committee's recommendations even when there was consensus. And in the meantime, the IVF industry in the US continued to grow. There were those guidelines from the Society for Assisted Reproductive Technology that I mentioned last week but no requirement to follow them. As of the late 1980s, any licensed physician could open an IVF clinic. You didn't have to be a board certified reproductive endocrinologist or even an OB/GYN. And this showed in the range of live birth rates in clinics. More established clinics with highly experienced reproductive endocrinologists reported rates of 20%, more than double the national average of 9%, and 21% of all clinics in the US in 1988 did not have a single live birth. |
| Erin Allmann Updyke | Wow. |
| Erin Welsh | Yeah. And that isn't to say that 21% of all clinics were terrible and just like exploiting people and taking their money but that perhaps the entire field might benefit from best practice guidelines that would protect the interests and health of everyone involved, from practitioners to patients. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | The calls for more regulation both then and now didn't just come from the outside, like people working on the outside of IVF, but also those who were most intimately involved in this work. In the 1980s, IVF practitioners knew that this booming field could be severely harmed by just a handful of physicians who saw IVF as an opportunity to exploit rather than help. Without guidelines, the field could grow increasingly market driven with private clinics competing for clients by doctoring their numbers or not being fully transparent about their rates of live birth. Ultimately it was fear of exploitation along with a scandal that helped to inspire the first major piece of regulation for IVF in the US. Even though Cecil Jacobson, the physician at the heart of the scandal, did not offer IVF, he did defraud many people at his reproductive health practice and also used his own sperm to impregnate patients, saying it was anonymous donation. He was one of those, yeah. |
| Erin Allmann Updyke | Is this the one that that podcast is about? |
| Erin Welsh | The Retrievals? |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | No, The Retrievals is something else. |
| Erin Allmann Updyke | Oh sorry. Wow. Okay. |
| Erin Welsh | Yeah, yeah. There's more than one. |

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| Erin Allmann Updyke | More than one. Okay, great. |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | Very, very great. |
| Erin Welsh | It's wonderful. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | And Cecil Jacobson was sentenced to five years in prison. |
| Erin Allmann Updyke | Five years. Okay. Yep, yep. |
| Erin Welsh | He also did some other really horrible things to some of his patients, I won't even get into it. But just give him a google. But finally in 1992 the Fertility Clinic Success Rate and Certification Act was passed, largely in the name of consumer protection to require that clinics be transparent about their procedure success rates. So this is straight from the CDC website. This act quote "mandates that clinics performing ART annually provide data for all procedures performed to the Centers for Disease Control and Prevention and sets forth definitions and reporting requirements. CDC is required to use these data to report and publish clinic-specific success rates and certification of embryo laboratories." End quote. So what I'm not sure about is how those rates or which of those rates are communicated to IVF clients. Is it a clinic-wide average? Does it include people experiencing infertility or people who seek IVF for other reasons? Is it across all ages? How much of it is influenced by the decision tree to use IVF? Like depending on the person seeking treatment, some clinics may jump straight to IVF while others may explore less expensive, less involved options first. Yeah. |
| Erin Allmann Updyke | I don't have answers to that. But the CDC does have a really awesome interactive way that you can look up all of the clinics in your area like by zip code. And so you can at least see some of the rates and they have a lot of disclaimers on there about what it accounts for and what it doesn't account for and all of that kind of stuff. So yeah. |
| Erin Welsh | Yeah. It's definitely like yeah, I think that is a really important tool to have. |
| Erin Allmann Updyke | Yeah. To get started at least. |
| Erin Welsh | Yeah. And I think it sometimes can put the onus of research on the person who is doing this and that's challenging. And also I don't know, as someone who has never sought IVF, I don't know how easy or difficult or like how different clinics interact with you. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | So yeah. |
| Erin Allmann Updyke | Well and I'm sure it's all going to also vary like which one, if any, take your insurance. |
| Erin Welsh | Oh yeah. |
| Erin Allmann Updyke | How much does your insurance cover? How much does this one cost vs that one cost? It's all just a huge web. And you just are stuck in it. |

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| Erin Welsh | And you're just stuck in it. And then there's egg freezing which is a totally separate procedure that I think more recently at least we have gotten better numbers on. But in the beginning it was sort of like here's this hypothetical scenario that we're going to do. And a lot of these egg freezing programs were started by people who didn't have necessarily backgrounds in medicine or reproductive medicine. And I'm sure that as you'll talk about, we have a better grasp on what egg freezing looks like but it can also be measured in many, many, many different ways. So it's complicated. And then the other thing about this act is that there aren't clear consequences for the clinics that don't participate in reporting to the CDC. 90% do in the US. And the bottom line is that this is still a market-driven enterprise, estimated at $5.34 billion in the US in 2024. |
| Erin Allmann Updyke | Just in the US? |
| Erin Welsh | Just in the US, yeah. |
| Erin Allmann Updyke | Ooh boy. |
| Erin Welsh | Yeah. And so I think what it comes down to for a lot of people is that opportunities exist for clinics to massage their results to stand out from the competition because of the way that a lot of this is market driven. But it is untrue that IVF in the US is completely unregulated wild west. In some ways there are stricter reporting requirements for IVF than there are for other medical procedures in the US who don't have to report success rates. Granted it is less regulated than in other countries, especially those that have national healthcare systems. But legislation does exist. And it's not just the 1992 act that helps to protect consumers, some US states have accreditation and inspection laws and then there's also the US legal system which allows patients to sue clinics and doctors for medical malpractice. |
| | But litigation is reactive and so it still allows for the potential for exploitation or abuse within fertility clinics. Instances of doctors using their own sperm to impregnate clients without their knowledge or consent, not providing adequate care during procedures or ignoring pain. So that podcast, The Retrievals by Serial, tells the story of how women underwent these painful surgical procedures at an IVF clinic where a nurse had swapped out fentanyl for saline solution. But no one believed that the women were actually experiencing pain. They were like no, this is normal amount of pain. But really they were undergoing procedures that normally they would be- |
| Erin Allmann Updyke | Without any pain control. |
| Erin Welsh | Yeah. Yeah. I haven't listened to it but it sounds rage-inducing and well done. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | Or some clinics will not properly inform of risks involved and it also leaves open things like extreme deviation from the standard of medical care, such as when a doctor transferred 12 embryos into a woman named Natalie Suleman, resulting in the world's first surviving octuplets. Octomom as we all probably remember. |
| Erin Allmann Updyke | Octomom. |

Erin Welsh

That doctor's license was later revoked. But again, how do we better protect against misuse or abuse from the outset? I don't know. The added regulation and threat of litigation did not dampen enthusiasm for IVF in the US during the rest of the 1990s and into the 2000s. From the book 'Pursuit of Parenthood', quote: "Between 1999-2015, the volume of treatment in America's fertility centers measured by the number of egg retrieval cycles went up more than 2.5 times to nearly 232,000 retrieval cycles, about 80% of them with the intent to achieve a pregnancy and the rest for the purpose of freezing and banking the resulting embryos for future use. Just under 61,000 women gave birth after being treated that year," in 2015, "for an overall take home baby rate of about 33%, up from about 25% in 1999." End quote.

And patient makeup at these clinics was also changing with more single women and same sex couples using IVF as well as an increase in traditional and gestational surrogacy, egg donation, and so on. These trends were not happening just in the US but also globally. And they have led to continued discussion and heated debate over how to best regulate some IVF practices. And so here's where I want to move more generally into the global landscape of IVF to touch on some of the questions that have been raised about practices within IVF beyond consumer protection and clinic transparency.

Laws about things like surrogacy, egg and sperm donation, IVF for single parents or same sex couples, age cutoffs, these laws vary globally which has led to people traveling to other countries to seek fertility treatment called cross border reproductive care or fertility tourism. The US for instance is one of a handful of countries where paid or commercial surrogacy is legal. India used to be a very popular destination for surrogacy due to its lower cost but they have since banned foreign couples seeking surrogacy. Other countries permit only altruistic surrogacy where the cost of medical care and other pregnancy related expenses are covered but no additional fees. And in some countries surrogacy of any kind is illegal.

This variation in surrogacy laws reflects discussions around whether paid surrogacy always carries with it the risk of exploitation; whether the transactional nature of paid surrogacy better protects both commissioning parents and surrogate by more clearly outlying expectations, how to deal with the fact that pregnancy is inherently risk-laden and can be especially so with IVF if multiple embryos implant, or what to do when the unexpected happens, commissioning couples divorcing during the surrogacy pregnancy, pregnancy loss, health issues developing during pregnancy or as a result of pregnancy, people changing their mind midway. There was one case where a genetic scan revealed that one of the fetuses that a surrogate was carrying had trisomy 21, Down syndrome, and the commissioning couple only adopted the twin without the condition. Then that led to a lot of other issues. It was like a long, really long drawn out process.

Erin Allmann Updyke

Wow.

Erin Welsh

But this in general is a very complicated topic as is the commodification of sperm, eggs, and embryos. Similar to gestational surrogacy or traditional surrogacy, countries have varying laws regarding sperm and egg donation or sale. And this is another reason that people travel across borders for reproductive care. And then there's anonymous donation, as in is there still such a thing as anonymity with the advent of ancestry testing?

Erin Allmann Updyke

Yeah.

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| Erin Welsh | Yeah. Discussion has also arisen over the use of frozen eggs, sperm, or fertilized eggs after a couple splits or if someone dies. In situations where there is no written documentation indicating the wishes of the deceased, how should posthumous reproduction be allowed to proceed? Or should it? I came across one high profile case where a couple died in a car accident and their two sets of parents engaged the services of a gestational carrier to carry their grandchild from frozen embryos from the deceased couple. So four years after the couple had died, their baby was born. |
| Erin Allmann Updyke | Wow. |
| Erin Welsh | Yeah. There are a lot of stories similar to that. |
| Erin Allmann Updyke | Okay. |
| Erin Welsh | Frozen sperm, frozen eggs, commissioning a gestational carrier. |
| Erin Allmann Updyke | Yeah, yeah. |
| Erin Welsh | Yeah. Yeah. And then finally recent technological advancements like gene editing where people can select for sex or other advertised quote unquote like "designer babies". These have also raised questions along the lines of just because we can, does that mean we should? It's still very early days when it comes to the practical application of gene editing technologies such as CRISPR to human embryos but it is in our future. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | Quite possibly our very near future. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | And many people have called for discussion and regulations now to start drawing lines between what is considered acceptable use of this technology and what could be considered misuse. Beyond how IVF is done or how the practice is regulated is the question of access. I've already talked about how most stories featuring IVF tend to have a quote unquote "happy ending" resulting in a baby. And stories where IVF didn't work out aren't highlighted as much. But even more silenced are the stories where people can't seek out IVF due to economic, insurance, or geographic reasons or reasons pertaining to their identity, whether that's marital status, sexual orientation, age, etc, sometimes referred to as socially infertile. The WHO and the CDC, among other organizations around the world, classify infertility as a disability. |
| | But in the US, insurance companies are not required in all states to cover or offer coverage for IVF. Some clinics offer IVF lotteries where people can enter to win a free cycle. And of course lack of access to IVF disproportionately impacts people of color and poor people. To quote American sociologist, law professor, and social justice advocate Dorothy Roberts, quote: "The people in the United States most likely to be infertile are poor, black, and poorly educated. Most couples who use IVF and other high tech procedures are white, highly educated, and affluent." End quote. This problem of access extends globally with resource-poor countries tending to have lowest access to assisted reproductive technologies like IVF. Laws and regulations that limit or remove reproductive rights, whether that's access to contraceptives, abortion, fertility treatments, without exception have a disproportionate impact on the poor and disadvantaged. We may not know what's going to happen in the future but that much we do know. |

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| Erin Allmann Updyke | Right. That has been clear for a very long time. |
| Erin Welsh | That is established. |
| Erin Allmann Updyke | We haven't fixed that problem yet. |
| Erin Welsh | It is still in existence in perpetuity. Yes. But IVF, the history, the regulation, the technology, it's such a hugely, vastly complex topic and may become even more so in the coming decades with the incorporation of new technologies. Figuring out how to regulate a constantly evolving technology is challenging but essential. IVF holds so much potential. It has given so many people the children they have always wanted and it has helped to expand our definition of what constitutes a family in a really beautiful way. And it also forces us to examine our feelings about what the limits of this technology are or what they should be in the future. |
| | And it's okay to not know how you feel about all these different aspects of IVF, like posthumous reproduction or gene editing, it's complex stuff. And if it were easy to come to a consensus or like know that this is the dividing line, then we would have already done that at this point, like at least country to country. Instead what we can do I think is some self reflection. We can listen, we can learn, and we can ask questions. And so I'll end with a question. Erin, what can you tell us about the potential future of IVF? |
| Erin Allmann Updyke | Oh I can tell you a little bit and maybe a lot right after this break. |
| TPWKY | (transition theme) |
| Madeline Kronfeld | Hi, my name is Madeline Kronfeld. My story is about egg retrieval and freezing because that's what I'm in the middle of doing. When I turned 38 in August 2023, I found myself in a situation that I didn't expect. I was single with no prospects of a partner and desperately wanting to be a mother one day. I've always wanted children and I've always been in long term relationships, so I just assumed it would happen. I was married and divorced before I turned 30 and then in a years long relationship after that that I thought was going to lead to marriage and kids. When it didn't, and after the death of my mom in May 2023, I decided that I had to take matters into my own hands and start the egg freezing process. Given my age and test results, it's expected that I need to do 3-4 cycles to freeze the 25-30 eggs that the fertility clinic recommends. |
| | At more than $15,000 per cycle, this would have been entirely cost prohibitive when I was younger. Of course I would have had more eggs at that point so maybe only one or two cycles. But even at a time when I'm more equipped to afford a large portion of this on my own, it's incredibly draining on my bank account and my emotions. So far I've done two egg retrievals, one in February 2024 and the second very recently in April 2024. Between those I have seven frozen eggs. I'm happy to have any but I'm also really disappointed that I don't have more. So I've been on this insane rollercoaster of emotions which is not helped by the extra hormones coursing through me. I plan on doing one more round and then I'll reassess things with my doctor. |

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| | What's getting me through it is knowing that I'm actually doing something, even if I never need to use these frozen eggs or I do and it doesn't actually result in a viable pregnancy. I know that I'm privileged in the sense that I have an incredible support system of family and friends around me, I have the savings to afford it because my insurance doesn't cover any of this, I have the flexibility with my schedule to do it, and I live in Northern Virginia which is a big metro area where there are excellent fertility resources. I feel really strongly that IVF, IUI, egg freezing, and any other fertility treatments are really empowering whether you do it with a partner or on your own. Right now I'm doing it on my own and I really hope that one day I have a child. Again, whether it's from one of these frozen eggs or naturally. But I can't wait to tell them how much I wanted them in my life. |
| Mallory | Hi, my name is Mallory and I'm gonna share my experience with IVF. My husband and I started trying to get pregnant after a year of marriage. We thought it would be easy, we were both young, healthy. Fast forward two years and we had tried natural conception, we had tried Clomid and finally IUI, all without a pregnancy. So we started our first round of IVF. I injected myself with a cocktail of hormones to stimulate my ovaries and got to experience all the fun side effects. Weight gain, bruising, bloating, headaches, massive mood swings. I had blood work and vaginal ultrasounds routinely and was finally told to give myself the last injection of hCG to stimulate my ovaries to ovulate. The next morning I went under anesthesia for the egg retrieval. However I woke up to my husband telling me it didn't work, we had to repeat the injection and the procedure again in two days. |
| | The second time they were able to retrieve about 20 eggs from my ovaries. But after the second procedure, I kept feeling worse and worse. I had severe nausea, vomiting, lack of appetite, abdominal tenderness, and bloating to the point I looked six months pregnant. When I finally couldn't take a deep breath, I went to the ER. I was diagnosed with ovarian hyperstimulation syndrome, an exaggerated response in the ovaries that caused swelling and leakage in of the blood vessels into the abdominal cavity. They drained about 3 liters off my abdominal cavity at the bedside, spent the night in the hospital because that promptly tanked my blood pressure, and then went home with a drain the next day to keep removing fluid over the next week. |
| | Two months later we did have frozen embryos implanted. I gave myself progesterone injections into my buttock every day for 12 weeks. And thankfully our daughter was born healthy without complications. Two years later, after using our last chromosomally normal embryo, my son was born. I found IVF to be incredibly difficult, physically, mentally, and emotionally. I wish fertility and the possibilities of infertility had been discussed more when I was younger and I had been better prepared. I'm a healthcare provider in women's health and I feel there's been a massive shift in awareness and perception of infertility. The rise of women finding platforms to vocalize their experiences with IVF and infertility has had major effects. I applaud the spread of information and the empowering and cathartic nature of women sharing their stories and forming communities. |
| | But I see women almost daily who are terrified that they're infertile and won't have children because of what they've seen or heard. I think it's so important to provide accurate, honest information. None of us have a crystal ball to see what the future of our fertility holds. And while there are some tests that can give insight into general reproductive health, the fact of the matter is for most people, we never know how easy or hard it will be to get pregnant until we start trying. |
| TPWKY | (transition theme) |
| Erin Allmann Updyke | So let's start with how many babies are born via IVF, shall we? |

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| Erin Welsh | Yeah, yeah. |
| Erin Allmann Updyke | In 2024, most papers that I read, most figures, say that the total number of humans that have been born as a result of IVF like total globally is 10 million people. |
| Erin Welsh | That's amazing. |
| Erin Allmann Updyke | I know. Isn't that incredible? |
| Erin Welsh | Yeah. Wow. |
| Erin Allmann Updyke | We had people who wrote in who were quote unquote "test tube babies". |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | That's what they called themselves. And that's incredible. It still absolutely blows my mind that this is possible. It is so fascinating and everything that we went through in the last episode about all of the steps that had to happen for us to be able to have IVF be a reality. And now that it is becoming something that for a lot of people though, as we'll talk about, not for everyone but for a lot of people is an attainable possibility. Like it's incredible we've come so far. In 2022 globally it was estimated that... Well globally it was reported that over 750,000 babies were born just in 2022. |
| Erin Welsh | Wow. |
| Erin Allmann Updyke | And that is to the kind of global registry of all places that report out their figures and their numbers. But just like in the US, it's not required and so it's thought that this is an underestimate. So it's possible that the real number was possibly closer to a million is what the paper that I read said. |
| Erin Welsh | Okay. |
| Erin Allmann Updyke | That's a huge number of people every year. Wow. |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | What I will also say is that this is from a reported 3 million ART cycles each year. 3 million cycles of IVF or IVF with ICSI to get 750,000 babies. So when you think about what so many people have had to go through, when you have heard so many of these firsthand accounts and so many more of you who wrote in, a lot of these ART cycles are often required before there is a baby. |
| Erin Welsh | Right. |
| Erin Allmann Updyke | So this is a massively huge industry like you kind of highlighted, Erin. And these numbers, this 750,000 babies, these 3 million ART cycles, they're not split in an equal fashion. We see that in the US and we see that globally. On a small scale here in the US, in 2018 ART accounted for... I'm not calling it ART today, I was calling it 'art' last time. Feeling a little spicy. ART accounted for 0.4% of babies that were born in Puerto Rico and 5% of babies born in Massachusetts in the US. |

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| Erin Welsh | Wow. Okay. |
| Erin Allmann Updyke | That's like the biggest scale that we see. |
| Erin Welsh | That is quite a range, yeah. |
| Erin Allmann Updyke | It's illustrative. Globally half of all people who have infertility or who are dealing with difficulty conceiving or infertility don't even gain access to medical treatment. And in many cases, people are seeking care for years before they can actually get access. That's true in the US, that's true in Europe. But this is especially true in low and middle income countries. And like you mentioned, Erin, race and ethnicity are hugely impactful in terms of who has access to infertility services, both because of systemic disparities in economics and access to healthcare but also because of the biases of our healthcare system and the burdens of the infertility treatment process itself. And on top of that social stigmatization or distrust of the medical establishment. Like there's a lot of layers of barriers to good infertility treatment especially for marginalized communities in the US and globally. But we have come an incredibly long way in terms of the technology itself. And so I want to kind of focus on what some of those advancements have been both for the good and for the how do we do this going forward? |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | And what's interesting I think in going through and reading all of this about how has IVF changed since the early days, some of the hugest advances in IVF in recent decades are now so commonplace that they're actually just part of the IVF process that I described last episode. |
| Erin Welsh | Right. |
| Erin Allmann Updyke | So they wouldn't even be considered like ooh this brand new, super exciting, on the edge thing. It's like no, that's just how we do IVF now. |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | But I want to highlight them because there were incredible advancements in the last few decades. ICSI is one of them. And that again is intracytoplasmic sperm injection, allowing for one single sperm to fertilize one single egg like via a tiny needle. This has allowed for successful IVF in the face of very severe male factor infertility which was not possible before this. That's major. We talked last episode about blastocyst stage implantation, that is growing the embryo or whatever you want to call it until it gets to day five where it becomes that blastocyst, that wasn't the norm before. And this not only allows for more successful implantation but it also allows for the testing of embryos because there's enough cells there to be able to take some to be able to test. This has allowed for a variety of genetic testing methods which I want to spend a little bit of time on because some of them are still a lot more controversial than I realized. And some of them are just amazing for people living with certain genetic conditions. |

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| | But I also just want to mention single embryo transfer as kind of like a novel occurrence. And this is possible today in part because of the things that I just mentioned, ICSI, blastocyst transfer, being able to do genetic testing, which has increased the success rates of each cycle of IVF. But single embryo transfer also substantially decreases the risks to both the person carrying the pregnancy and the fetus. So that has also been a pretty huge technological advancement. And then there are a whole bunch more. And you mentioned, Erin, how as a marketplace-driven phenomenon part of what IVF clinics have to do is get clients. And so a lot of them will offer a range of add-ons that they recommend or offer to patients that could potentially help their chances of having a live birth. And this is not just true in the US, this is across the globe. |
| | But the big thing that I learned about a lot of these add on procedures is that many of them have little to no evidence that they're actually going to improve the chances of having a live birth. And in some cases they could even be harmful. So I want to go into what some of those are and kind of like break down some of the data on what things are really potentially helpful and what things are maybe just still in the stage of research and yet they're already being used in practice. So this includes things like assisted hatching. I don't know if you came across that, Erin. |
| Erin Welsh | No, I did not. |
| Erin Allmann Updyke | When I came across this I was like wow, I've never felt more like a chicken. |
| Erin Welsh | Hatching? Okay. |
| Erin Allmann Updyke | Assisted hatching. This has not great evidence from what I can tell, it's a little bit unclear. Maybe it works. The data seems poor on all sides whether it supports it or whether it's not beneficial. But basically what it is is it's using a laser or something to drill a little bit into this blastocyst prior to implantation because in order for implantation to happen, the blastocyst has to kind of break out of what's called the zona pellucida in order to implant in the uterus. So it's basically like making a little crack in that to hopefully improve the chances of implantation. |
| Erin Welsh | Assisted hatching. |
| Erin Allmann Updyke | Assisted hatching. It is what it sounds like. There's not great evidence for it though. |
| Erin Welsh | Okay. |
| Erin Allmann Updyke | So it's one of those where perhaps in certain situations if you've had a lot of failed implantations or something like that, could it be beneficial? Maybe. But I think, and this is true for a lot of these potential add-ons, is that if they're offered as just a suite of items, I can imagine if you are someone who has tried so many different things, of course you're going to try anything that someone says could be beneficial. |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | And so I think that's where these things can become really problematic if they're not well regulated. |
| Erin Welsh | Okay. So I have a question about assisted hatching. |
| Erin Allmann Updyke | Okay. |

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| Erin Welsh | You said that there's not good evidence. Is there evidence in one direction or another or is it just so context dependent? Like is there a trend toward assisted hatching potentially decrease rates of success? |
| Erin Allmann Updyke | It's a good question. I read a Cochrane Review about it which basically said that the quality of data that we have is so poor that you can't come to any conclusion one way or the other. |
| Erin Welsh | Okay. I see. But given the fact that it's sold as an add-on where it's like maybe- |
| Erin Allmann Updyke | Yeah. Maybe it's going to help you but yeah. |
| Erin Welsh | How much is it? And in the US do insurance companies cover this? |
| Erin Allmann Updyke | It's such a good question, Erin. I didn't even look into the numbers of prices on this because it varies so much like state to state, country to country, insurance to insurance. I would guess that anything beyond like a quote unquote "standard cycle" of IVF is probably not covered by most insurances but I don't know for sure because I didn't look it up. |
| Erin Welsh | Okay. |
| Erin Allmann Updyke | Yeah. And there's more things too. There's certain special culture media that some facilities might use that they call it sometimes embryo glue that supposedly makes the embryo more likely to implant. Not a lot of data for anything like that. There's something called endometrial scratching which is exactly what it sounds like, scratching the endometrium to try and help implantation. |
| Erin Welsh | Okay, okay. |
| Erin Allmann Updyke | There's not any substantial amount of evidence that that is going to increase live birth rates. Then there are things that the evidence is a little bit more specific and nuanced. So that's things like elective freeze only cycles. That would be rather than trying to do a cycle of IVF where you implant the embryo right after that five days, you freeze all of the embryos and then you plan for a cycle later. This doesn't seem to increase the chance of a live birth. That is not what the data shows. But it can decrease the risk of ovarian hyperstimulation syndrome. So it's kind of a trade off. And then we get into preimplantation genetic testing as a part of IVF. And I want to spend a little bit of time here because it's become a huge part of the IVF process. |
| Erin Welsh | Before we do this, real quick can I just ask a question about these add-ons? |
| Erin Allmann Updyke | Yeah. Yeah, please. There's also more, like there were so many more that I found. |
| Erin Welsh | Yeah. So I guess is there a certain point or threshold of evidence or something when an add-on becomes part of the procedure? And then how are "take home baby" rates unquote reported based on add-ons? Like can you do that for a clinic where you say okay, well what is this add on? How does that change the rate vs... |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | Are those things communicated clearly? |

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| Erin Allmann Updyke | These are good questions. |
| Erin Welsh | Yeah. I guess, yeah. |
| Erin Allmann Updyke | I don't have an answer to those questions. They're very good questions. I relied, when I'm looking these things up to see like what's the data on X, Y, and Z, full disclosure, I used a lot of up to date to get sources but then I also was looking at Cochrane Reviews to see because they do a lot of looking at all of the data that exists and what's the quality of the data. So there is IVF that's being done on the regular through these clinics and then there's IVF that is still being done at teaching institutions and academic institutions where they're collecting data for research on these things. |
| Erin Welsh | Right. |
| Erin Allmann Updyke | So that is where the data is going to come from to then determine is this new or novel technology going to become a part of standard practice. Right now all of those things that I mentioned, with the exception of preimplantation testing which we'll get into more detail on, but all of those other ones that I mentioned are not part of a standard IVF procedure. So that is why they're considered as add-ons. And again there are more. One source that I found that was very helpful especially as like a patient-facing resource was actually out of the UK. And it's a website, I'll link to it on our website. But it had really great pictorial graphics of all of the different types of add-ons and what the evidence was, whether it was evidence that it could be helpful, whether it was evidence that could be harmful, or whether there just wasn't really good evidence for it one way or the other. And it had a green or a red or a question mark or whatever. So that was a really helpful resource and some of them you click on it and it'll say well in this particular scenario, it could be beneficial, wherein all of these other situations we just don't have any evidence for it. |
| Erin Welsh | Right. I mean and it's a really interesting thing but because like you said, if you've tried this before or you desperately want this to work, then it seems like okay, yeah, you would try anything that you possibly could if you could afford to do so. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | And then it is really interesting because even if we don't have good data now, in the future we hopefully will have better data to be like oh this shouldn't be an add-on, this should be part of standard practice. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | Or this doesn't do anything. |
| Erin Allmann Updyke | Exactly, exactly. |
| Erin Welsh | It just takes time to get to those things. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | It's just still so complicated. |

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| Erin Allmann Updyke | It is because you're living through a time where things are changing so rapidly that we don't have all of the answers. And that is true for preimplantation testing. So preimplantation genetic testing, it goes by a few different names. There used to be kind of two different suites, one that was called preimplantation genetic testing or PGT, and one that was preimplantation diagnosis or PGD. |
| Erin Welsh | Okay. |
| Erin Allmann Updyke | Now they have split those and they're all called PGT. |
| Erin Welsh | Okay. |
| Erin Allmann Updyke | But then they have different letters after them. So I want to go through what each of them are because what's important is that the three different main kinds of preimplantation genetic testing are used for very different things. And so the research is actually very different on the utility of these different things. preimplantation genetic testing, PGT-A was the first one and that's preimplantation genetic testing for aneuploidy. Aneuploidy is when you have a different number of chromosomes than most people, an extra or one missing. So this type of genetic testing is the type that tests the embryo to make sure that there are the correct number of chromosomes. So it's looking for trisomies or other aneuploidies. This is things like Edward syndrome or Down syndrome, etc. |
| | In most of the literature that I read, this is still kind of on the line of a more experimental and research procedure but it is very, very commonly used in clinical practice. There isn't data that it improves live birth outcomes. And there's a lot of reasons that go into this. Part of the thought is that something that can happen as this embryo is dividing, and I'm sorry if this is getting too nerdy but I find this really fascinating. |
| Erin Welsh | Never apologize for being nerdy, Erin. |
| Erin Allmann Updyke | As this embryo is dividing, every time that these cells divide there's going to be little mistakes that happen. And so as these little mistakes happen early enough on, it seems more and more likely that what's called mosaicism, so different cells actually having a different number of chromosomes might be a part of typical embryogenesis. And there are mechanisms in place because embryogenesis is phenomenally fascinating that many of these blastocysts will self correct later in development. Or in some cases if this was happening for example in a uterus, might end in a miscarriage. Right? But when we do preimplantation genetic testing, we're taking so few cells that we can't tell if something is a mosaic or not necessarily. |
| | And so what this can end up happening is having false positives and also potentially false negatives. But the false positives seem to be what in terms of lawsuits and issues that have come up seem to be the biggest issue because what it leads to is discarding of embryos that could have been viable, that could not have an aneuploidy. Which means that you're then discarding embryos and maybe you only had two or three viable embryos to begin with. Right? But the reverse is also true where you could have a falsely negative sample that could end up resulting in a miscarriage. And so then you went through this whole cycle and thought that this embryo was going to have a good chance of surviving and then it doesn't. So it kind of goes both ways. |
| Erin Welsh | And do we have any numbers on the rate of false positives or false negatives? |
| Erin Allmann Updyke | Because it varies so much place to place, I don't have numbers on that. |

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| Erin Welsh | Okay. |
| Erin Allmann Updyke | Yeah. But that is kind of one of... I think I didn't realize because I had heard a lot about preimplantation genetic testing and I kind of thought that it was just part of the process of IVF but it isn't. |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | But in a lot of places it actually is, especially if you're over a certain age, it's kind of often offered. Like you were asking when is this offered as part of the suite? I think it's very possible that that is the way that this will go. But right now because you only can take so much DNA and we only can do so much testing on that DNA, right now the technology doesn't seem to be good enough to have a super, super high sensitivity and specificity to be able to offer this like across the board as like part of the standard practice necessarily. Or at least when it is offered, it doesn't improve live birth rates. |
| Erin Welsh | Okay. |
| Erin Allmann Updyke | But while this process is similar to, it is separate from a couple of other preimplantation genetic testings. PGT-M, which is preimplantation genetic testing for monogenic disorders and PGT-SR which is testing for structural rearrangements. These are the types of genetic testing that would be done if an individual or a couple has a very high chance of passing on a known genetic disorder or if they for example were having recurrent miscarriage and through their infertility evaluation found out that they had a structural rearrangement in one of their chromosomes. So this is what someone who maybe had a history of Huntington's or sickle cell or cystic fibrosis or things like that would use. These are part of the standard suite for people who have those because you're looking for just these single gene chromosome things, if that makes sense. So it has a different utilization and a different success rate in part because the population that you're doing these testing in is very specific rather than everyone who's seeking out IVF. |
| Erin Welsh | That makes sense. Yeah. |
| Erin Allmann Updyke | Yeah. So these preimplantation genetic testing technologies have been incredible and still have kind of a lot of work to go. And they also, like you were talking about, Erin, kind of do open the door to some potentially ethical gray areas. Because these types of technologies are the same ones that can be used for things like sex selection, which means choosing the sex of your embryo prior to implantation. Different countries have implemented different policies on whether or not this is an acceptable practice. And there's other things that preimplantation genetic testing can be used for. It has been used in the past for selecting specific HLA genotypes. |
| | And this is so that you can select an embryo that is born that is compatible, like genetically identical with their HLA type to a previously living child who for example has a very severe cancer or something like Fanconi anemia. I think that's the example of the first time that this was used. Or some other disorder where they need a bone marrow or some other type of transplant. So you can choose an embryo that will match that living child and then be able to essentially save that child's life with their sibling. These are things that have happened today and are possible because of this technology. And I am not here making a judgment to say that one is right and one is wrong, etc. But all of these different technologies force us as societies to be able to have conversations about where the lines end essentially and where the gray becomes more black and more white. And that is especially true as this technology continues to develop because the things on the horizon for IVF, Erin, are incredible. |

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| Erin Welsh | Of like what, Erin? |
| Erin Allmann Updyke | There are three major areas that IVF will go and they're not far off. One is mitochondrial transfer. Have you heard of this? |
| Erin Welsh | Oh yes. I have heard of this. |
| Erin Allmann Updyke | Have you heard of the three person IVF? It's incredible. This is transferring mitochondria either from one's own cells but from different cells other than your eggs or from a different person entirely, for example if you had some type of mitochondrial gene disorder, and transferring the mitochondria into the egg and then using sperm to fertilize that egg. And so that's why it's called three person or three parent potentially because that mitochondria could come from someone who's genetically separate from you or it could come from different cells in the oocyte donor's own body. But this is amazing. I mean I'm sorry- |
| Erin Welsh | I know. |
| Erin Allmann Updyke | Mitochondria, like moving a mitochondria from one cell to another? That's amazing. |
| Erin Welsh | Yeah. It's amazing. |
| Erin Allmann Updyke | There's more though. People have been working on inducing adult stem cells, like our skin cells, to become sperm cells and egg cells. |
| Erin Welsh | That is wild. |
| Erin Allmann Updyke | It is wild. |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | This process is called in vitro gametogenesis or IVG and it sounds like science fiction but they've already done it in mice. |
| Erin Welsh | I mean everything sounds like science fiction until it's not. |
| Erin Allmann Updyke | Right? I just think about how in Star Trek in the 60s, in the original Star Trek- |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | They didn't have sliding doors yet but all of the doors slid. And so they literally had people standing there and like they physically moved the doors open whenever they would walk through. |
| Erin Welsh | I just remember the cellphone, like the transponder or whatever, I can't remember what it was called. |
| Erin Allmann Updyke | Yeah. Transponders, that's right. |
| Erin Welsh | Was it transponders? Okay. |

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| Erin Allmann Updyke | Yeah. |
| Erin Welsh | Yeah. Still a few more steps til we get to Star Trek World. But yeah. |
| Erin Allmann Updyke | Only a few though! And yeah, so this could give someone the capacity to say generate more eggs if you had poor oocyte quantity or if you had cancer or... Like just so many possibilities, right. And then like you mentioned, Erin, the improvements in gene editing and CRISPR technology.That opens so many doors for not only IVF but so many medical conditions that we have talked about on this podcast before as well. The things that people are working on are incredible and societies are going to have to reckon with what the ethical implications of all of these things are and how we decide that they are regulated. And I mean the royal we, not me and you. |
| Erin Welsh | Thank goodness. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | It really stretches the limits of imagination in terms of what is possible, what could be possible. Things that I didn't know about until doing these episodes. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | Like we talked about off camera, uterine transplants. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | Just like so many things that have completely opened the door and it's like it's open the door and a little bit of opening the door to a world of amazing possibilities and a little Pandora's box at the same time in terms of regulation and in terms of technology evolving faster than our imagination can see where it will go and how it will be used. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | And it really forces us to confront sort of our own feelings about these things that we don't know where they're going. And it's not just IVF. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | It's AI. |
| Erin Allmann Updyke | It's AI. |
| Erin Welsh | It's like what cellphones have given us. |
| Erin Allmann Updyke | It's how much are they listening to me? Always. |
| Erin Welsh | They're always, always. |

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| Erin Allmann Updyke | No, it really is. It's like you said, it is the ability of technology to develop so rapidly and then come online so rapidly. And us have to then look around and realize oh what does this mean for me and for us as a society? |
| Erin Welsh | And who decides that? |
| Erin Allmann Updyke | Right. That's the important question. And then especially when it comes to things like this is who gets access and who decides who gets access? I read a really interesting paper that was really making an argument for access to infertility treatment and including IVF specifically as a human right. |
| Erin Welsh | Yes. |
| Erin Allmann Updyke | And it was framing it in a way that I had never really considered before and it was just so... It's so interesting. |
| Erin Welsh | Well and that is actually, if you compare/contrast, I didn't really get into this but if you compare/contrast sort of the reception to IVF in the years following 1978, it seemed to at least from what I read be more quickly embraced and normalized in the UK where a lot of the physicians who were beginning to practice IVF, including that team that first led to the first IVF baby in the world, their stance was a right to reproduction. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | And it was like this is a thing that will allow people who are not able to have children to have children. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | And that wasn't really as much in the US. And so I think that like... And also I mean there are a myriad of reasons why the US reacted differently than other parts of the world in terms of IVF and still does today and so on and so forth. But I think that has been a really fascinating discussion that a lot of people- |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | That I've seen a lot sort of come up more recently too. |
| Erin Allmann Updyke | And there's still so many differences in who gets access to IVF in this country vs that country. I was reading, I don't know why, but about Italy. Their rules that they made in the early 2000s were super, super restrictive. |
| Erin Welsh | Yes. |
| Erin Allmann Updyke | And so then they've had to work really hard to repeal those to an extreme degree. And it's just, yeah, it varies so, so much place to place still. |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | And that's just reflective of how many different people feel so differently about so many aspects of something like IVF. |

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| Erin Welsh | Yeah. |
| Erin Allmann Updyke | And controlling women's bodies as an example. |
| Erin Welsh | Yes. Yeah. |
| Erin Allmann Updyke | But yeah, that is IVF. We've come so far, we have so far to go. I've learned so much. |
| Erin Welsh | We've learned so much. And also there is so much more that we didn't even begin to talk about. |
| Erin Allmann Updyke | Totally, totally. |
| Erin Welsh | I think this was for me such a meaningful topic to research about because like we've talked about I had this conception of IVF in my head, this perception like I knew okay, this is what it was, this is how it worked, all of these different things. And not really. It just is layers upon layers upon layers. Even though I feel like we could have done so much more. |
| Erin Allmann Updyke | We always will feel that way, Erin. |
| Erin Welsh | We always will feel that way. I do feel like this was a really meaningful topic to do and I am just really appreciative of the amount of literature that exists out there, how many layers are involved in IVF in so many different facets, but especially always coming back to these firsthand accounts. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | And the incredible range of experiences and emotions and feelings and outcomes and everything that people have with IVF and fertility and infertility and egg freezing and all of these different things that it's like IVF is not just IVF. |
| Erin Allmann Updyke | Right. |
| Erin Welsh | It is a million bajillion things. |
| Erin Allmann Updyke | Yeah. We are just really grateful that we get to do this as a job and talk about these things and learn about these things and cover this topic and cannot thank you all enough for sharing your stories with us. And I hope that through these three episodes, everybody feels like they got something out of this because I know that I certainly did selfishly. |
| Erin Welsh | Same. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | Also selfishly but same. And if you want to get even more out of these sources, we've got lots of them. |
| Erin Allmann Updyke | We have so many. |

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| Erin Welsh | I have a bunch of papers that have more detail on this but I will also shout out a couple of the books again. One is called 'The Pursuit of Parenthood' by Margaret Marsh and Wanda Ronner. And then the other book is called 'IVF and Assisted Reproduction: A Global History' by Sarah Ferber, Nicola Marks, and Vera Mackie. |
| Erin Allmann Updyke | I will definitely post the link to that website that I mentioned. So many papers from the CDC vital statistics report to papers on preimplantation genetic diagnosis, like so many, so, so much data. On our website thispodcastwillkillyou.com under the EPISODES tab you will find the list of all of our sources from this episode and every single one of our episodes. That's where you can find it. |
| Erin Welsh | Thank you to Bloodmobile for providing the music for this episode and all of our episodes. |
| Erin Allmann Updyke | Thank you to Lianna Squillace and Tom Breyfogle for the incredible audio mixing. |
| Erin Welsh | Thank you to Exactly Right. |
| Erin Allmann Updyke | And thank you to you, listeners. We really hope that you enjoyed this journey with us. |
| Erin Welsh | Yeah, yeah. We hope that you learned something. |
| Erin Allmann Updyke | Hopefully. |
| Erin Welsh | Yeah. |
| Erin Allmann Updyke | Yeah. |
| Erin Welsh | And a special thank you of course to our wonderful, lovely, generous patrons. We truly do appreciate your support. |
| Erin Allmann Updyke | Yeah, we do. |
| Erin Welsh | It really means a lot. |
| Erin Allmann Updyke | Also do you guys still want a series on pregnancy because we're planning that. |
| Erin Welsh | Yeah, let us know. |
| Erin Allmann Updyke | Is it too much? Have we gone too far? |
| Erin Welsh | I mean it'll be like six months from now. |
| Erin Allmann Updyke | Yeah, yeah, yeah. Not anytime soon. |
| Erin Welsh | Yeah. Well until next time, wash your hands. |
| Erin Allmann Updyke | You filthy animals. |