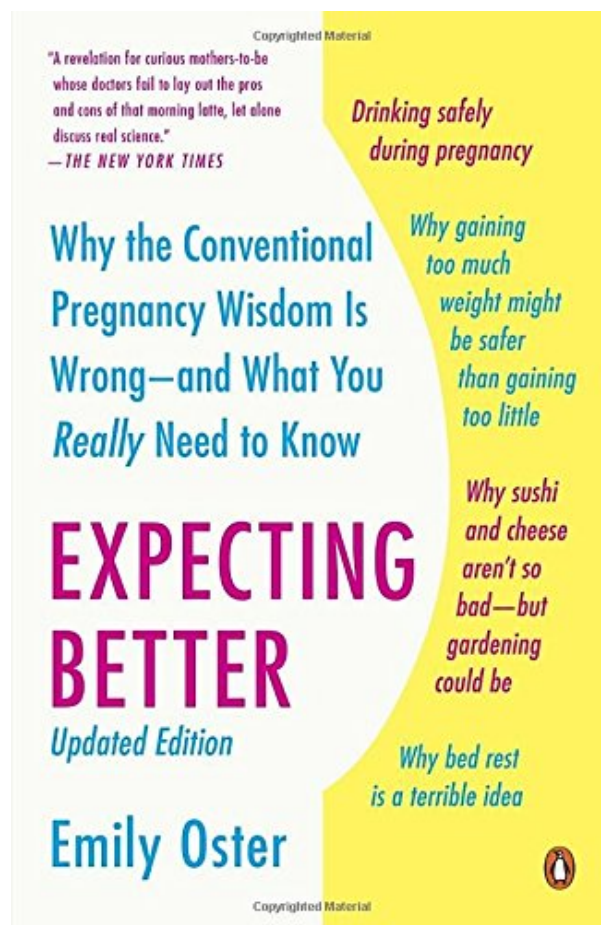


# EXPECTING BETTER: WHY THE CONVENTIONAL PREGNANCY WISDOM IS WRONG--AND WHAT YOU REALLY NEED TO KNOW BY EMILY OSTER



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## Review

"Expecting Better gives moms-to-be a big helping of peace of mind! Oster debunks many tired old myths and shines a light on issues that really matter."

—Harvey, Karp, MD, bestselling author of *The Happiest Baby Guide to Sleep* and *The Happiest Baby on the Block*

"It took someone as smart as Emily Oster to make it all this simple. She cuts through the thicket of anxiety and received wisdom, and gives us the facts. *Expecting Better* is both enlightening and calming. It almost makes me want to get pregnant."

—Pamela Druckerman, New York Times bestselling author of *Bringing Up Bébé* and *Bébé Day by Day*

"This is a fascinating—and reassuring—look at the most important numbers of your pregnancy. It will make parents-to-be rethink much of the conventional wisdom: think bed rest is a good idea? Think again. This may be the most important book about pregnancy you read."

—Steven D. Levitt, New York Times bestselling co-author of *Freakonomics*

"*Expecting Better* is a fascinating and reassuring tour of pregnancy and childbirth, with data leading the way at every juncture. From start to finish, Oster easily leads us through the key findings of the extant pregnancy-related research. My only regret is that my wife and I had three children without the benefit of this insightful approach."

—Charles Wheelan, New York Times bestselling author of *Naked Statistics*

"The only antidote to pregnancy anxiety is facts, and Emily Oster has them in spades. Disarmingly personal and easy to read, this book is guaranteed to cut your freaking out in half. Pregnancy studies has a new heroine. Every pregnant woman will cheer this book—and want to take Oster out for a shot of espresso."

—Rachel Simmons, New York Times bestselling author of *Curse of the Good Girl*

## About the Author

Emily Oster, the daughter of two economists and the wife of a third, is an associate professor of economics at the University of Chicago Booth School. She lives with her husband and daughter in Chicago.

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## Introduction

In the fall of 2009 my husband, Jesse, and I decided to have a baby. We were both economics professors at the University of Chicago. We'd been together since my junior year of college, and married almost five years. Jesse was close to getting tenure, and my work was going pretty well. My thirtieth birthday was around the corner.

We'd always talked about having a family, and the discussion got steadily more serious. One morning in

October we took a long run together and, finally, decided we were ready. Or, at the very least, we probably were not going to get any more ready. It took a bit of time, but about eighteen months later our daughter, Penelope, arrived.

I'd always worried that being pregnant would affect my work—people tell all kinds of stories about “pregnancy brain,” and missing weeks (or months!) of work for morning sickness. As it happens, I was lucky and it didn't seem to make much difference (actually having the baby was another story).

But what I didn't expect at all is how much I would put the tools of my job as an economist to use during my pregnancy. This may seem odd. Despite the occasional use of “Dr.” in front of my name, I am not, in fact, a real doctor, let alone an obstetrician. If you have a traditional view of economics, you're probably thinking of Ben Bernanke making Fed policy, or the guys creating financial derivatives at Goldman Sachs. You would not go to Alan Greenspan for pregnancy advice.

But here is the thing: the tools of economics turn out to be enormously useful in evaluating the quality of information in any situation. Economists' core decision-making principles are applicable everywhere. Everywhere. And that includes the womb.

When I got pregnant, I pretty quickly learned that there is a lot of information out there about pregnancy, and a lot of recommendations. But neither the information nor the recommendations were all good. The information was of varying quality, and the recommendations were often contradictory and occasionally infuriating. In the end, in an effort to get to the good information—to really figure out the truth—and to make the right decisions, I tackled the problem as I would any other, with economics.

At the University of Chicago I teach introductory microeconomics to first-year MBA students. My students would probably tell you the point of the class is to torture them with calculus. In fact, I have a slightly more lofty goal. I want to teach them decision making. Ultimately, this is what microeconomics is: decision science—a way to structure your thinking so you make good choices.

I try to teach them that making good decisions—in business, and in life—requires two things. First, they need all the information about the decision—they need the right data. Second, they need to think about the right way to weigh the pluses and minuses of the decision (in class we call this costs and benefits) for them personally. The key is that even with the same data, this second part—this weighing of the pluses and minuses—may result in different decisions for different people. Individuals may value the same thing differently.

For my students, the applications they care about most are business-related. They want to answer questions like, should I buy this company or not? I tell them to start with the numbers: How much money does this company make? How much do you expect it to make in the future? This is the data, the information part of the decision.

Once they know that, they can weigh the pluses and minuses. Here is where they sometimes get tripped up. The plus of buying is, of course, the profits that they'll make. The minus is that they have to give up the option to buy something else. Maybe a better company. In the end, the decision rests on evaluating these pluses and minuses for them personally. They have to figure out what else they could do with the money. Making this decision correctly requires thinking hard about the alternative, and that's not going to be the same for everyone.

Of course, most of us don't spend a lot of time purchasing companies. (To be fair, I'm not sure this is always what my students use my class for, either—I recently got an e-mail from a student saying that what he learned from my class was that he should stop drinking his beer if he wasn't enjoying it. This actually is a

good application of the principle of sunk costs, if not the primary focus of class.) But the concept of good decision making goes far beyond business.

In fact, once you internalize economic decision making, it comes up everywhere.

When Jesse and I decided we should have a baby, I convinced him that we had to move out of our third-floor walk-up. Too many steps with a stroller, I declared. He agreed, as long as I was willing to do the house shopping.

I got around to it sometime in February, in Chicago, and I trekked in the snow to fifteen or sixteen seemingly identical houses. When I finally found one that I liked (slightly) more than the others, the fun started. We had to make a decision about how much to offer for it.

As I teach my students, we started with the data: we tried to figure out how much this particular house was worth in the market. This wasn't too difficult. The house had last sold in 2007, and we found the price listed online. All we had to do was figure out how much prices had changed in the last two years. We were right in the middle of a housing crisis—hard to miss, especially for an economist—so we knew prices had gone down. But by how much?

If we wanted to know about price changes in Chicago overall we could have used something called the Case-Shiller index, a common measure of housing prices. But this was for the whole city—not just for our neighborhood. Could we do better? I found an online housing resource (Zillow.com) that provided simple graphs showing the changes in housing prices by neighborhood in Chicago. All we had to do was take the old price, figure out the expected change, and come up with our new price.

This was the data side of the decision. But we weren't done. To make the right decision we still needed the pluses and minuses part. We needed to think about how much we liked this house relative to other houses. What we had figured out was the market price for the house—what we thought other people would want to pay, on average. But if we thought this house was really special, really perfect, and ideal for us in particular, we would probably want to bid more than we thought it was worth in the market—we'd be willing to pay something extra because our feelings about this house were so strong.

There wasn't any data to tell us about this second part of the decision; we just had to think about it. In the end, we thought that, for us, this house seemed pretty similar to all the other ones. We bid the price we thought was correct for the house, and we didn't get it. (Maybe it was the pricing memo we sent with our bid? Hard to say.) In the end, we bought another house we liked just as much.

But this was just our personal situation. A few months later one of our friends fell in love with one particular house. He thought this house was a one-of-a-kind option, perfect for him and his family. When it came down to it, he paid a bit more than the data might have suggested. It's easy to see why that's also the right decision, once you use the right decision process—the economist's decision process.

Ultimately, as I tell my students, this isn't just one way to make decisions. It is the correct way.

So, naturally, when I did get pregnant I thought this was how pregnancy decision making would work, too. Take something like amniocentesis. I thought my doctor would start by outlining a framework for making this decision—pluses and minuses. She'd tell me the plus of this test is you can get a lot of information about the baby; the minus is that there is a risk of miscarriage. She'd give me the data I needed. She'd tell me how much extra information I'd get, and she'd tell me the exact risk of miscarriage. She'd then sit back, Jesse and I would discuss it, and we'd come to a decision that worked for us.

This is not what it was like at all.

In reality, pregnancy medical care seemed to be one long list of rules. In fact, being pregnant was a lot like being a child again. There was always someone telling you what to do. It started right away. “You can have only two cups of coffee a day.” I wondered why—what were the minuses (I knew the pluses—I love coffee!)? What did the numbers say about how risky this was? This wasn’t discussed anywhere.

And then we got to prenatal testing. “The guidelines say you should have an amniocentesis only if you are over thirty-five.” Why is that? Well, those are the rules. Surely that differs for different people? Nope, apparently not (at least according to my doctor).

Pregnancy seemed to be treated as a one-size-fits-all affair. The way I was used to making decisions—thinking about my personal preferences, combined with the data—was barely used at all. This was frustrating enough. Making it worse, the recommendations I read in books or heard from friends often contradicted what I heard from my doctor.

Pregnancy seemed to be a world of arbitrary rules. It was as if when we were shopping for houses, our realtor announced that people without kids do not like backyards, and therefore she would not be showing us any houses with backyards. Worse, it was as if when we told her that we actually do like backyards she said, “No, you don’t, this is the rule.” You’d fire your real estate agent on the spot if she did this. Yet this is how pregnancy often seemed to work.

This wasn’t universal, of course; there were occasional decisions to which I was supposed to contribute. But even these seemed cursory. When it came time to think about the epidural, I decided not to have one. This wasn’t an especially common choice, and the doctor told me something like, “Okay, well, you’ll probably get one anyway.” I had the appearance of decision-making authority, but apparently not the reality.

I don’t think this is limited to pregnancy—other interactions with the medical system often seem to be the same way. The recognition that patient preferences might differ, which might play an important role in deciding on treatment, is at least sometimes ignored. At some point I found myself reading Jerome Groopman and Pamela Hartzband’s book, *Your Medical Mind: How to Decide What Is Right for You*, and nodding along with many of their stories about people in other settings—prostate cancer, for example—who should have had a more active role in deciding which particular treatment was right for them.

But, like most healthy young women, pregnancy was my first sustained interaction with the medical system. It was getting pretty frustrating. Adding to the stress of the rules was the fear of what might go wrong if I did not follow them. Of course, I had no way of knowing how nervous I should be.

I wanted a doctor who was trained in decision making. In fact, this isn’t really done much in medical schools. Appropriately, medical school tends to focus much more on the mechanics of being a doctor. You’ll be glad for that, as I was, when someone actually has to get the baby out of you. But it doesn’t leave much time for decision theory.

It became clear quickly that I’d have to come up with my own framework—to structure the decisions on my own. That didn’t seem so hard, at least in principle. But when it came to actually doing it, I simply couldn’t find an easy way to get the numbers—the data—to make these decisions.

I thought my questions were fairly simple. Consider alcohol. I figured out the way to think about the decision—there might be some decrease in child IQ from drinking in pregnancy (the minus), but I’d enjoy a glass of wine occasionally (the plus). The truth was that the plus here is small, and if there was any demonstrated impact of occasional drinking on IQ, I’d abstain. But I did need the number: would having an

occasional glass of wine impact my child's IQ at all? If not, there was no reason not to have one.

Or in prenatal testing. The minus seemed to be the risk of miscarriage. The plus was information about the health of my baby. But what was the actual miscarriage risk? And how much information did these tests really provide relative to other, less risky, options?

The numbers were not forthcoming. I asked my doctor about drinking. She said that one or two drinks a week was "probably fine." "Probably fine" is not a number. The books were the same way. They didn't always say the same thing, or agree with my doctor, but they tended to provide vague reassurances ("prenatal testing is very safe") or blanket bans ("no amount of alcohol has been proven safe"). Again, not numbers.

I tried going a little closer to the source, reading the official recommendation from the American Congress of Obstetricians and Gynecologists. Interestingly, these recommendations were often different from what my doctor said—they seemed to be evolving faster with the current medical literature than actual practice was. But they still didn't provide numbers.

To get to the data, I had to get into the papers that the recommendations were based on. In some cases, this wasn't too hard. When it came time to think about whether or not to get an epidural, I was able to use data from randomized trials—the gold standard evidence in science—to figure out the risks and benefits.

In other cases, it was a lot more complicated. And several times—with alcohol and coffee, certainly, but also things like weight gain—I came to disagree somewhat with the official recommendations. This is where another part of my training as an economist came in: I knew enough to read the data correctly.

A few years ago, my husband wrote a paper on the impact of television on children's test scores. The American Academy of Pediatrics says there should be no television for children under two years of age. They base this recommendation on evidence provided by public health researchers (the same kinds of people who provide evidence about behavior during pregnancy). Those researchers have shown time and again that children who watch a lot of TV before the age of two tend to perform worse in school.

This research is constantly being written up in places like the New York Times Science section under headlines like SPONGEBOB THREAT TO CHILDREN, RESEARCHERS ARGUE. But Jesse was skeptical, and you should be, too. It is not so easy to isolate a simple cause-and-effect relationship in a case like this.

Imagine that I told you there are two families. In one family the one-year-old watches four hours of television per day, and in the other the one-year-old watches none. Now I want you to tell me whether you think these families are similar. You probably don't think so, and you'd be right.

On average, the kinds of parents who forbid television tend to have more education, be older, read more books, and on and on. So is it really the television that matters? Or is it all these other differences?

This is the difference between correlation and causation. Television and test scores are correlated, there is no question. This means that when you see a child who watches a lot of TV, on average you expect him to have lower test scores. But that is not causation.

The claim that SpongeBob makes your child dumber is a causal claim. If you do X, Y will happen. To prove that, you'd have to show that if you forced the children in the no-TV households to watch SpongeBob and changed nothing else about their lives, they would do worse in school. But that is awfully hard to conclude based on comparing kids who watch TV to those who do not.



In the end, Jesse (and his coauthor, Matt) designed a clever experiment.<sup>1</sup> They noted that when television was first getting popular in the 1940s and 1950s, it arrived in some parts of the country earlier than others. They identified children who lived in areas where TV was available before they were two, and compared them to children who were otherwise similar but lived in areas with no TV access until they were older than two. The families of these children were similar; the only difference was that one child had access to TV early in life and one did not. This is how you draw causal conclusions.

And they found that, in fact, television has no impact on children's test scores. Zero. Zilch. It's very precise, which is a statistical way of saying they are actually quite sure that it doesn't matter. All that research in public health about the dangers of SpongeBob? Wrong. It seems very likely that the reason SpongeBob gets a bad rap is that the kinds of parents who let their kids watch a lot of television are different. Correlation, yes. Causation, no.

Just to be clear, I'm still a little wary of television, being from one of those families where we could never watch TV. Jesse is not. Occasionally, when he thinks I'm not looking, I catch him and Penelope in the basement snuggling on the couch, enjoying some Sesame Street. When I protest, he points to the evidence, and I can't really argue.

Pregnancy, like SpongeBob, suffers from a lot of misinformation. One or two weak studies can rapidly become conventional wisdom. At some point I came across a well-cited study that indicated that light drinking in pregnancy—perhaps a drink a day—causes aggressive behavior in children. The study wasn't randomized; they just compared women who drank to women who did not. When I looked a little closer, I found that the women who drank were also much, much more likely to use cocaine.

We know that cocaine is bad for your child—not to mention the fact that women who do cocaine often have other issues. So can we really conclude from this that light drinking is a problem? Isn't it more likely (or at least equally likely) that the cocaine is the problem?

Some studies were better than others. And often, when I located the "good" studies, the reliable ones, the ones without the cocaine users, I found them painting a pretty different picture from the official recommendations.

These recommendations increasingly seemed designed to drive pregnant women crazy, to make us worry about every tiny thing, to obsess about every mouthful of food, every pound we gained. Actually getting the numbers led me to a more relaxed place—a glass of wine every now and then, plenty of coffee, exercise if you want, or not. Economics may not be known as a great stress reliever, but in this case it really is.

More than even the actual recommendations, I found having numbers at all provided some reassurance. At some point I wondered about the risks of the baby arriving prematurely. I went to the data and got some idea of the chance of birth in each pregnancy week (and the fetal survival rate). There wasn't any decision to be made—nothing to really do about this—but just knowing the numbers let me relax a bit. These were the pregnancy numbers I thought I'd get from my doctor and from pregnancy books. In the end, it just turned out that I had to get them myself.

I've always been someone for whom knowing the data, knowing the evidence, is exactly what I need to chill out. It makes me feel comfortable and confident that I'm making the right choices. Approaching pregnancy in this way worked for me. I wasn't sure it would work for other people.

And then my friends got pregnant. Pretty much all of them at the same time. They all had the same questions and frustrations I had. Can I take a sleeping pill? Can I have an Italian sub (I really want one! Does that make a difference?)? My doctor wants to schedule a labor induction—should I do it? What's the deal with cord-

blood banking?

Sometimes they weren't even pregnant yet. I had lunch with a friend who wanted to know whether she should worry about waiting a year to try to get pregnant—how fast does fertility really fall with age?

Their doctors, like mine, had a recommendation. Sometimes there was an official rule. But they wanted to make the decision that was right for them. I found myself referring to my obstetrics textbook, and to the medical literature, long after my Penelope was born. There was a limit to the role I could play—no delivering babies, fortunately (for me and, especially, the babies). But I could provide people with information, give them a way to discuss concerns with their OBs on more equal footing, help them make decisions they were happy with.

And as I talked to more and more women it became clear that the information I could give them was useful precisely because it didn't come with a specific recommendation. The key to good decision making is taking the information, the data, and combining it with your own estimates of pluses and minuses.

In some cases, the existing rule is wrong. In others, it isn't a question of right or wrong but what is right for you and your pregnancy. I looked at the evidence on the epidural, combined it with my own plus and minus preferences, and decided not to have one. My friend Jane looked at the same evidence and decided to have one. In the end, I felt fine eating deli meats; my college roommate Tricia looked at the evidence and decided she would avoid them. All of these are good decisions.

So this book is for my friends. It's the pregnancy numbers—the data to help them make their personalized pregnancy decisions and to help them understand their pregnancies in the clearest possible way, by the numbers. It's the suggestion that maybe it's okay to have a glass of wine and, more important, the data on why. It's the numbers on the risk of miscarriage by week, data on which fish to eat to make your kid smart (and which to avoid because they could make your kid dumb), information on weight gain, on prenatal testing versus prenatal screening, on bed rest and labor induction, on the epidural and the benefits (or not) of a birth plan. This book is a way to take control and to expect better.

Pregnancy and childbirth (and child rearing) are among the most important and meaningful experiences most of us will ever have; probably the most important. Yet we are often not given the opportunity to think critically about the decisions we make. Instead, we are expected to follow a largely arbitrary script without question. It's time to take control: pick up a cup of coffee or, if you like, a glass of wine, and read on.

## PART 1

### In the Beginning: Conception

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### Prep Work

Some pregnancies are a surprise. If you're one of those women who woke up feeling queasy, took a pregnancy test on a whim, and were shocked to see the second pink line show up, congratulations! Please skip ahead.

But for a lot of us, we're thinking about getting pregnant long before it actually happens. I met my husband

in college in 2001. We got married in 2006. Our daughter was born in 2011. I won't say I spent the whole ten years thinking about a baby, but I (and, later, we) did make a lot of choices with at least the long-term plan of having a family.

And as I approached 30, and pregnant friends started popping up here and there, I thought a little more seriously. I wondered if there was something I should be doing in advance, even before we started trying to get pregnant. Should I change my diet? My doctor did once suggest I should cut down on coffee, just so it wouldn't be such a shock to reduce when I was pregnant. Was that really necessary?

Mostly, I worried that I was getting old.

Thirty is not actually old in pregnancy terms. "Advanced maternal age" is reserved for women over 35, and you wouldn't be faulted for thinking that 35 was a sharp cutoff. I read one paper once that referred to eggs as "best used by 35." Thanks, it's really helpful to know my sell-by date. But, of course, 35 is not a magical number. Biological processes don't work like this. Your eggs don't wake up on the morning of your 35th birthday and start planning their retirement party.

Starting pretty much the first day you menstruate, your fertility is declining. Your most fertile time is in your teens, and it goes down from there—30 is worse than 20, and 40 is worse than 30. But, of course, there are other factors that push you in other directions. I certainly wasn't in a good position to have a baby in my first year of graduate school at 23, and the truth is that I'd probably be in a better position at 35 than at 30.

It wasn't the only consideration, but I did wonder about how fast fertility declined. My doctor didn't seem worried—"You're not thirty-five yet!" she said—but that wasn't quite the detailed reassurance I was looking for.

I went looking for reassurance (or, at least, information) in the world of data, in the academic medical literature. As I expected, there was an answer. It just wasn't quite what the over-35 retired-eggs story would have suggested.

The main research on this uses data from the 1800s (it's old but the technology hasn't changed much!). Here is the idea: prior to the modern era, couples would pretty much get down to business right after the wedding, and there were limited birth control options. So you can figure out how fertility varies with age by looking at the chance of having children at all for women getting married at different ages.

Researchers found that the chance of having any children was very similar for women who got married at any age between 20 and 35. Then it began to decline: women who got married between 35 and 39 were about 90 percent as likely to have a child as those who got married younger than 35; women who got married between 40 and 44 were only about 62 percent as likely; and women who got married between 45 and 49 were only 14 percent as likely. Put differently, virtually everyone who got married between 20 and 35 had at least one child, compared to only about 14 percent of those who got married after 45.

You may or may not like to draw conclusions from such old data. People live longer now, and are healthier longer. It is certainly possible that as longevity and health increase, women will remain fertile longer. Even if you do take this data at face value, the reduction in fertility is not as dramatic as you might have feared. The 35- to 39-year-old group is only slightly less likely to have children; the major drop in fertility is not until after 40, and at least some women over 45 in this data did conceive—this in an era well before in vitro fertilization (IVF)!

Contemporary data looks fairly similar, perhaps even somewhat more encouraging. Researchers in France studied a group of around 2,000 women who were undergoing insemination with donor sperm. One nice

aspect of this study is that they didn't have to worry that older people had sex less frequently because everyone in the study was trying to get knocked up at the right time of the month in a controlled environment. After 12 cycles, the pregnancy rate was around 75 percent for women under 30, 62 percent for women 31 to 35, and 54 percent for women over 35. In this oldest group things were similar for women 36 to 40 and over 40. More than half of the over-40 women in the sample got pregnant within a year.<sup>1</sup>

In the end, my doctor was basically right to pooh-pooh my worries. But for me, seeing the numbers this way, in black and white, was far more reassuring. I could see in detail that starting to try at 30 rather than at 28 was not going to make that much difference. I could think about the timing if we wanted, for example, more than one child. And I could see that the numbers were all pretty high—for me, reading “75 percent of women were pregnant with a year” was a lot more helpful than hearing things like, “It works out for most women.” For one thing, how do I know if your “most” is the same as mine?

I'd experience this again and again. The value of having numbers—data—is that they aren't subject to someone else's interpretation. They are just the numbers. You can decide what they mean for you. In this case, it's true that it's harder to get pregnant when you are older. But it's not impossible, not even close.

When we did start thinking more seriously about a baby, I stopped focusing so much on age. (After all, what could I do? Not getting older is not exactly an option.) But I did wonder about other things I might do to prepare. I asked my OB at my yearly visit if there was anything I should be aware of. Other than some generic advice to relax (not one of my strengths), the one thing she focused on was exercise. Make sure you are exercising before you get pregnant.

When I talked to other women, it seemed like this was part of a more general theme—it's a good idea to try to be in good physical shape before getting pregnant. Independent of any medical advice, I had long harbored the fantasy of getting to my “goal weight” prior to pregnancy. I had achieved this weight exactly once in my life, before my wedding, through a process of five A.M. ninety-minute cardio workouts four days a week. I figured if I got to this weight again before we got pregnant, I'd be one of those Heidi Klum-type women who look great through the whole pregnancy and are back to bikini modeling eight weeks after giving birth.

In the end, of course, I got pregnant right after our summer vacation, not exactly the most weight-loss-friendly time of year. That's okay, I figured, I'm sure it will be easy to get to that goal weight after the baby is born. I am nothing if not optimistic.

Other than some feeling of personal achievement, it wasn't clear to me why I should care about my prepregnancy weight. Does it matter for anything? A few pounds here and there, obviously not. Overall, yes. Women (and their doctors) worry a lot about weight gain during pregnancy, but it turns out that weight before pregnancy is much more important.

About 70 percent of the U.S. population are overweight (defined as a body mass index over 25), and 35 percent are obese (BMI over 30). (Note: to calculate your BMI, take your weight in kilograms and divide it by your height in meters squared. If you are 5 feet 6 inches and 150 pounds, your BMI is 24.2.) On a number of important dimensions, obese women in particular have more difficult pregnancies than normal-weight women.

One study that demonstrates this effectively used a group of roughly 5,000 births at one hospital in Mississippi.<sup>2</sup> The advantage of using a single hospital is that it means the women are all pretty similar in terms of income, education, and other characteristics. A large percentage of the women in the study were obese.

The authors looked at a very large number of outcomes related to the mothers: preeclampsia, urinary tract

infection, gestational diabetes, preterm delivery, the need for labor induction, Cesarean delivery, and postpartum hemorrhage (bleeding after birth). They also looked at some things about the babies: shoulder dystocia (when the second shoulder gets stuck during delivery), whether the baby needed help breathing, the five-minute APGAR score (a measure of the baby's condition five minutes after birth), and whether the baby was abnormally small or abnormally large.

Obese women have more pregnancy complications, as the graph on the next page illustrates. One example: 23 percent of normal-weight women have a C-section, versus almost 40 percent of obese women. The risk of preeclampsia, a serious pregnancy complication, is more than three times as high if you are obese. Overweight women (not in this graph) fall somewhere in the middle—a slightly higher risk for some complications, but the differences with normal-weight women are small.

### Pregnancy Complications and Prepregnancy Obesity

When this study looked at infants, the babies of obese women were also more likely to have complications. If you are obese when you get pregnant, your baby is more likely to have shoulder dystocia, more likely to have low APGAR scores, and more likely to be abnormally large for gestational age. Even scarier, children of obese women are at higher risk for death, although this is very rare, regardless of Mom's weight.

This data is from just one study, but the findings are very consistent with other studies, from the United States and elsewhere.<sup>3, 4</sup> And the effects aren't limited to outcomes during pregnancy. Obese women have a harder time conceiving, and are more likely to miscarry early in pregnancy.<sup>5</sup> There is even some recent evidence that maternal obesity is associated with delays in breast milk coming in, which can impact breast-feeding success.<sup>6</sup>

### Baby Outcome and Prepregnancy Weight

A review article from 2010 summarizes the literature on this issue with a simple statement: "Maternal obesity affects conception, duration and outcome of pregnancy. Offspring are at increased risk of both immediate and long term implications for health."<sup>7</sup> In other words, it is harder to get pregnant, harder to sustain a pregnancy, more likely that later-term complications will arise, and more likely that there will be complications with the baby. All of which you would like to avoid.

None of this is to suggest that it's a problem if you can't lose that last five pounds, of course. The outcomes here are a result of pretty large differences in weight. I may have been disappointed not to get down to my fighting weight, but it is unlikely that it mattered. And being too skinny can also interfere with conception. But it does suggest that there are real benefits to getting your weight under control before you get pregnant. Of course, weight loss may have health benefits for reasons other than pregnancy. See, your (hypothetical) baby is helping out already!

### The Bottom Line

- Fertility declines with age, but not as fast as you might expect—35 is not a magic number cutoff.
- Being obese before pregnancy is associated with an increased risk of complications for both you and your baby. Don't worry too much about a few pounds here and there, but if you are significantly overweight, weight loss before pregnancy may have benefits.

• • •

## Data-Driven Conception

I spent most of my twenties trying not to get pregnant. I used at least three versions of the birth control pill and even, for a brief time, something called “The Patch.” So I knew I was really good at not getting pregnant. Of course, I worried that perhaps I wouldn’t be so good at getting pregnant.

I’d like to say that I approached the process of conception in a laissez-faire way. After all, I was only thirty, we had plenty of time, and there was no indication that we’d have trouble conceiving. I wish I could say I was like my sister-in-law, Rebecca, who was so relaxed about this with my nephew that she was two months along before she even realized she was pregnant.

But this doesn’t really fit with my personality. I suspected even before we got down to business that I would be a neurotic mess. I was correct. I actually had a panic attack about this before we even started trying. It must be a record. When I went to my primary care doctor, she looked at me thoughtfully and suggested that perhaps knowing more about the process would help me relax (even if I couldn’t actually control it).

I don’t know why this hadn’t occurred to me before, but she was exactly right. On her recommendation, I picked up a copy of *Taking Charge of Your Fertility* and read it cover to cover.

The main thing I learned was that a lot has to go right to get pregnant. It’s kind of amazing that the human race continues to exist at all.

You probably remember the basics of conception from health class: unprotected sex, sperm meets egg, and, all of a sudden, you’re pregnant. High school health class tends to give the impression that pregnancy is really, really likely—part of the general scare-tactic attitude. But, in fact, the majority of the time it is not possible to get pregnant. The key issue is timing: you need sperm to be around at the exact moment that the egg is ready.

When is that? The average woman has a menstrual cycle of 28 days, counting from the beginning of one period to the beginning of the next. The first day of your period is considered day 1. The week of your period and the week after it are preparation for ovulation. About 14 days after your period starts the egg is released (this is ovulation) and begins to travel down toward the uterus.

The egg is available for fertilization during this journey, which lasts a couple of days. If the egg meets a sperm on its way to the uterus and the sperm gets lucky, fertilization occurs. If you happen to release two eggs and they both meet sperm, you get twins; twins can also happen if the fertilized egg divides right at the beginning. When the fertilized egg (or eggs) reaches the uterus, implantation occurs and pregnancy actually begins. The process from egg release to implantation lasts 6 to 12 days. For most successful pregnancies, implantation occurs 22 to 24 days after the first day of your last period.<sup>1</sup>

This whole second half of the cycle (after the egg is released) is called the luteal phase. It’s either taken up with fertilization and implantation (if you get pregnant) or with the egg waiting around in the uterus to be flushed out during your period. If you do not get pregnant, day 28 will bring your period. If you do get pregnant, day 28 will roll around periodless, and you’ll be off and running. Here’s the basic timeline (this is for someone with a standard 28-day cycle; if your cycle is a few days longer or shorter you might ovulate a bit earlier or later than day 14):

The key to pregnancy is that when the egg starts making its way down the tube, the sperm has to be waiting for it. This means the best time for sex or insemination is the day before or the day of ovulation. It takes

some time for sperm to swim into the fallopian tubes, so the day after ovulation is generally too late.

Sperm are, however, a bit more robust than the egg. They can typically live up to 5 days in the fallopian tube, waiting. This means the window is actually a bit longer. Sex 4 or 5 days before ovulation can lead to a baby, although it's less likely. I was curious about how much less likely. All this talk about a small "ovulation window"—was there really any truth to that? How small was the window?

Figuring this out actually requires knowing quite a lot about people's sex lives. Fortunately, at least some researchers are up to the challenge. I found a study that followed more than 200 couples who were trying to conceive for more than a year. The authors recorded detailed information on when they had sex and collected their urine daily (daily!) so they could monitor both ovulation and pregnancy.<sup>2</sup> Using this information, the researchers figured out the best timing for baby-making sex (this wasn't the goal of the study, just an auxiliary fact we can learn from it).

What makes this question a bit tricky to answer is that most couples trying to get pregnant have sex frequently. This makes it hard to know which sex act led to the baby—was it the sex you had on the day of ovulation? Or three days before? The researchers get around this by focusing on women who had sex just one time in the plausible conception window.

Using these one-day-of-sex people, we can figure out the chance of conception by day. Here it is:

#### Probability of Conception by Cycle Day

For most of the month, pregnancy is impossible (at least based on these data). No one conceived by having sex after ovulation—by the time the sperm gets up into the fallopian tubes, the egg is long gone. In addition, no one conceived by having sex more than 5 days before ovulation.

The window of possible conception is short: from 5 days before ovulation through the day of ovulation. But note that if you time it right, the chances of pregnancy are good. Conception rates are more than 30 percent for the day before and the day of ovulation! These odds are really not bad.

If you had to pick just one day in the month for sex, you'd want to pick the day you ovulate (or the day before: the pregnancy rates are similar). If you are using artificial insemination, it also makes sense to focus on the day before and the day of ovulation, when fertilization is most likely. For most women with a standard 28-day cycle, this is around the 14th day after your period starts.

Of course, one way to make sure that you definitely have sex on the day of ovulation is to have sex every day around the possible ovulation day (or just have sex every day). This technique is typically pretty popular with husbands, at least in the first month or two. But some OBs will warn you off this. I was told that the best strategy is to have sex every other day. If you did this, you'd be sure to capture at least one of the two best days, and the argument is that if you (or your partner) "save up" the sperm, then pregnancy chances are increased. On the other hand, saving them too much (say, skipping sex for more than ten days) tends to cause their effectiveness to diminish.<sup>3</sup>

This always sounded a little suspicious to me. I can easily believe that the amount of sperm is higher if you wait a day, but could it really be more than twice as high, which is what would have to be true for the every-other-day plan to beat out the every-day plan?

It turns out my skepticism was somewhat well placed. The same paper that gave me information on the right day for sex also determined whether frequency of intercourse mattered. The researchers calculated the predicted chance of pregnancy for people who had sex once during the 6-day window leading up to

ovulation, for those who had it twice, three times, and so on. The chances were almost identical. In other words, there seems to be no benefit to alternating sex days, having sex more frequently, or having sex less frequently. The crucial thing is to hit the day of ovulation or the day before.

This appeared to make things simple. All I had to do was figure out when I was going to ovulate, and then have sex that day or the day before. I figured this wouldn't be that hard, although I worried a bit about work travel, and I patted myself on the back for having avoided what the fertility book suggested was the major infertility pitfall—namely, not having sex on the right day.

There was just one remaining problem: I didn't seem to be ovulating at all. Or, at least, things didn't seem to be behaving normally. When I went off the pill, my doctor said my cycle would return to normal (or return to whatever it was before I went on the pill, as if I could remember that). She said it would happen within three months. It didn't. I went two months between periods, then had two within a few weeks.

I called the doctor at 3 months and 1 day. What is going on? I asked the nurse when she called back. Should I be worried? What should I do?

What I wanted was a concrete answer. Something like: 70 percent of women resume normal cycles within 3 months, 90 percent within 6 months. I wanted to know whether it mattered that I had been on the pill for 12 years. Would it take longer to get back to normal? This is not what I got. What I got was best described as vague reassurance (and the ever-helpful “Just relax!”).

I thought if I pushed, I would get to the more detailed evidence, but I didn't. “Everyone is different,” I was told. “Yes, that is why I asked about the average,” I grumbled to Jesse. I would have this type of experience again and again. How accurate is the prenatal screening they suggested? “Quite accurate.” When should I expect to go into labor? “It's a different time for everyone.”

I wanted a number. I craved evidence. Even if the answer was that the evidence was flawed and incomplete, I wanted to know about it. Yes, I understood that everyone was different. But that doesn't mean there isn't any information!

Again, I headed out on my own to look for the numbers.

The most popular temporary forms of birth control in the United States are (in order): the pill, condoms, IUDs, and the withdrawal method. Obviously, neither condoms nor the withdrawal method have any impact on your menstrual cycle. If you've been using condoms, whatever cycle you've had up until now will continue. Same for withdrawal, and for any other barrier method (diaphragm, Today Sponge, etc.).

The pill makes things more complicated. As my doctor noted, sometimes the cycle returns to normal right away, but sometimes it takes a bit longer. The advantage of referring to the actual studies is that we can be more precise. In one study in Germany,<sup>4</sup> researchers studied menstrual cycles of women who just went off the pill. For some women it took up to 9 months to get back to a “normal” cycle. In the initial months after going off the pill these women had longer menstrual cycles, were more likely to have cycles in which they didn't ovulate, and were more likely to have cycles where the second half of the cycle (the luteal phase) was so short that pregnancy was unlikely.

This study is similar to others. Researchers in the United States studying women who had gone off the pill in the last 3 months found they had longer cycles (by a couple of days), more variable cycle length, and later ovulation in some cycles than those who had been off the pill longer.<sup>5</sup> In addition, when researchers measured their cervical mucus, the women who had been off the pill longer had cervical mucus that was more “welcoming” to the sperm.



The very good news, however, is that these effects are relatively short-lived. In the German study, virtually everyone had a normal cycle by 9 months after going off the pill. For some women it is much faster: 60 percent of women in that study had a normal cycle the first month off the pill.

I was also reassured that once you do ovulate, having been on the pill doesn't seem to impact pregnancy rates. In another German study,<sup>6</sup> researchers studied women actually trying to get pregnant. They found that women who had just gone off the pill were slightly less likely to get pregnant in the first 3 months of trying, but no less likely to be pregnant within a year. This study also looked at the duration of pill usage and found no effect: even for people like me, who had been on the pill since their teenage years, things went back to normal in the same basic time frame.

What I took from this was that worrying at 3 months and 1 day was unnecessary. If I got to 9 months without things normalizing I could consider stressing out a bit.

Fewer women use IUDs, but the rates have crept up in the last decade. As with the pill, it takes a bit of time to recover fertility after using an IUD. In a recent literature review, authors found that women who had just gone off an IUD took (on average) a month longer to get pregnant than those who had just stopped oral contraceptives, but 80 to 90 percent (depending on the study) were pregnant within one year.<sup>7</sup>

So I waited, and a couple of months later things normalized a bit, just like the data said they would. But I still needed to figure out when I was ovulating. Day 14? Day 16? Day 12? Even after 6 months my cycle wasn't completely regular; I couldn't just assume it was day 14. Also, I quickly figured out that this was an opportunity to collect data. I couldn't resist!

There are three common ways to detect ovulation: temperature charting, checking cervical mucus, and pee sticks. The first two of these have been in use for many years; the pee stick method is relatively new.

**Temperature Charting:** Temperature charting (sometimes called BBT charting, for basal body temperature) relies on the mildly interesting fact that your body temperature is higher in the second half of the month, after ovulation, than before. You can therefore figure out when you ovulate by taking your temperature every day. The technique itself is not complicated. Every morning before you get out of bed (moving around affects your temperature; you ideally want to take it as soon as you wake up, before you do anything), you take your temperature using an accurate digital thermometer.

For the first half of the month, your temperature will be low—typically below 98 degrees. The day after ovulation, it will jump up, usually at least half a degree and sometimes more. This is the sign that you ovulated. Your temperature will stay high through the rest of the month, and then drop on the day your period starts, or (often) the day before. If you get pregnant, your temperature will stay high.

There are some very good things about temperature charting. In the month you are doing it, it can tell you with high certainty that you did, in fact, ovulate. If your cycles are regular, it can help you plan for the next month by showing you the day on which you generally ovulate. It can also tell you that you are pregnant. More than 14 days of high temperatures is a very good indication of pregnancy.

However, this isn't perfect. The biggest issue is that it tells you only after you ovulate. So although it is useful for predicting the next month, it doesn't help with this month. Also, it's not as simple as it seems. To really make this work you need to take your temperature at the same time every day, ideally first thing in the morning after four to five hours of continuous sleep. The results can get screwed up by jet lag, a fever, or a bad night of sleep.

I liked this method a lot, if only because it enabled me to feel like I was doing something proactive every day

(and because it produced data, which I could use to make attractive charts). The downside is that I was never especially good at it.

My temperature chart from the month that I got pregnant with Penelope is on the next page. On one hand, the fact that my temperature eventually elevated and stayed up gave me a (small) clue that I was pregnant. On the other hand, all the jet lag and my generally poor sleep meant that it was almost impossible to interpret. I initially thought I ovulated on June 9 because my temperature went up on June 10; then I realized this was just because of the time change when we got back from Europe. The sustained higher temperatures did not occur until I got back from Ghana. The only way I knew that I must have ovulated before that trip was that Jesse wasn't there!

#### Basal Body Temperature Chart, June 2010

We can be a little more scientific about how useful this is for the average woman. In a study from the late 1990s,<sup>8</sup> researchers followed a set of women trying not to get pregnant and evaluated how good various methods were at detecting ovulation. In this study they were able to pinpoint the actual date of ovulation using ultrasound, so they knew the truth. The temperature-charting method as used by these women accurately identified the day of ovulation about 30 percent of the time. Another 30 percent of the time this method pointed to ovulation one day before it actually occurred.

That day before ovulation is also good for pregnancy sex. Putting this together: if you have sex on the date indicated by temperature charting, 60 percent of the time you would manage to time sex on one of the two most fertile days of the month.

**Cervical Mucus:** If you really want to get serious about natural ovulation detection, you probably want to chart your cervical mucus along with your temperature. This is a bit more complicated than temperature charting and, at least for some women (read: me), there is an "ick" factor. Here's the idea: right around ovulation your body produces a type of mucus ideal for sperm to swim through. You can detect this mucus in and around your cervix.

# **EXPECTING BETTER: WHY THE CONVENTIONAL PREGNANCY WISDOM IS WRONG--AND WHAT YOU REALLY NEED TO KNOW BY EMILY OSTER PDF**

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# **EXPECTING BETTER: WHY THE CONVENTIONAL PREGNANCY WISDOM IS WRONG--AND WHAT YOU REALLY NEED TO KNOW BY EMILY OSTER PDF**

\*Newly Updated, this Revised Edition Includes the Latest Research and Findings on Genetic Testing and more\*

“Gives moms-to-be a big helping of peace of mind!” —Harvey Karp M.D., bestselling author of *The Happiest Baby on the Block*

Pregnancy—unquestionably one of the most profound, meaningful experiences of adulthood—can reduce otherwise intelligent women to, well, babies. Pregnant women are told to avoid cold cuts, sushi, alcohol, and coffee without ever being told why these are forbidden. Rules for prenatal testing are similarly unexplained. Moms-to-be desperately want a resource that empowers them to make their own right choices.

When award-winning economist Emily Oster was a mom-to-be herself, she evaluated the data behind the accepted rules of pregnancy, and discovered that most are often misguided and some are just flat-out wrong. Debunking myths and explaining everything from the real effects of caffeine to the surprising dangers of gardening, *Expecting Better* is the book for every pregnant woman who wants to enjoy a healthy and relaxed pregnancy—and the occasional glass of wine.

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## Review

"Expecting Better gives moms-to-be a big helping of peace of mind! Oster debunks many tired old myths and shines a light on issues that really matter."

—Harvey, Karp, MD, bestselling author of *The Happiest Baby Guide to Sleep* and *The Happiest Baby on the Block*

"It took someone as smart as Emily Oster to make it all this simple. She cuts through the thicket of anxiety and received wisdom, and gives us the facts. *Expecting Better* is both enlightening and calming. It almost makes me want to get pregnant."

—Pamela Druckerman, New York Times bestselling author of *Bringing Up Bébé* and *Bébé Day by Day*

"This is a fascinating—and reassuring—look at the most important numbers of your pregnancy. It will make parents-to-be rethink much of the conventional wisdom: think bed rest is a good idea? Think again. This may

be the most important book about pregnancy you read."

—Steven D. Levitt, New York Times bestselling co-author of *Freakonomics*

"Expecting Better is a fascinating and reassuring tour of pregnancy and childbirth, with data leading the way at every juncture. From start to finish, Oster easily leads us through the key findings of the extant pregnancy-related research. My only regret is that my wife and I had three children without the benefit of this insightful approach."

—Charles Wheelan, New York Times bestselling author of *Naked Statistics*

"The only antidote to pregnancy anxiety is facts, and Emily Oster has them in spades. Disarmingly personal and easy to read, this book is guaranteed to cut your freaking out in half. Pregnancy studies has a new heroine. Every pregnant woman will cheer this book—and want to take Oster out for a shot of espresso."

—Rachel Simmons, New York Times bestselling author of *Curse of the Good Girl*

#### About the Author

Emily Oster, the daughter of two economists and the wife of a third, is an associate professor of economics at the University of Chicago Booth School. She lives with her husband and daughter in Chicago.

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## Introduction

In the fall of 2009 my husband, Jesse, and I decided to have a baby. We were both economics professors at the University of Chicago. We'd been together since my junior year of college, and married almost five years. Jesse was close to getting tenure, and my work was going pretty well. My thirtieth birthday was around the corner.

We'd always talked about having a family, and the discussion got steadily more serious. One morning in October we took a long run together and, finally, decided we were ready. Or, at the very least, we probably were not going to get any more ready. It took a bit of time, but about eighteen months later our daughter, Penelope, arrived.

I'd always worried that being pregnant would affect my work—people tell all kinds of stories about “pregnancy brain,” and missing weeks (or months!) of work for morning sickness. As it happens, I was lucky and it didn't seem to make much difference (actually having the baby was another story).

But what I didn't expect at all is how much I would put the tools of my job as an economist to use during my pregnancy. This may seem odd. Despite the occasional use of “Dr.” in front of my name, I am not, in fact, a real doctor, let alone an obstetrician. If you have a traditional view of economics, you're probably thinking of Ben Bernanke making Fed policy, or the guys creating financial derivatives at Goldman Sachs. You would not go to Alan Greenspan for pregnancy advice.

But here is the thing: the tools of economics turn out to be enormously useful in evaluating the quality of information in any situation. Economists' core decision-making principles are applicable everywhere. Everywhere. And that includes the womb.

When I got pregnant, I pretty quickly learned that there is a lot of information out there about pregnancy, and a lot of recommendations. But neither the information nor the recommendations were all good. The information was of varying quality, and the recommendations were often contradictory and occasionally infuriating. In the end, in an effort to get to the good information—to really figure out the truth—and to make the right decisions, I tackled the problem as I would any other, with economics.

At the University of Chicago I teach introductory microeconomics to first-year MBA students. My students would probably tell you the point of the class is to torture them with calculus. In fact, I have a slightly more lofty goal. I want to teach them decision making. Ultimately, this is what microeconomics is: decision science—a way to structure your thinking so you make good choices.

I try to teach them that making good decisions—in business, and in life—requires two things. First, they need all the information about the decision—they need the right data. Second, they need to think about the right way to weigh the pluses and minuses of the decision (in class we call this costs and benefits) for them personally. The key is that even with the same data, this second part—this weighing of the pluses and minuses—may result in different decisions for different people. Individuals may value the same thing differently.

For my students, the applications they care about most are business-related. They want to answer questions like, should I buy this company or not? I tell them to start with the numbers: How much money does this company make? How much do you expect it to make in the future? This is the data, the information part of the decision.

Once they know that, they can weigh the pluses and minuses. Here is where they sometimes get tripped up. The plus of buying is, of course, the profits that they'll make. The minus is that they have to give up the option to buy something else. Maybe a better company. In the end, the decision rests on evaluating these pluses and minuses for them personally. They have to figure out what else they could do with the money. Making this decision correctly requires thinking hard about the alternative, and that's not going to be the same for everyone.

Of course, most of us don't spend a lot of time purchasing companies. (To be fair, I'm not sure this is always what my students use my class for, either—I recently got an e-mail from a student saying that what he learned from my class was that he should stop drinking his beer if he wasn't enjoying it. This actually is a good application of the principle of sunk costs, if not the primary focus of class.) But the concept of good decision making goes far beyond business.

In fact, once you internalize economic decision making, it comes up everywhere.

When Jesse and I decided we should have a baby, I convinced him that we had to move out of our third-floor walk-up. Too many steps with a stroller, I declared. He agreed, as long as I was willing to do the house shopping.

I got around to it sometime in February, in Chicago, and I trekked in the snow to fifteen or sixteen seemingly identical houses. When I finally found one that I liked (slightly) more than the others, the fun started. We had to make a decision about how much to offer for it.

As I teach my students, we started with the data: we tried to figure out how much this particular house was worth in the market. This wasn't too difficult. The house had last sold in 2007, and we found the price listed online. All we had to do was figure out how much prices had changed in the last two years. We were right in the middle of a housing crisis—hard to miss, especially for an economist—so we knew prices had gone down. But by how much?

If we wanted to know about price changes in Chicago overall we could have used something called the Case-Shiller index, a common measure of housing prices. But this was for the whole city—not just for our neighborhood. Could we do better? I found an online housing resource (Zillow.com) that provided simple graphs showing the changes in housing prices by neighborhood in Chicago. All we had to do was take the old price, figure out the expected change, and come up with our new price.

This was the data side of the decision. But we weren't done. To make the right decision we still needed the pluses and minuses part. We needed to think about how much we liked this house relative to other houses. What we had figured out was the market price for the house—what we thought other people would want to pay, on average. But if we thought this house was really special, really perfect, and ideal for us in particular, we would probably want to bid more than we thought it was worth in the market—we'd be willing to pay something extra because our feelings about this house were so strong.

There wasn't any data to tell us about this second part of the decision; we just had to think about it. In the end, we thought that, for us, this house seemed pretty similar to all the other ones. We bid the price we thought was correct for the house, and we didn't get it. (Maybe it was the pricing memo we sent with our bid? Hard to say.) In the end, we bought another house we liked just as much.

But this was just our personal situation. A few months later one of our friends fell in love with one particular house. He thought this house was a one-of-a-kind option, perfect for him and his family. When it came down to it, he paid a bit more than the data might have suggested. It's easy to see why that's also the right decision, once you use the right decision process—the economist's decision process.

Ultimately, as I tell my students, this isn't just one way to make decisions. It is the correct way.

So, naturally, when I did get pregnant I thought this was how pregnancy decision making would work, too. Take something like amniocentesis. I thought my doctor would start by outlining a framework for making this decision—pluses and minuses. She'd tell me the plus of this test is you can get a lot of information about the baby; the minus is that there is a risk of miscarriage. She'd give me the data I needed. She'd tell me how much extra information I'd get, and she'd tell me the exact risk of miscarriage. She'd then sit back, Jesse and I would discuss it, and we'd come to a decision that worked for us.

This is not what it was like at all.

In reality, pregnancy medical care seemed to be one long list of rules. In fact, being pregnant was a lot like being a child again. There was always someone telling you what to do. It started right away. "You can have only two cups of coffee a day." I wondered why—what were the minuses (I knew the pluses—I love coffee!)? What did the numbers say about how risky this was? This wasn't discussed anywhere.

And then we got to prenatal testing. "The guidelines say you should have an amniocentesis only if you are over thirty-five." Why is that? Well, those are the rules. Surely that differs for different people? Nope, apparently not (at least according to my doctor).

Pregnancy seemed to be treated as a one-size-fits-all affair. The way I was used to making decisions—thinking about my personal preferences, combined with the data—was barely used at all. This was frustrating enough. Making it worse, the recommendations I read in books or heard from friends often contradicted what I heard from my doctor.

Pregnancy seemed to be a world of arbitrary rules. It was as if when we were shopping for houses, our realtor announced that people without kids do not like backyards, and therefore she would not be showing us any houses with backyards. Worse, it was as if when we told her that we actually do like backyards she said, "No, you don't, this is the rule." You'd fire your real estate agent on the spot if she did this. Yet this is how pregnancy often seemed to work.

This wasn't universal, of course; there were occasional decisions to which I was supposed to contribute. But even these seemed cursory. When it came time to think about the epidural, I decided not to have one. This wasn't an especially common choice, and the doctor told me something like, "Okay, well, you'll probably get one anyway." I had the appearance of decision-making authority, but apparently not the reality.

I don't think this is limited to pregnancy—other interactions with the medical system often seem to be the same way. The recognition that patient preferences might differ, which might play an important role in deciding on treatment, is at least sometimes ignored. At some point I found myself reading Jerome Groopman and Pamela Hartzband's book, *Your Medical Mind: How to Decide What Is Right for You*, and nodding along with many of their stories about people in other settings—prostate cancer, for example—who should have had a more active role in deciding which particular treatment was right for them.

But, like most healthy young women, pregnancy was my first sustained interaction with the medical system. It was getting pretty frustrating. Adding to the stress of the rules was the fear of what might go wrong if I did not follow them. Of course, I had no way of knowing how nervous I should be.



I wanted a doctor who was trained in decision making. In fact, this isn't really done much in medical schools. Appropriately, medical school tends to focus much more on the mechanics of being a doctor. You'll be glad for that, as I was, when someone actually has to get the baby out of you. But it doesn't leave much time for decision theory.

It became clear quickly that I'd have to come up with my own framework—to structure the decisions on my own. That didn't seem so hard, at least in principle. But when it came to actually doing it, I simply couldn't find an easy way to get the numbers—the data—to make these decisions.

I thought my questions were fairly simple. Consider alcohol. I figured out the way to think about the decision—there might be some decrease in child IQ from drinking in pregnancy (the minus), but I'd enjoy a glass of wine occasionally (the plus). The truth was that the plus here is small, and if there was any demonstrated impact of occasional drinking on IQ, I'd abstain. But I did need the number: would having an occasional glass of wine impact my child's IQ at all? If not, there was no reason not to have one.

Or in prenatal testing. The minus seemed to be the risk of miscarriage. The plus was information about the health of my baby. But what was the actual miscarriage risk? And how much information did these tests really provide relative to other, less risky, options?

The numbers were not forthcoming. I asked my doctor about drinking. She said that one or two drinks a week was “probably fine.” “Probably fine” is not a number. The books were the same way. They didn't always say the same thing, or agree with my doctor, but they tended to provide vague reassurances (“prenatal testing is very safe”) or blanket bans (“no amount of alcohol has been proven safe”). Again, not numbers.

I tried going a little closer to the source, reading the official recommendation from the American Congress of Obstetricians and Gynecologists. Interestingly, these recommendations were often different from what my doctor said—they seemed to be evolving faster with the current medical literature than actual practice was. But they still didn't provide numbers.

To get to the data, I had to get into the papers that the recommendations were based on. In some cases, this wasn't too hard. When it came time to think about whether or not to get an epidural, I was able to use data from randomized trials—the gold standard evidence in science—to figure out the risks and benefits.

In other cases, it was a lot more complicated. And several times—with alcohol and coffee, certainly, but also things like weight gain—I came to disagree somewhat with the official recommendations. This is where another part of my training as an economist came in: I knew enough to read the data correctly.

A few years ago, my husband wrote a paper on the impact of television on children's test scores. The American Academy of Pediatrics says there should be no television for children under two years of age. They base this recommendation on evidence provided by public health researchers (the same kinds of people who provide evidence about behavior during pregnancy). Those researchers have shown time and again that children who watch a lot of TV before the age of two tend to perform worse in school.

This research is constantly being written up in places like the New York Times Science section under headlines like SPONGEBOB THREAT TO CHILDREN, RESEARCHERS ARGUE. But Jesse was skeptical, and you should be, too. It is not so easy to isolate a simple cause-and-effect relationship in a case like this.

Imagine that I told you there are two families. In one family the one-year-old watches four hours of television per day, and in the other the one-year-old watches none. Now I want you to tell me whether you think these families are similar. You probably don't think so, and you'd be right.

On average, the kinds of parents who forbid television tend to have more education, be older, read more books, and on and on. So is it really the television that matters? Or is it all these other differences?

This is the difference between correlation and causation. Television and test scores are correlated, there is no question. This means that when you see a child who watches a lot of TV, on average you expect him to have lower test scores. But that is not causation.

The claim that SpongeBob makes your child dumber is a causal claim. If you do X, Y will happen. To prove that, you'd have to show that if you forced the children in the no-TV households to watch SpongeBob and changed nothing else about their lives, they would do worse in school. But that is awfully hard to conclude based on comparing kids who watch TV to those who do not.

In the end, Jesse (and his coauthor, Matt) designed a clever experiment.<sup>1</sup> They noted that when television was first getting popular in the 1940s and 1950s, it arrived in some parts of the country earlier than others. They identified children who lived in areas where TV was available before they were two, and compared them to children who were otherwise similar but lived in areas with no TV access until they were older than two. The families of these children were similar; the only difference was that one child had access to TV early in life and one did not. This is how you draw causal conclusions.

And they found that, in fact, television has no impact on children's test scores. Zero. Zilch. It's very precise, which is a statistical way of saying they are actually quite sure that it doesn't matter. All that research in public health about the dangers of SpongeBob? Wrong. It seems very likely that the reason SpongeBob gets a bad rap is that the kinds of parents who let their kids watch a lot of television are different. Correlation, yes. Causation, no.

Just to be clear, I'm still a little wary of television, being from one of those families where we could never watch TV. Jesse is not. Occasionally, when he thinks I'm not looking, I catch him and Penelope in the basement snuggling on the couch, enjoying some Sesame Street. When I protest, he points to the evidence, and I can't really argue.

Pregnancy, like SpongeBob, suffers from a lot of misinformation. One or two weak studies can rapidly become conventional wisdom. At some point I came across a well-cited study that indicated that light drinking in pregnancy—perhaps a drink a day—causes aggressive behavior in children. The study wasn't randomized; they just compared women who drank to women who did not. When I looked a little closer, I found that the women who drank were also much, much more likely to use cocaine.

We know that cocaine is bad for your child—not to mention the fact that women who do cocaine often have other issues. So can we really conclude from this that light drinking is a problem? Isn't it more likely (or at least equally likely) that the cocaine is the problem?

Some studies were better than others. And often, when I located the "good" studies, the reliable ones, the ones without the cocaine users, I found them painting a pretty different picture from the official recommendations.

These recommendations increasingly seemed designed to drive pregnant women crazy, to make us worry about every tiny thing, to obsess about every mouthful of food, every pound we gained. Actually getting the numbers led me to a more relaxed place—a glass of wine every now and then, plenty of coffee, exercise if you want, or not. Economics may not be known as a great stress reliever, but in this case it really is.

More than even the actual recommendations, I found having numbers at all provided some reassurance. At some point I wondered about the risks of the baby arriving prematurely. I went to the data and got some idea

of the chance of birth in each pregnancy week (and the fetal survival rate). There wasn't any decision to be made—nothing to really do about this—but just knowing the numbers let me relax a bit. These were the pregnancy numbers I thought I'd get from my doctor and from pregnancy books. In the end, it just turned out that I had to get them myself.

I've always been someone for whom knowing the data, knowing the evidence, is exactly what I need to chill out. It makes me feel comfortable and confident that I'm making the right choices. Approaching pregnancy in this way worked for me. I wasn't sure it would work for other people.

And then my friends got pregnant. Pretty much all of them at the same time. They all had the same questions and frustrations I had. Can I take a sleeping pill? Can I have an Italian sub (I really want one! Does that make a difference?)? My doctor wants to schedule a labor induction—should I do it? What's the deal with cord-blood banking?

Sometimes they weren't even pregnant yet. I had lunch with a friend who wanted to know whether she should worry about waiting a year to try to get pregnant—how fast does fertility really fall with age?

Their doctors, like mine, had a recommendation. Sometimes there was an official rule. But they wanted to make the decision that was right for them. I found myself referring to my obstetrics textbook, and to the medical literature, long after my Penelope was born. There was a limit to the role I could play—no delivering babies, fortunately (for me and, especially, the babies). But I could provide people with information, give them a way to discuss concerns with their OBs on more equal footing, help them make decisions they were happy with.

And as I talked to more and more women it became clear that the information I could give them was useful precisely because it didn't come with a specific recommendation. The key to good decision making is taking the information, the data, and combining it with your own estimates of pluses and minuses.

In some cases, the existing rule is wrong. In others, it isn't a question of right or wrong but what is right for you and your pregnancy. I looked at the evidence on the epidural, combined it with my own plus and minus preferences, and decided not to have one. My friend Jane looked at the same evidence and decided to have one. In the end, I felt fine eating deli meats; my college roommate Tricia looked at the evidence and decided she would avoid them. All of these are good decisions.

So this book is for my friends. It's the pregnancy numbers—the data to help them make their personalized pregnancy decisions and to help them understand their pregnancies in the clearest possible way, by the numbers. It's the suggestion that maybe it's okay to have a glass of wine and, more important, the data on why. It's the numbers on the risk of miscarriage by week, data on which fish to eat to make your kid smart (and which to avoid because they could make your kid dumb), information on weight gain, on prenatal testing versus prenatal screening, on bed rest and labor induction, on the epidural and the benefits (or not) of a birth plan. This book is a way to take control and to expect better.

Pregnancy and childbirth (and child rearing) are among the most important and meaningful experiences most of us will ever have; probably the most important. Yet we are often not given the opportunity to think critically about the decisions we make. Instead, we are expected to follow a largely arbitrary script without question. It's time to take control: pick up a cup of coffee or, if you like, a glass of wine, and read on.

## PART 1

### In the Beginning: Conception

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## Prep Work

Some pregnancies are a surprise. If you're one of those women who woke up feeling queasy, took a pregnancy test on a whim, and were shocked to see the second pink line show up, congratulations! Please skip ahead.

But for a lot of us, we're thinking about getting pregnant long before it actually happens. I met my husband in college in 2001. We got married in 2006. Our daughter was born in 2011. I won't say I spent the whole ten years thinking about a baby, but I (and, later, we) did make a lot of choices with at least the long-term plan of having a family.

And as I approached 30, and pregnant friends started popping up here and there, I thought a little more seriously. I wondered if there was something I should be doing in advance, even before we started trying to get pregnant. Should I change my diet? My doctor did once suggest I should cut down on coffee, just so it wouldn't be such a shock to reduce when I was pregnant. Was that really necessary?

Mostly, I worried that I was getting old.

Thirty is not actually old in pregnancy terms. "Advanced maternal age" is reserved for women over 35, and you wouldn't be faulted for thinking that 35 was a sharp cutoff. I read one paper once that referred to eggs as "best used by 35." Thanks, it's really helpful to know my sell-by date. But, of course, 35 is not a magical number. Biological processes don't work like this. Your eggs don't wake up on the morning of your 35th birthday and start planning their retirement party.

Starting pretty much the first day you menstruate, your fertility is declining. Your most fertile time is in your teens, and it goes down from there—30 is worse than 20, and 40 is worse than 30. But, of course, there are other factors that push you in other directions. I certainly wasn't in a good position to have a baby in my first year of graduate school at 23, and the truth is that I'd probably be in a better position at 35 than at 30.

It wasn't the only consideration, but I did wonder about how fast fertility declined. My doctor didn't seem worried—"You're not thirty-five yet!" she said—but that wasn't quite the detailed reassurance I was looking for.

I went looking for reassurance (or, at least, information) in the world of data, in the academic medical literature. As I expected, there was an answer. It just wasn't quite what the over-35 retired-eggs story would have suggested.

The main research on this uses data from the 1800s (it's old but the technology hasn't changed much!). Here is the idea: prior to the modern era, couples would pretty much get down to business right after the wedding, and there were limited birth control options. So you can figure out how fertility varies with age by looking at the chance of having children at all for women getting married at different ages.

Researchers found that the chance of having any children was very similar for women who got married at any age between 20 and 35. Then it began to decline: women who got married between 35 and 39 were about 90 percent as likely to have a child as those who got married younger than 35; women who got married

between 40 and 44 were only about 62 percent as likely; and women who got married between 45 and 49 were only 14 percent as likely. Put differently, virtually everyone who got married between 20 and 35 had at least one child, compared to only about 14 percent of those who got married after 45.

You may or may not like to draw conclusions from such old data. People live longer now, and are healthier longer. It is certainly possible that as longevity and health increase, women will remain fertile longer. Even if you do take this data at face value, the reduction in fertility is not as dramatic as you might have feared. The 35- to 39-year-old group is only slightly less likely to have children; the major drop in fertility is not until after 40, and at least some women over 45 in this data did conceive—this in an era well before in vitro fertilization (IVF)!

Contemporary data looks fairly similar, perhaps even somewhat more encouraging. Researchers in France studied a group of around 2,000 women who were undergoing insemination with donor sperm. One nice aspect of this study is that they didn't have to worry that older people had sex less frequently because everyone in the study was trying to get knocked up at the right time of the month in a controlled environment. After 12 cycles, the pregnancy rate was around 75 percent for women under 30, 62 percent for women 31 to 35, and 54 percent for women over 35. In this oldest group things were similar for women 36 to 40 and over 40. More than half of the over-40 women in the sample got pregnant within a year.<sup>1</sup>

In the end, my doctor was basically right to pooh-pooh my worries. But for me, seeing the numbers this way, in black and white, was far more reassuring. I could see in detail that starting to try at 30 rather than at 28 was not going to make that much difference. I could think about the timing if we wanted, for example, more than one child. And I could see that the numbers were all pretty high—for me, reading “75 percent of women were pregnant with a year” was a lot more helpful than hearing things like, “It works out for most women.” For one thing, how do I know if your “most” is the same as mine?

I'd experience this again and again. The value of having numbers—data—is that they aren't subject to someone else's interpretation. They are just the numbers. You can decide what they mean for you. In this case, it's true that it's harder to get pregnant when you are older. But it's not impossible, not even close.

When we did start thinking more seriously about a baby, I stopped focusing so much on age. (After all, what could I do? Not getting older is not exactly an option.) But I did wonder about other things I might do to prepare. I asked my OB at my yearly visit if there was anything I should be aware of. Other than some generic advice to relax (not one of my strengths), the one thing she focused on was exercise. Make sure you are exercising before you get pregnant.

When I talked to other women, it seemed like this was part of a more general theme—it's a good idea to try to be in good physical shape before getting pregnant. Independent of any medical advice, I had long harbored the fantasy of getting to my “goal weight” prior to pregnancy. I had achieved this weight exactly once in my life, before my wedding, through a process of five A.M. ninety-minute cardio workouts four days a week. I figured if I got to this weight again before we got pregnant, I'd be one of those Heidi Klum-type women who look great through the whole pregnancy and are back to bikini modeling eight weeks after giving birth.

In the end, of course, I got pregnant right after our summer vacation, not exactly the most weight-loss-friendly time of year. That's okay, I figured, I'm sure it will be easy to get to that goal weight after the baby is born. I am nothing if not optimistic.

Other than some feeling of personal achievement, it wasn't clear to me why I should care about my prepregnancy weight. Does it matter for anything? A few pounds here and there, obviously not. Overall, yes. Women (and their doctors) worry a lot about weight gain during pregnancy, but it turns out that weight before pregnancy is much more important.

About 70 percent of the U.S. population are overweight (defined as a body mass index over 25), and 35 percent are obese (BMI over 30). (Note: to calculate your BMI, take your weight in kilograms and divide it by your height in meters squared. If you are 5 feet 6 inches and 150 pounds, your BMI is 24.2.) On a number of important dimensions, obese women in particular have more difficult pregnancies than normal-weight women.

One study that demonstrates this effectively used a group of roughly 5,000 births at one hospital in Mississippi.<sup>2</sup> The advantage of using a single hospital is that it means the women are all pretty similar in terms of income, education, and other characteristics. A large percentage of the women in the study were obese.

The authors looked at a very large number of outcomes related to the mothers: preeclampsia, urinary tract infection, gestational diabetes, preterm delivery, the need for labor induction, Cesarean delivery, and postpartum hemorrhage (bleeding after birth). They also looked at some things about the babies: shoulder dystocia (when the second shoulder gets stuck during delivery), whether the baby needed help breathing, the five-minute APGAR score (a measure of the baby's condition five minutes after birth), and whether the baby was abnormally small or abnormally large.

Obese women have more pregnancy complications, as the graph on the next page illustrates. One example: 23 percent of normal-weight women have a C-section, versus almost 40 percent of obese women. The risk of preeclampsia, a serious pregnancy complication, is more than three times as high if you are obese. Overweight women (not in this graph) fall somewhere in the middle—a slightly higher risk for some complications, but the differences with normal-weight women are small.

#### Pregnancy Complications and Prepregnancy Obesity

When this study looked at infants, the babies of obese women were also more likely to have complications. If you are obese when you get pregnant, your baby is more likely to have shoulder dystocia, more likely to have low APGAR scores, and more likely to be abnormally large for gestational age. Even scarier, children of obese women are at higher risk for death, although this is very rare, regardless of Mom's weight.

This data is from just one study, but the findings are very consistent with other studies, from the United States and elsewhere.<sup>3, 4</sup> And the effects aren't limited to outcomes during pregnancy. Obese women have a harder time conceiving, and are more likely to miscarry early in pregnancy.<sup>5</sup> There is even some recent evidence that maternal obesity is associated with delays in breast milk coming in, which can impact breast-feeding success.<sup>6</sup>

#### Baby Outcome and Prepregnancy Weight

A review article from 2010 summarizes the literature on this issue with a simple statement: "Maternal obesity affects conception, duration and outcome of pregnancy. Offspring are at increased risk of both immediate and long term implications for health."<sup>7</sup> In other words, it is harder to get pregnant, harder to sustain a pregnancy, more likely that later-term complications will arise, and more likely that there will be complications with the baby. All of which you would like to avoid.

None of this is to suggest that it's a problem if you can't lose that last five pounds, of course. The outcomes here are a result of pretty large differences in weight. I may have been disappointed not to get down to my fighting weight, but it is unlikely that it mattered. And being too skinny can also interfere with conception. But it does suggest that there are real benefits to getting your weight under control before you get pregnant. Of course, weight loss may have health benefits for reasons other than pregnancy. See, your (hypothetical) baby is helping out already!

## The Bottom Line

- Fertility declines with age, but not as fast as you might expect—35 is not a magic number cutoff.
- Being obese before pregnancy is associated with an increased risk of complications for both you and your baby. Don't worry too much about a few pounds here and there, but if you are significantly overweight, weight loss before pregnancy may have benefits.

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## Data-Driven Conception

I spent most of my twenties trying not to get pregnant. I used at least three versions of the birth control pill and even, for a brief time, something called “The Patch.” So I knew I was really good at not getting pregnant. Of course, I worried that perhaps I wouldn't be so good at getting pregnant.

I'd like to say that I approached the process of conception in a laissez-faire way. After all, I was only thirty, we had plenty of time, and there was no indication that we'd have trouble conceiving. I wish I could say I was like my sister-in-law, Rebecca, who was so relaxed about this with my nephew that she was two months along before she even realized she was pregnant.

But this doesn't really fit with my personality. I suspected even before we got down to business that I would be a neurotic mess. I was correct. I actually had a panic attack about this before we even started trying. It must be a record. When I went to my primary care doctor, she looked at me thoughtfully and suggested that perhaps knowing more about the process would help me relax (even if I couldn't actually control it).

I don't know why this hadn't occurred to me before, but she was exactly right. On her recommendation, I picked up a copy of *Taking Charge of Your Fertility* and read it cover to cover.

The main thing I learned was that a lot has to go right to get pregnant. It's kind of amazing that the human race continues to exist at all.

You probably remember the basics of conception from health class: unprotected sex, sperm meets egg, and, all of a sudden, you're pregnant. High school health class tends to give the impression that pregnancy is really, really likely—part of the general scare-tactic attitude. But, in fact, the majority of the time it is not possible to get pregnant. The key issue is timing: you need sperm to be around at the exact moment that the egg is ready.

When is that? The average woman has a menstrual cycle of 28 days, counting from the beginning of one period to the beginning of the next. The first day of your period is considered day 1. The week of your period and the week after it are preparation for ovulation. About 14 days after your period starts the egg is released (this is ovulation) and begins to travel down toward the uterus.

The egg is available for fertilization during this journey, which lasts a couple of days. If the egg meets a sperm on its way to the uterus and the sperm gets lucky, fertilization occurs. If you happen to release two eggs and they both meet sperm, you get twins; twins can also happen if the fertilized egg divides right at the beginning. When the fertilized egg (or eggs) reaches the uterus, implantation occurs and pregnancy actually begins. The process from egg release to implantation lasts 6 to 12 days. For most successful pregnancies, implantation occurs 22 to 24 days after the first day of your last period.<sup>1</sup>

This whole second half of the cycle (after the egg is released) is called the luteal phase. It's either taken up with fertilization and implantation (if you get pregnant) or with the egg waiting around in the uterus to be flushed out during your period. If you do not get pregnant, day 28 will bring your period. If you do get pregnant, day 28 will roll around periodless, and you'll be off and running. Here's the basic timeline (this is for someone with a standard 28-day cycle; if your cycle is a few days longer or shorter you might ovulate a bit earlier or later than day 14):

The key to pregnancy is that when the egg starts making its way down the tube, the sperm has to be waiting for it. This means the best time for sex or insemination is the day before or the day of ovulation. It takes some time for sperm to swim into the fallopian tubes, so the day after ovulation is generally too late.

Sperm are, however, a bit more robust than the egg. They can typically live up to 5 days in the fallopian tube, waiting. This means the window is actually a bit longer. Sex 4 or 5 days before ovulation can lead to a baby, although it's less likely. I was curious about how much less likely. All this talk about a small "ovulation window"—was there really any truth to that? How small was the window?

Figuring this out actually requires knowing quite a lot about people's sex lives. Fortunately, at least some researchers are up to the challenge. I found a study that followed more than 200 couples who were trying to conceive for more than a year. The authors recorded detailed information on when they had sex and collected their urine daily (daily!) so they could monitor both ovulation and pregnancy.<sup>2</sup> Using this information, the researchers figured out the best timing for baby-making sex (this wasn't the goal of the study, just an auxiliary fact we can learn from it).

What makes this question a bit tricky to answer is that most couples trying to get pregnant have sex frequently. This makes it hard to know which sex act led to the baby—was it the sex you had on the day of ovulation? Or three days before? The researchers get around this by focusing on women who had sex just one time in the plausible conception window.

Using these one-day-of-sex people, we can figure out the chance of conception by day. Here it is:

#### Probability of Conception by Cycle Day

For most of the month, pregnancy is impossible (at least based on these data). No one conceived by having sex after ovulation—by the time the sperm gets up into the fallopian tubes, the egg is long gone. In addition, no one conceived by having sex more than 5 days before ovulation.

The window of possible conception is short: from 5 days before ovulation through the day of ovulation. But note that if you time it right, the chances of pregnancy are good. Conception rates are more than 30 percent for the day before and the day of ovulation! These odds are really not bad.

If you had to pick just one day in the month for sex, you'd want to pick the day you ovulate (or the day before: the pregnancy rates are similar). If you are using artificial insemination, it also makes sense to focus on the day before and the day of ovulation, when fertilization is most likely. For most women with a standard 28-day cycle, this is around the 14th day after your period starts.

Of course, one way to make sure that you definitely have sex on the day of ovulation is to have sex every day around the possible ovulation day (or just have sex every day). This technique is typically pretty popular with husbands, at least in the first month or two. But some OBs will warn you off this. I was told that the best strategy is to have sex every other day. If you did this, you'd be sure to capture at least one of the two best days, and the argument is that if you (or your partner) "save up" the sperm, then pregnancy chances are increased. On the other hand, saving them too much (say, skipping sex for more than ten days) tends to cause



their effectiveness to diminish.<sup>3</sup>

This always sounded a little suspicious to me. I can easily believe that the amount of sperm is higher if you wait a day, but could it really be more than twice as high, which is what would have to be true for the every-other-day plan to beat out the every-day plan?

It turns out my skepticism was somewhat well placed. The same paper that gave me information on the right day for sex also determined whether frequency of intercourse mattered. The researchers calculated the predicted chance of pregnancy for people who had sex once during the 6-day window leading up to ovulation, for those who had it twice, three times, and so on. The chances were almost identical. In other words, there seems to be no benefit to alternating sex days, having sex more frequently, or having sex less frequently. The crucial thing is to hit the day of ovulation or the day before.

This appeared to make things simple. All I had to do was figure out when I was going to ovulate, and then have sex that day or the day before. I figured this wouldn't be that hard, although I worried a bit about work travel, and I patted myself on the back for having avoided what the fertility book suggested was the major infertility pitfall—namely, not having sex on the right day.

There was just one remaining problem: I didn't seem to be ovulating at all. Or, at least, things didn't seem to be behaving normally. When I went off the pill, my doctor said my cycle would return to normal (or return to whatever it was before I went on the pill, as if I could remember that). She said it would happen within three months. It didn't. I went two months between periods, then had two within a few weeks.

I called the doctor at 3 months and 1 day. What is going on? I asked the nurse when she called back. Should I be worried? What should I do?

What I wanted was a concrete answer. Something like: 70 percent of women resume normal cycles within 3 months, 90 percent within 6 months. I wanted to know whether it mattered that I had been on the pill for 12 years. Would it take longer to get back to normal? This is not what I got. What I got was best described as vague reassurance (and the ever-helpful "Just relax!").

I thought if I pushed, I would get to the more detailed evidence, but I didn't. "Everyone is different," I was told. "Yes, that is why I asked about the average," I grumbled to Jesse. I would have this type of experience again and again. How accurate is the prenatal screening they suggested? "Quite accurate." When should I expect to go into labor? "It's a different time for everyone."

I wanted a number. I craved evidence. Even if the answer was that the evidence was flawed and incomplete, I wanted to know about it. Yes, I understood that everyone was different. But that doesn't mean there isn't any information!

Again, I headed out on my own to look for the numbers.

The most popular temporary forms of birth control in the United States are (in order): the pill, condoms, IUDs, and the withdrawal method. Obviously, neither condoms nor the withdrawal method have any impact on your menstrual cycle. If you've been using condoms, whatever cycle you've had up until now will continue. Same for withdrawal, and for any other barrier method (diaphragm, Today Sponge, etc.).

The pill makes things more complicated. As my doctor noted, sometimes the cycle returns to normal right away, but sometimes it takes a bit longer. The advantage of referring to the actual studies is that we can be more precise. In one study in Germany,<sup>4</sup> researchers studied menstrual cycles of women who just went off the pill. For some women it took up to 9 months to get back to a "normal" cycle. In the initial months after

going off the pill these women had longer menstrual cycles, were more likely to have cycles in which they didn't ovulate, and were more likely to have cycles where the second half of the cycle (the luteal phase) was so short that pregnancy was unlikely.

This study is similar to others. Researchers in the United States studying women who had gone off the pill in the last 3 months found they had longer cycles (by a couple of days), more variable cycle length, and later ovulation in some cycles than those who had been off the pill longer.<sup>5</sup> In addition, when researchers measured their cervical mucus, the women who had been off the pill longer had cervical mucus that was more "welcoming" to the sperm.

The very good news, however, is that these effects are relatively short-lived. In the German study, virtually everyone had a normal cycle by 9 months after going off the pill. For some women it is much faster: 60 percent of women in that study had a normal cycle the first month off the pill.

I was also reassured that once you do ovulate, having been on the pill doesn't seem to impact pregnancy rates. In another German study,<sup>6</sup> researchers studied women actually trying to get pregnant. They found that women who had just gone off the pill were slightly less likely to get pregnant in the first 3 months of trying, but no less likely to be pregnant within a year. This study also looked at the duration of pill usage and found no effect: even for people like me, who had been on the pill since their teenage years, things went back to normal in the same basic time frame.

What I took from this was that worrying at 3 months and 1 day was unnecessary. If I got to 9 months without things normalizing I could consider stressing out a bit.

Fewer women use IUDs, but the rates have crept up in the last decade. As with the pill, it takes a bit of time to recover fertility after using an IUD. In a recent literature review, authors found that women who had just gone off an IUD took (on average) a month longer to get pregnant than those who had just stopped oral contraceptives, but 80 to 90 percent (depending on the study) were pregnant within one year.<sup>7</sup>

So I waited, and a couple of months later things normalized a bit, just like the data said they would. But I still needed to figure out when I was ovulating. Day 14? Day 16? Day 12? Even after 6 months my cycle wasn't completely regular; I couldn't just assume it was day 14. Also, I quickly figured out that this was an opportunity to collect data. I couldn't resist!

There are three common ways to detect ovulation: temperature charting, checking cervical mucus, and pee sticks. The first two of these have been in use for many years; the pee stick method is relatively new.

**Temperature Charting:** Temperature charting (sometimes called BBT charting, for basal body temperature) relies on the mildly interesting fact that your body temperature is higher in the second half of the month, after ovulation, than before. You can therefore figure out when you ovulate by taking your temperature every day. The technique itself is not complicated. Every morning before you get out of bed (moving around affects your temperature; you ideally want to take it as soon as you wake up, before you do anything), you take your temperature using an accurate digital thermometer.

For the first half of the month, your temperature will be low—typically below 98 degrees. The day after ovulation, it will jump up, usually at least half a degree and sometimes more. This is the sign that you ovulated. Your temperature will stay high through the rest of the month, and then drop on the day your period starts, or (often) the day before. If you get pregnant, your temperature will stay high.

There are some very good things about temperature charting. In the month you are doing it, it can tell you with high certainty that you did, in fact, ovulate. If your cycles are regular, it can help you plan for the next

month by showing you the day on which you generally ovulate. It can also tell you that you are pregnant. More than 14 days of high temperatures is a very good indication of pregnancy.

However, this isn't perfect. The biggest issue is that it tells you only after you ovulate. So although it is useful for predicting the next month, it doesn't help with this month. Also, it's not as simple as it seems. To really make this work you need to take your temperature at the same time every day, ideally first thing in the morning after four to five hours of continuous sleep. The results can get screwed up by jet lag, a fever, or a bad night of sleep.

I liked this method a lot, if only because it enabled me to feel like I was doing something proactive every day (and because it produced data, which I could use to make attractive charts). The downside is that I was never especially good at it.

My temperature chart from the month that I got pregnant with Penelope is on the next page. On one hand, the fact that my temperature eventually elevated and stayed up gave me a (small) clue that I was pregnant. On the other hand, all the jet lag and my generally poor sleep meant that it was almost impossible to interpret. I initially thought I ovulated on June 9 because my temperature went up on June 10; then I realized this was just because of the time change when we got back from Europe. The sustained higher temperatures did not occur until I got back from Ghana. The only way I knew that I must have ovulated before that trip was that Jesse wasn't there!

#### Basal Body Temperature Chart, June 2010

We can be a little more scientific about how useful this is for the average woman. In a study from the late 1990s,<sup>8</sup> researchers followed a set of women trying not to get pregnant and evaluated how good various methods were at detecting ovulation. In this study they were able to pinpoint the actual date of ovulation using ultrasound, so they knew the truth. The temperature-charting method as used by these women accurately identified the day of ovulation about 30 percent of the time. Another 30 percent of the time this method pointed to ovulation one day before it actually occurred.

That day before ovulation is also good for pregnancy sex. Putting this together: if you have sex on the date indicated by temperature charting, 60 percent of the time you would manage to time sex on one of the two most fertile days of the month.

**Cervical Mucus:** If you really want to get serious about natural ovulation detection, you probably want to chart your cervical mucus along with your temperature. This is a bit more complicated than temperature charting and, at least for some women (read: me), there is an "ick" factor. Here's the idea: right around ovulation your body produces a type of mucus ideal for sperm to swim through. You can detect this mucus in and around your cervix.

#### Most helpful customer reviews

526 of 564 people found the following review helpful.

Fact-based book for empowered pregnancy choices

By Caroline Niziol

If you asked me a couple of weeks ago if I was interested in reading *Yet Another Pregnancy Book*, I would have laughed. Hardly! I read a couple early on, then turned to the almighty Google when I had questions or curiosities. Then about a week ago, my mom clipped an excerpt from the *Wall Street Journal* called "Take Back Your Pregnancy." Well, I took the bait. Emily Oster's article intrigued me. Definitely one for any subsequent pregnancy, I thought!

Then the furor struck on the Interwebs. Because Oster draws the conclusion from a variety of studies and data that it's fine to indulge in the occasional alcoholic beverage during pregnancy, she has been excoriated in a variety of articles and in the responding comments. Current Amazon.com reviews are skewed by those who take issue with an economist (not a medical doctor) who will, in their minds, increase the number of children born with FASD (Fetal Alcohol Spectrum Disorder). Several comments made nasty remarks about the author's 2-year-old daughter, Penelope, implying that it was only a matter of time before she would begin to fail IQ tests and demonstrate signs of FASD herself.

Was Oster truly that horrible and conniving? Did she write her book to cause birth defects and emotional trauma? I had to know the truth, and while 40 weeks and two days pregnant, I picked up *Expecting Better* and read it carefully.

Spoiler alert: it's really not that bad. I love authors who examine evidence, explain scientific studies and methodology, and draw logical conclusions about the data. Oster isn't an ob/gyn, but she's a well-trained economist whose job is interpreting data. Her analysis is thorough even as she keeps her writing accessible, humorous, and sympathetic. As she points out in the introduction, advice about pregnancy tends to be either black and white--don't have any drinks, ever--or vague--drink coffee in moderation. Instead of relying on the hearsay, she reviews the actual data and comes to her own conclusions. Oster doesn't demand that women drink during pregnancy despite their own reservations. Not at all! She just presents the evidence that light drinking has been shown to be not harmful, and lets the reader make her own choice.

The knee-jerk reactions to the book and Oster's approach are misguided because they don't realize that telling women what to do during pregnancy is exactly the opposite of Oster's intentions. Rather, she wants all the data laid out so women can make informed decisions during pregnancy based on their own assessment and comfort levels with varying amounts of risk. That is far more empowering and practical than a notarized list of what to do and not do. She gives examples in the text, citing instances where her review of the data prompted her to chose one path and a friend reviewing the same data to chose another path. That is fine. The goal is seeking knowledge to inform personal decisions.

Pregnancy in the U.S. is fraught with judgment from family, friends, and total strangers that add extra stress in an already anxious time. *Expecting Better* steps back from the hysteria and offers women up-to-date, relevant information about the choices they will need to make during pregnancy. I'll definitely be recommending this one to pregnant friends in the future.

334 of 364 people found the following review helpful.

**YES! A data driven book on pregnancy-- a MUST READ!**

By Annie Y.

My husband showed me an article on Emily Oster's book (published in the Wall Street Journal, August 9th) and once I read it, I could not wait to read her book. I am 12 weeks pregnant and could not understand the lack of data supporting all of the rules that pregnant women must adhere to. I saw 2 OB-GYN's and both doctors provided differing views, without providing sound data... was it just their opinion they were spouting off to me? That's what it seemed like to me. Women must make their own decisions, at the end of the day, and I am shocked with the negative reviews this book is receiving. This book is a **MUST READ FOR ALL WOMEN!!**

The negativity is around drinking --- Emily Oster is NOT supporting drinking while being pregnant. This book provides multiple studies on women who drink and shows us that if you have a drink or two, you are **NOT HURTING YOUR BABY**. But if you don't agree with this philosophy, then don't drink and mind your own business! There are plenty of women around the world who drink while carrying a child. I highly doubt

that the reviewers who are so concerned with FAS have actually read the book!!

I loved the chapter on miscarrying since there is so much random information online. I too, like Emily's friend in the book, wondered the % of miscarrying at varying weeks. It is comforting to know that there are many reasons why women miscarry and you can't make a generalization as to your chances of miscarrying.

Another chapter I appreciated was foods you really should avoid. Even though I'm pregnant, I don't want to feel like I can't live and enjoy food! Knowing the foods I must avoid brings me a peace of mind. In addition, I always wondered about listeria and did not believe it would be harmful to me or my baby. But Emily Oster opened my eyes to the seriousness of this bacteria.

I am so thankful that this book came out during my 1st pregnancy. I felt very lost with all of the information that was provided to me and I kept wondering, "why is there such differing information out there?" This book is a god-send and every chapter is useful and to make it even better, she is HILARIOUS! This author is really funny and she adds personal touches throughout the book so you feel connected to her as well.

You cannot disagree with data and please do not be influenced by the negative reviews. Please get this book and make your own decision. I am so thankful that I bought the book and I hope you enjoy it as much as I have!

344 of 389 people found the following review helpful.

Case In Point

By Melina

The highly emotional reviews railing against Ms. Oster's book are exactly why this book was necessary. Too often, we rely on unbridled emotion to make really big decisions, when in reality our emotion needs to be tempered by factual data (so that we are not scared into doing something that may, in fact, be MORE dangerous). For what it's worth, I am incredibly conservative on the topic of alcohol. I myself do not drink. I am aware of and take seriously the damage alcohol can do to people. That being said, I hope that I NEVER, EVER come across as expounding the belief that alcohol is bad, hands down. While I certainly would not choose to drink during my pregnancy (for the reason that I live a sober life), I absolutely do NOT condemn those who choose to do so. I have a great appreciation for the numbers, and the numbers have clearly shown that small amounts in the 2nd and 3rd tri are unlikely to have any impact on the developing fetus. There is no arguing with that. It is fact, and it is public. Nowhere in Ms. Oster's book does she encourage ANYONE to drink. All Ms. Oster has done is collect the information that was already publicly available, and make it palatable for the average person. With all due respect to those representing NOFAS in the reviews here, this book is not going to change anything. People who are alcoholics and drink excessively during pregnancy have a problem that has probably never been influenced by medical data, not even when it was still believed by researchers that any amount of alcohol was hazardous to a developing fetus. As someone who has had to make very difficult decisions in my pregnancy, I have greatly appreciated having this book---a beacon of sanity in a period that is fraught with fear-mongering and false information. The overall takeaway is not that you SHOULD do anything discussed in the book, but rather look at the evidence (which Ms. Oster did not invent, but merely provided) and use a healthy combination of emotional and rational thought in the decision-making process.

See all 531 customer reviews...

# **EXPECTING BETTER: WHY THE CONVENTIONAL PREGNANCY WISDOM IS WRONG--AND WHAT YOU REALLY NEED TO KNOW BY EMILY OSTER PDF**

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## Review

"Expecting Better gives moms-to-be a big helping of peace of mind! Oster debunks many tired old myths and shines a light on issues that really matter."

—Harvey, Karp, MD, bestselling author of *The Happiest Baby Guide to Sleep* and *The Happiest Baby on the Block*

"It took someone as smart as Emily Oster to make it all this simple. She cuts through the thicket of anxiety and received wisdom, and gives us the facts. *Expecting Better* is both enlightening and calming. It almost makes me want to get pregnant."

—Pamela Druckerman, New York Times bestselling author of *Bringing Up Bébé* and *Bébé Day by Day*

"This is a fascinating—and reassuring—look at the most important numbers of your pregnancy. It will make parents-to-be rethink much of the conventional wisdom: think bed rest is a good idea? Think again. This may be the most important book about pregnancy you read."

—Steven D. Levitt, New York Times bestselling co-author of *Freakonomics*

"*Expecting Better* is a fascinating and reassuring tour of pregnancy and childbirth, with data leading the way at every juncture. From start to finish, Oster easily leads us through the key findings of the extant pregnancy-related research. My only regret is that my wife and I had three children without the benefit of this insightful approach."

—Charles Wheelan, New York Times bestselling author of *Naked Statistics*

"The only antidote to pregnancy anxiety is facts, and Emily Oster has them in spades. Disarmingly personal and easy to read, this book is guaranteed to cut your freaking out in half. Pregnancy studies has a new heroine. Every pregnant woman will cheer this book—and want to take Oster out for a shot of espresso."

—Rachel Simmons, New York Times bestselling author of *Curse of the Good Girl*

## About the Author

Emily Oster, the daughter of two economists and the wife of a third, is an associate professor of economics at the University of Chicago Booth School. She lives with her husband and daughter in Chicago.

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## Introduction

In the fall of 2009 my husband, Jesse, and I decided to have a baby. We were both economics professors at the University of Chicago. We'd been together since my junior year of college, and married almost five years. Jesse was close to getting tenure, and my work was going pretty well. My thirtieth birthday was around the corner.

We'd always talked about having a family, and the discussion got steadily more serious. One morning in October we took a long run together and, finally, decided we were ready. Or, at the very least, we probably were not going to get any more ready. It took a bit of time, but about eighteen months later our daughter, Penelope, arrived.

I'd always worried that being pregnant would affect my work—people tell all kinds of stories about “pregnancy brain,” and missing weeks (or months!) of work for morning sickness. As it happens, I was lucky

and it didn't seem to make much difference (actually having the baby was another story).

But what I didn't expect at all is how much I would put the tools of my job as an economist to use during my pregnancy. This may seem odd. Despite the occasional use of "Dr." in front of my name, I am not, in fact, a real doctor, let alone an obstetrician. If you have a traditional view of economics, you're probably thinking of Ben Bernanke making Fed policy, or the guys creating financial derivatives at Goldman Sachs. You would not go to Alan Greenspan for pregnancy advice.

But here is the thing: the tools of economics turn out to be enormously useful in evaluating the quality of information in any situation. Economists' core decision-making principles are applicable everywhere. Everywhere. And that includes the womb.

When I got pregnant, I pretty quickly learned that there is a lot of information out there about pregnancy, and a lot of recommendations. But neither the information nor the recommendations were all good. The information was of varying quality, and the recommendations were often contradictory and occasionally infuriating. In the end, in an effort to get to the good information—to really figure out the truth—and to make the right decisions, I tackled the problem as I would any other, with economics.

At the University of Chicago I teach introductory microeconomics to first-year MBA students. My students would probably tell you the point of the class is to torture them with calculus. In fact, I have a slightly more lofty goal. I want to teach them decision making. Ultimately, this is what microeconomics is: decision science—a way to structure your thinking so you make good choices.

I try to teach them that making good decisions—in business, and in life—requires two things. First, they need all the information about the decision—they need the right data. Second, they need to think about the right way to weigh the pluses and minuses of the decision (in class we call this costs and benefits) for them personally. The key is that even with the same data, this second part—this weighing of the pluses and minuses—may result in different decisions for different people. Individuals may value the same thing differently.

For my students, the applications they care about most are business-related. They want to answer questions like, should I buy this company or not? I tell them to start with the numbers: How much money does this company make? How much do you expect it to make in the future? This is the data, the information part of the decision.

Once they know that, they can weigh the pluses and minuses. Here is where they sometimes get tripped up. The plus of buying is, of course, the profits that they'll make. The minus is that they have to give up the option to buy something else. Maybe a better company. In the end, the decision rests on evaluating these pluses and minuses for them personally. They have to figure out what else they could do with the money. Making this decision correctly requires thinking hard about the alternative, and that's not going to be the same for everyone.

Of course, most of us don't spend a lot of time purchasing companies. (To be fair, I'm not sure this is always what my students use my class for, either—I recently got an e-mail from a student saying that what he learned from my class was that he should stop drinking his beer if he wasn't enjoying it. This actually is a good application of the principle of sunk costs, if not the primary focus of class.) But the concept of good decision making goes far beyond business.

In fact, once you internalize economic decision making, it comes up everywhere.

When Jesse and I decided we should have a baby, I convinced him that we had to move out of our third-floor



walk-up. Too many steps with a stroller, I declared. He agreed, as long as I was willing to do the house shopping.

I got around to it sometime in February, in Chicago, and I trekked in the snow to fifteen or sixteen seemingly identical houses. When I finally found one that I liked (slightly) more than the others, the fun started. We had to make a decision about how much to offer for it.

As I teach my students, we started with the data: we tried to figure out how much this particular house was worth in the market. This wasn't too difficult. The house had last sold in 2007, and we found the price listed online. All we had to do was figure out how much prices had changed in the last two years. We were right in the middle of a housing crisis—hard to miss, especially for an economist—so we knew prices had gone down. But by how much?

If we wanted to know about price changes in Chicago overall we could have used something called the Case-Shiller index, a common measure of housing prices. But this was for the whole city—not just for our neighborhood. Could we do better? I found an online housing resource (Zillow.com) that provided simple graphs showing the changes in housing prices by neighborhood in Chicago. All we had to do was take the old price, figure out the expected change, and come up with our new price.

This was the data side of the decision. But we weren't done. To make the right decision we still needed the pluses and minuses part. We needed to think about how much we liked this house relative to other houses. What we had figured out was the market price for the house—what we thought other people would want to pay, on average. But if we thought this house was really special, really perfect, and ideal for us in particular, we would probably want to bid more than we thought it was worth in the market—we'd be willing to pay something extra because our feelings about this house were so strong.

There wasn't any data to tell us about this second part of the decision; we just had to think about it. In the end, we thought that, for us, this house seemed pretty similar to all the other ones. We bid the price we thought was correct for the house, and we didn't get it. (Maybe it was the pricing memo we sent with our bid? Hard to say.) In the end, we bought another house we liked just as much.

But this was just our personal situation. A few months later one of our friends fell in love with one particular house. He thought this house was a one-of-a-kind option, perfect for him and his family. When it came down to it, he paid a bit more than the data might have suggested. It's easy to see why that's also the right decision, once you use the right decision process—the economist's decision process.

Ultimately, as I tell my students, this isn't just one way to make decisions. It is the correct way.

So, naturally, when I did get pregnant I thought this was how pregnancy decision making would work, too. Take something like amniocentesis. I thought my doctor would start by outlining a framework for making this decision—pluses and minuses. She'd tell me the plus of this test is you can get a lot of information about the baby; the minus is that there is a risk of miscarriage. She'd give me the data I needed. She'd tell me how much extra information I'd get, and she'd tell me the exact risk of miscarriage. She'd then sit back, Jesse and I would discuss it, and we'd come to a decision that worked for us.

This is not what it was like at all.

In reality, pregnancy medical care seemed to be one long list of rules. In fact, being pregnant was a lot like being a child again. There was always someone telling you what to do. It started right away. "You can have only two cups of coffee a day." I wondered why—what were the minuses (I knew the pluses—I love coffee!)? What did the numbers say about how risky this was? This wasn't discussed anywhere.

And then we got to prenatal testing. “The guidelines say you should have an amniocentesis only if you are over thirty-five.” Why is that? Well, those are the rules. Surely that differs for different people? Nope, apparently not (at least according to my doctor).

Pregnancy seemed to be treated as a one-size-fits-all affair. The way I was used to making decisions—thinking about my personal preferences, combined with the data—was barely used at all. This was frustrating enough. Making it worse, the recommendations I read in books or heard from friends often contradicted what I heard from my doctor.

Pregnancy seemed to be a world of arbitrary rules. It was as if when we were shopping for houses, our realtor announced that people without kids do not like backyards, and therefore she would not be showing us any houses with backyards. Worse, it was as if when we told her that we actually do like backyards she said, “No, you don’t, this is the rule.” You’d fire your real estate agent on the spot if she did this. Yet this is how pregnancy often seemed to work.

This wasn’t universal, of course; there were occasional decisions to which I was supposed to contribute. But even these seemed cursory. When it came time to think about the epidural, I decided not to have one. This wasn’t an especially common choice, and the doctor told me something like, “Okay, well, you’ll probably get one anyway.” I had the appearance of decision-making authority, but apparently not the reality.

I don’t think this is limited to pregnancy—other interactions with the medical system often seem to be the same way. The recognition that patient preferences might differ, which might play an important role in deciding on treatment, is at least sometimes ignored. At some point I found myself reading Jerome Groopman and Pamela Hartzband’s book, *Your Medical Mind: How to Decide What Is Right for You*, and nodding along with many of their stories about people in other settings—prostate cancer, for example—who should have had a more active role in deciding which particular treatment was right for them.

But, like most healthy young women, pregnancy was my first sustained interaction with the medical system. It was getting pretty frustrating. Adding to the stress of the rules was the fear of what might go wrong if I did not follow them. Of course, I had no way of knowing how nervous I should be.

I wanted a doctor who was trained in decision making. In fact, this isn’t really done much in medical schools. Appropriately, medical school tends to focus much more on the mechanics of being a doctor. You’ll be glad for that, as I was, when someone actually has to get the baby out of you. But it doesn’t leave much time for decision theory.

It became clear quickly that I’d have to come up with my own framework—to structure the decisions on my own. That didn’t seem so hard, at least in principle. But when it came to actually doing it, I simply couldn’t find an easy way to get the numbers—the data—to make these decisions.

I thought my questions were fairly simple. Consider alcohol. I figured out the way to think about the decision—there might be some decrease in child IQ from drinking in pregnancy (the minus), but I’d enjoy a glass of wine occasionally (the plus). The truth was that the plus here is small, and if there was any demonstrated impact of occasional drinking on IQ, I’d abstain. But I did need the number: would having an occasional glass of wine impact my child’s IQ at all? If not, there was no reason not to have one.

Or in prenatal testing. The minus seemed to be the risk of miscarriage. The plus was information about the health of my baby. But what was the actual miscarriage risk? And how much information did these tests really provide relative to other, less risky, options?

The numbers were not forthcoming. I asked my doctor about drinking. She said that one or two drinks a

week was “probably fine.” “Probably fine” is not a number. The books were the same way. They didn’t always say the same thing, or agree with my doctor, but they tended to provide vague reassurances (“prenatal testing is very safe”) or blanket bans (“no amount of alcohol has been proven safe”). Again, not numbers.

I tried going a little closer to the source, reading the official recommendation from the American Congress of Obstetricians and Gynecologists. Interestingly, these recommendations were often different from what my doctor said—they seemed to be evolving faster with the current medical literature than actual practice was. But they still didn’t provide numbers.

To get to the data, I had to get into the papers that the recommendations were based on. In some cases, this wasn’t too hard. When it came time to think about whether or not to get an epidural, I was able to use data from randomized trials—the gold standard evidence in science—to figure out the risks and benefits.

In other cases, it was a lot more complicated. And several times—with alcohol and coffee, certainly, but also things like weight gain—I came to disagree somewhat with the official recommendations. This is where another part of my training as an economist came in: I knew enough to read the data correctly.

A few years ago, my husband wrote a paper on the impact of television on children’s test scores. The American Academy of Pediatrics says there should be no television for children under two years of age. They base this recommendation on evidence provided by public health researchers (the same kinds of people who provide evidence about behavior during pregnancy). Those researchers have shown time and again that children who watch a lot of TV before the age of two tend to perform worse in school.

This research is constantly being written up in places like the New York Times Science section under headlines like SPONGEBOB THREAT TO CHILDREN, RESEARCHERS ARGUE. But Jesse was skeptical, and you should be, too. It is not so easy to isolate a simple cause-and-effect relationship in a case like this.

Imagine that I told you there are two families. In one family the one-year-old watches four hours of television per day, and in the other the one-year-old watches none. Now I want you to tell me whether you think these families are similar. You probably don’t think so, and you’d be right.

On average, the kinds of parents who forbid television tend to have more education, be older, read more books, and on and on. So is it really the television that matters? Or is it all these other differences?

This is the difference between correlation and causation. Television and test scores are correlated, there is no question. This means that when you see a child who watches a lot of TV, on average you expect him to have lower test scores. But that is not causation.

The claim that SpongeBob makes your child dumber is a causal claim. If you do X, Y will happen. To prove that, you’d have to show that if you forced the children in the no-TV households to watch SpongeBob and changed nothing else about their lives, they would do worse in school. But that is awfully hard to conclude based on comparing kids who watch TV to those who do not.

In the end, Jesse (and his coauthor, Matt) designed a clever experiment.<sup>1</sup> They noted that when television was first getting popular in the 1940s and 1950s, it arrived in some parts of the country earlier than others. They identified children who lived in areas where TV was available before they were two, and compared them to children who were otherwise similar but lived in areas with no TV access until they were older than two. The families of these children were similar; the only difference was that one child had access to TV early in life and one did not. This is how you draw causal conclusions.

And they found that, in fact, television has no impact on children's test scores. Zero. Zilch. It's very precise, which is a statistical way of saying they are actually quite sure that it doesn't matter. All that research in public health about the dangers of SpongeBob? Wrong. It seems very likely that the reason SpongeBob gets a bad rap is that the kinds of parents who let their kids watch a lot of television are different. Correlation, yes. Causation, no.

Just to be clear, I'm still a little wary of television, being from one of those families where we could never watch TV. Jesse is not. Occasionally, when he thinks I'm not looking, I catch him and Penelope in the basement snuggling on the couch, enjoying some Sesame Street. When I protest, he points to the evidence, and I can't really argue.

Pregnancy, like SpongeBob, suffers from a lot of misinformation. One or two weak studies can rapidly become conventional wisdom. At some point I came across a well-cited study that indicated that light drinking in pregnancy—perhaps a drink a day—causes aggressive behavior in children. The study wasn't randomized; they just compared women who drank to women who did not. When I looked a little closer, I found that the women who drank were also much, much more likely to use cocaine.

We know that cocaine is bad for your child—not to mention the fact that women who do cocaine often have other issues. So can we really conclude from this that light drinking is a problem? Isn't it more likely (or at least equally likely) that the cocaine is the problem?

Some studies were better than others. And often, when I located the "good" studies, the reliable ones, the ones without the cocaine users, I found them painting a pretty different picture from the official recommendations.

These recommendations increasingly seemed designed to drive pregnant women crazy, to make us worry about every tiny thing, to obsess about every mouthful of food, every pound we gained. Actually getting the numbers led me to a more relaxed place—a glass of wine every now and then, plenty of coffee, exercise if you want, or not. Economics may not be known as a great stress reliever, but in this case it really is.

More than even the actual recommendations, I found having numbers at all provided some reassurance. At some point I wondered about the risks of the baby arriving prematurely. I went to the data and got some idea of the chance of birth in each pregnancy week (and the fetal survival rate). There wasn't any decision to be made—nothing to really do about this—but just knowing the numbers let me relax a bit. These were the pregnancy numbers I thought I'd get from my doctor and from pregnancy books. In the end, it just turned out that I had to get them myself.

I've always been someone for whom knowing the data, knowing the evidence, is exactly what I need to chill out. It makes me feel comfortable and confident that I'm making the right choices. Approaching pregnancy in this way worked for me. I wasn't sure it would work for other people.

And then my friends got pregnant. Pretty much all of them at the same time. They all had the same questions and frustrations I had. Can I take a sleeping pill? Can I have an Italian sub (I really want one! Does that make a difference?)? My doctor wants to schedule a labor induction—should I do it? What's the deal with cord-blood banking?

Sometimes they weren't even pregnant yet. I had lunch with a friend who wanted to know whether she should worry about waiting a year to try to get pregnant—how fast does fertility really fall with age?

Their doctors, like mine, had a recommendation. Sometimes there was an official rule. But they wanted to make the decision that was right for them. I found myself referring to my obstetrics textbook, and to the

medical literature, long after my Penelope was born. There was a limit to the role I could play—no delivering babies, fortunately (for me and, especially, the babies). But I could provide people with information, give them a way to discuss concerns with their OBs on more equal footing, help them make decisions they were happy with.

And as I talked to more and more women it became clear that the information I could give them was useful precisely because it didn't come with a specific recommendation. The key to good decision making is taking the information, the data, and combining it with your own estimates of pluses and minuses.

In some cases, the existing rule is wrong. In others, it isn't a question of right or wrong but what is right for you and your pregnancy. I looked at the evidence on the epidural, combined it with my own plus and minus preferences, and decided not to have one. My friend Jane looked at the same evidence and decided to have one. In the end, I felt fine eating deli meats; my college roommate Tricia looked at the evidence and decided she would avoid them. All of these are good decisions.

So this book is for my friends. It's the pregnancy numbers—the data to help them make their personalized pregnancy decisions and to help them understand their pregnancies in the clearest possible way, by the numbers. It's the suggestion that maybe it's okay to have a glass of wine and, more important, the data on why. It's the numbers on the risk of miscarriage by week, data on which fish to eat to make your kid smart (and which to avoid because they could make your kid dumb), information on weight gain, on prenatal testing versus prenatal screening, on bed rest and labor induction, on the epidural and the benefits (or not) of a birth plan. This book is a way to take control and to expect better.

Pregnancy and childbirth (and child rearing) are among the most important and meaningful experiences most of us will ever have; probably the most important. Yet we are often not given the opportunity to think critically about the decisions we make. Instead, we are expected to follow a largely arbitrary script without question. It's time to take control: pick up a cup of coffee or, if you like, a glass of wine, and read on.

## PART 1

### In the Beginning: Conception

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### Prep Work

Some pregnancies are a surprise. If you're one of those women who woke up feeling queasy, took a pregnancy test on a whim, and were shocked to see the second pink line show up, congratulations! Please skip ahead.

But for a lot of us, we're thinking about getting pregnant long before it actually happens. I met my husband in college in 2001. We got married in 2006. Our daughter was born in 2011. I won't say I spent the whole ten years thinking about a baby, but I (and, later, we) did make a lot of choices with at least the long-term plan of having a family.

And as I approached 30, and pregnant friends started popping up here and there, I thought a little more seriously. I wondered if there was something I should be doing in advance, even before we started trying to

get pregnant. Should I change my diet? My doctor did once suggest I should cut down on coffee, just so it wouldn't be such a shock to reduce when I was pregnant. Was that really necessary?

Mostly, I worried that I was getting old.

Thirty is not actually old in pregnancy terms. "Advanced maternal age" is reserved for women over 35, and you wouldn't be faulted for thinking that 35 was a sharp cutoff. I read one paper once that referred to eggs as "best used by 35." Thanks, it's really helpful to know my sell-by date. But, of course, 35 is not a magical number. Biological processes don't work like this. Your eggs don't wake up on the morning of your 35th birthday and start planning their retirement party.

Starting pretty much the first day you menstruate, your fertility is declining. Your most fertile time is in your teens, and it goes down from there—30 is worse than 20, and 40 is worse than 30. But, of course, there are other factors that push you in other directions. I certainly wasn't in a good position to have a baby in my first year of graduate school at 23, and the truth is that I'd probably be in a better position at 35 than at 30.

It wasn't the only consideration, but I did wonder about how fast fertility declined. My doctor didn't seem worried—"You're not thirty-five yet!" she said—but that wasn't quite the detailed reassurance I was looking for.

I went looking for reassurance (or, at least, information) in the world of data, in the academic medical literature. As I expected, there was an answer. It just wasn't quite what the over-35 retired-eggs story would have suggested.

The main research on this uses data from the 1800s (it's old but the technology hasn't changed much!). Here is the idea: prior to the modern era, couples would pretty much get down to business right after the wedding, and there were limited birth control options. So you can figure out how fertility varies with age by looking at the chance of having children at all for women getting married at different ages.

Researchers found that the chance of having any children was very similar for women who got married at any age between 20 and 35. Then it began to decline: women who got married between 35 and 39 were about 90 percent as likely to have a child as those who got married younger than 35; women who got married between 40 and 44 were only about 62 percent as likely; and women who got married between 45 and 49 were only 14 percent as likely. Put differently, virtually everyone who got married between 20 and 35 had at least one child, compared to only about 14 percent of those who got married after 45.

You may or may not like to draw conclusions from such old data. People live longer now, and are healthier longer. It is certainly possible that as longevity and health increase, women will remain fertile longer. Even if you do take this data at face value, the reduction in fertility is not as dramatic as you might have feared. The 35- to 39-year-old group is only slightly less likely to have children; the major drop in fertility is not until after 40, and at least some women over 45 in this data did conceive—this in an era well before in vitro fertilization (IVF)!

Contemporary data looks fairly similar, perhaps even somewhat more encouraging. Researchers in France studied a group of around 2,000 women who were undergoing insemination with donor sperm. One nice aspect of this study is that they didn't have to worry that older people had sex less frequently because everyone in the study was trying to get knocked up at the right time of the month in a controlled environment. After 12 cycles, the pregnancy rate was around 75 percent for women under 30, 62 percent for women 31 to 35, and 54 percent for women over 35. In this oldest group things were similar for women 36 to 40 and over 40. More than half of the over-40 women in the sample got pregnant within a year.<sup>1</sup>

In the end, my doctor was basically right to pooh-pooh my worries. But for me, seeing the numbers this way, in black and white, was far more reassuring. I could see in detail that starting to try at 30 rather than at 28 was not going to make that much difference. I could think about the timing if we wanted, for example, more than one child. And I could see that the numbers were all pretty high—for me, reading “75 percent of women were pregnant with a year” was a lot more helpful than hearing things like, “It works out for most women.” For one thing, how do I know if your “most” is the same as mine?

I’d experience this again and again. The value of having numbers—data—is that they aren’t subject to someone else’s interpretation. They are just the numbers. You can decide what they mean for you. In this case, it’s true that it’s harder to get pregnant when you are older. But it’s not impossible, not even close.

When we did start thinking more seriously about a baby, I stopped focusing so much on age. (After all, what could I do? Not getting older is not exactly an option.) But I did wonder about other things I might do to prepare. I asked my OB at my yearly visit if there was anything I should be aware of. Other than some generic advice to relax (not one of my strengths), the one thing she focused on was exercise. Make sure you are exercising before you get pregnant.

When I talked to other women, it seemed like this was part of a more general theme—it’s a good idea to try to be in good physical shape before getting pregnant. Independent of any medical advice, I had long harbored the fantasy of getting to my “goal weight” prior to pregnancy. I had achieved this weight exactly once in my life, before my wedding, through a process of five A.M. ninety-minute cardio workouts four days a week. I figured if I got to this weight again before we got pregnant, I’d be one of those Heidi Klum-type women who look great through the whole pregnancy and are back to bikini modeling eight weeks after giving birth.

In the end, of course, I got pregnant right after our summer vacation, not exactly the most weight-loss-friendly time of year. That’s okay, I figured, I’m sure it will be easy to get to that goal weight after the baby is born. I am nothing if not optimistic.

Other than some feeling of personal achievement, it wasn’t clear to me why I should care about my prepregnancy weight. Does it matter for anything? A few pounds here and there, obviously not. Overall, yes. Women (and their doctors) worry a lot about weight gain during pregnancy, but it turns out that weight before pregnancy is much more important.

About 70 percent of the U.S. population are overweight (defined as a body mass index over 25), and 35 percent are obese (BMI over 30). (Note: to calculate your BMI, take your weight in kilograms and divide it by your height in meters squared. If you are 5 feet 6 inches and 150 pounds, your BMI is 24.2.) On a number of important dimensions, obese women in particular have more difficult pregnancies than normal-weight women.

One study that demonstrates this effectively used a group of roughly 5,000 births at one hospital in Mississippi.<sup>2</sup> The advantage of using a single hospital is that it means the women are all pretty similar in terms of income, education, and other characteristics. A large percentage of the women in the study were obese.

The authors looked at a very large number of outcomes related to the mothers: preeclampsia, urinary tract infection, gestational diabetes, preterm delivery, the need for labor induction, Cesarean delivery, and postpartum hemorrhage (bleeding after birth). They also looked at some things about the babies: shoulder dystocia (when the second shoulder gets stuck during delivery), whether the baby needed help breathing, the five-minute APGAR score (a measure of the baby’s condition five minutes after birth), and whether the baby was abnormally small or abnormally large.

Obese women have more pregnancy complications, as the graph on the next page illustrates. One example: 23 percent of normal-weight women have a C-section, versus almost 40 percent of obese women. The risk of preeclampsia, a serious pregnancy complication, is more than three times as high if you are obese. Overweight women (not in this graph) fall somewhere in the middle—a slightly higher risk for some complications, but the differences with normal-weight women are small.

### Pregnancy Complications and Prepregnancy Obesity

When this study looked at infants, the babies of obese women were also more likely to have complications. If you are obese when you get pregnant, your baby is more likely to have shoulder dystocia, more likely to have low APGAR scores, and more likely to be abnormally large for gestational age. Even scarier, children of obese women are at higher risk for death, although this is very rare, regardless of Mom's weight.

This data is from just one study, but the findings are very consistent with other studies, from the United States and elsewhere.<sup>3, 4</sup> And the effects aren't limited to outcomes during pregnancy. Obese women have a harder time conceiving, and are more likely to miscarry early in pregnancy.<sup>5</sup> There is even some recent evidence that maternal obesity is associated with delays in breast milk coming in, which can impact breast-feeding success.<sup>6</sup>

### Baby Outcome and Prepregnancy Weight

A review article from 2010 summarizes the literature on this issue with a simple statement: "Maternal obesity affects conception, duration and outcome of pregnancy. Offspring are at increased risk of both immediate and long term implications for health."<sup>7</sup> In other words, it is harder to get pregnant, harder to sustain a pregnancy, more likely that later-term complications will arise, and more likely that there will be complications with the baby. All of which you would like to avoid.

None of this is to suggest that it's a problem if you can't lose that last five pounds, of course. The outcomes here are a result of pretty large differences in weight. I may have been disappointed not to get down to my fighting weight, but it is unlikely that it mattered. And being too skinny can also interfere with conception. But it does suggest that there are real benefits to getting your weight under control before you get pregnant. Of course, weight loss may have health benefits for reasons other than pregnancy. See, your (hypothetical) baby is helping out already!

### The Bottom Line

- Fertility declines with age, but not as fast as you might expect—35 is not a magic number cutoff.
- Being obese before pregnancy is associated with an increased risk of complications for both you and your baby. Don't worry too much about a few pounds here and there, but if you are significantly overweight, weight loss before pregnancy may have benefits.

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### Data-Driven Conception

I spent most of my twenties trying not to get pregnant. I used at least three versions of the birth control pill and even, for a brief time, something called "The Patch." So I knew I was really good at not getting



pregnant. Of course, I worried that perhaps I wouldn't be so good at getting pregnant.

I'd like to say that I approached the process of conception in a laissez-faire way. After all, I was only thirty, we had plenty of time, and there was no indication that we'd have trouble conceiving. I wish I could say I was like my sister-in-law, Rebecca, who was so relaxed about this with my nephew that she was two months along before she even realized she was pregnant.

But this doesn't really fit with my personality. I suspected even before we got down to business that I would be a neurotic mess. I was correct. I actually had a panic attack about this before we even started trying. It must be a record. When I went to my primary care doctor, she looked at me thoughtfully and suggested that perhaps knowing more about the process would help me relax (even if I couldn't actually control it).

I don't know why this hadn't occurred to me before, but she was exactly right. On her recommendation, I picked up a copy of *Taking Charge of Your Fertility* and read it cover to cover.

The main thing I learned was that a lot has to go right to get pregnant. It's kind of amazing that the human race continues to exist at all.

You probably remember the basics of conception from health class: unprotected sex, sperm meets egg, and, all of a sudden, you're pregnant. High school health class tends to give the impression that pregnancy is really, really likely—part of the general scare-tactic attitude. But, in fact, the majority of the time it is not possible to get pregnant. The key issue is timing: you need sperm to be around at the exact moment that the egg is ready.

When is that? The average woman has a menstrual cycle of 28 days, counting from the beginning of one period to the beginning of the next. The first day of your period is considered day 1. The week of your period and the week after it are preparation for ovulation. About 14 days after your period starts the egg is released (this is ovulation) and begins to travel down toward the uterus.

The egg is available for fertilization during this journey, which lasts a couple of days. If the egg meets a sperm on its way to the uterus and the sperm gets lucky, fertilization occurs. If you happen to release two eggs and they both meet sperm, you get twins; twins can also happen if the fertilized egg divides right at the beginning. When the fertilized egg (or eggs) reaches the uterus, implantation occurs and pregnancy actually begins. The process from egg release to implantation lasts 6 to 12 days. For most successful pregnancies, implantation occurs 22 to 24 days after the first day of your last period.<sup>1</sup>

This whole second half of the cycle (after the egg is released) is called the luteal phase. It's either taken up with fertilization and implantation (if you get pregnant) or with the egg waiting around in the uterus to be flushed out during your period. If you do not get pregnant, day 28 will bring your period. If you do get pregnant, day 28 will roll around periodless, and you'll be off and running. Here's the basic timeline (this is for someone with a standard 28-day cycle; if your cycle is a few days longer or shorter you might ovulate a bit earlier or later than day 14):

The key to pregnancy is that when the egg starts making its way down the tube, the sperm has to be waiting for it. This means the best time for sex or insemination is the day before or the day of ovulation. It takes some time for sperm to swim into the fallopian tubes, so the day after ovulation is generally too late.

Sperm are, however, a bit more robust than the egg. They can typically live up to 5 days in the fallopian tube, waiting. This means the window is actually a bit longer. Sex 4 or 5 days before ovulation can lead to a baby, although it's less likely. I was curious about how much less likely. All this talk about a small "ovulation window"—was there really any truth to that? How small was the window?

Figuring this out actually requires knowing quite a lot about people's sex lives. Fortunately, at least some researchers are up to the challenge. I found a study that followed more than 200 couples who were trying to conceive for more than a year. The authors recorded detailed information on when they had sex and collected their urine daily (daily!) so they could monitor both ovulation and pregnancy.<sup>2</sup> Using this information, the researchers figured out the best timing for baby-making sex (this wasn't the goal of the study, just an auxiliary fact we can learn from it).

What makes this question a bit tricky to answer is that most couples trying to get pregnant have sex frequently. This makes it hard to know which sex act led to the baby—was it the sex you had on the day of ovulation? Or three days before? The researchers get around this by focusing on women who had sex just one time in the plausible conception window.

Using these one-day-of-sex people, we can figure out the chance of conception by day. Here it is:

#### Probability of Conception by Cycle Day

For most of the month, pregnancy is impossible (at least based on these data). No one conceived by having sex after ovulation—by the time the sperm gets up into the fallopian tubes, the egg is long gone. In addition, no one conceived by having sex more than 5 days before ovulation.

The window of possible conception is short: from 5 days before ovulation through the day of ovulation. But note that if you time it right, the chances of pregnancy are good. Conception rates are more than 30 percent for the day before and the day of ovulation! These odds are really not bad.

If you had to pick just one day in the month for sex, you'd want to pick the day you ovulate (or the day before: the pregnancy rates are similar). If you are using artificial insemination, it also makes sense to focus on the day before and the day of ovulation, when fertilization is most likely. For most women with a standard 28-day cycle, this is around the 14th day after your period starts.

Of course, one way to make sure that you definitely have sex on the day of ovulation is to have sex every day around the possible ovulation day (or just have sex every day). This technique is typically pretty popular with husbands, at least in the first month or two. But some OBs will warn you off this. I was told that the best strategy is to have sex every other day. If you did this, you'd be sure to capture at least one of the two best days, and the argument is that if you (or your partner) "save up" the sperm, then pregnancy chances are increased. On the other hand, saving them too much (say, skipping sex for more than ten days) tends to cause their effectiveness to diminish.<sup>3</sup>

This always sounded a little suspicious to me. I can easily believe that the amount of sperm is higher if you wait a day, but could it really be more than twice as high, which is what would have to be true for the every-other-day plan to beat out the every-day plan?

It turns out my skepticism was somewhat well placed. The same paper that gave me information on the right day for sex also determined whether frequency of intercourse mattered. The researchers calculated the predicted chance of pregnancy for people who had sex once during the 6-day window leading up to ovulation, for those who had it twice, three times, and so on. The chances were almost identical. In other words, there seems to be no benefit to alternating sex days, having sex more frequently, or having sex less frequently. The crucial thing is to hit the day of ovulation or the day before.

This appeared to make things simple. All I had to do was figure out when I was going to ovulate, and then have sex that day or the day before. I figured this wouldn't be that hard, although I worried a bit about work travel, and I patted myself on the back for having avoided what the fertility book suggested was the major

infertility pitfall—namely, not having sex on the right day.

There was just one remaining problem: I didn't seem to be ovulating at all. Or, at least, things didn't seem to be behaving normally. When I went off the pill, my doctor said my cycle would return to normal (or return to whatever it was before I went on the pill, as if I could remember that). She said it would happen within three months. It didn't. I went two months between periods, then had two within a few weeks.

I called the doctor at 3 months and 1 day. What is going on? I asked the nurse when she called back. Should I be worried? What should I do?

What I wanted was a concrete answer. Something like: 70 percent of women resume normal cycles within 3 months, 90 percent within 6 months. I wanted to know whether it mattered that I had been on the pill for 12 years. Would it take longer to get back to normal? This is not what I got. What I got was best described as vague reassurance (and the ever-helpful "Just relax!").

I thought if I pushed, I would get to the more detailed evidence, but I didn't. "Everyone is different," I was told. "Yes, that is why I asked about the average," I grumbled to Jesse. I would have this type of experience again and again. How accurate is the prenatal screening they suggested? "Quite accurate." When should I expect to go into labor? "It's a different time for everyone."

I wanted a number. I craved evidence. Even if the answer was that the evidence was flawed and incomplete, I wanted to know about it. Yes, I understood that everyone was different. But that doesn't mean there isn't any information!

Again, I headed out on my own to look for the numbers.

The most popular temporary forms of birth control in the United States are (in order): the pill, condoms, IUDs, and the withdrawal method. Obviously, neither condoms nor the withdrawal method have any impact on your menstrual cycle. If you've been using condoms, whatever cycle you've had up until now will continue. Same for withdrawal, and for any other barrier method (diaphragm, Today Sponge, etc.).

The pill makes things more complicated. As my doctor noted, sometimes the cycle returns to normal right away, but sometimes it takes a bit longer. The advantage of referring to the actual studies is that we can be more precise. In one study in Germany,<sup>4</sup> researchers studied menstrual cycles of women who just went off the pill. For some women it took up to 9 months to get back to a "normal" cycle. In the initial months after going off the pill these women had longer menstrual cycles, were more likely to have cycles in which they didn't ovulate, and were more likely to have cycles where the second half of the cycle (the luteal phase) was so short that pregnancy was unlikely.

This study is similar to others. Researchers in the United States studying women who had gone off the pill in the last 3 months found they had longer cycles (by a couple of days), more variable cycle length, and later ovulation in some cycles than those who had been off the pill longer.<sup>5</sup> In addition, when researchers measured their cervical mucus, the women who had been off the pill longer had cervical mucus that was more "welcoming" to the sperm.

The very good news, however, is that these effects are relatively short-lived. In the German study, virtually everyone had a normal cycle by 9 months after going off the pill. For some women it is much faster: 60 percent of women in that study had a normal cycle the first month off the pill.

I was also reassured that once you do ovulate, having been on the pill doesn't seem to impact pregnancy rates. In another German study,<sup>6</sup> researchers studied women actually trying to get pregnant. They found that

women who had just gone off the pill were slightly less likely to get pregnant in the first 3 months of trying, but no less likely to be pregnant within a year. This study also looked at the duration of pill usage and found no effect: even for people like me, who had been on the pill since their teenage years, things went back to normal in the same basic time frame.

What I took from this was that worrying at 3 months and 1 day was unnecessary. If I got to 9 months without things normalizing I could consider stressing out a bit.

Fewer women use IUDs, but the rates have crept up in the last decade. As with the pill, it takes a bit of time to recover fertility after using an IUD. In a recent literature review, authors found that women who had just gone off an IUD took (on average) a month longer to get pregnant than those who had just stopped oral contraceptives, but 80 to 90 percent (depending on the study) were pregnant within one year.<sup>7</sup>

So I waited, and a couple of months later things normalized a bit, just like the data said they would. But I still needed to figure out when I was ovulating. Day 14? Day 16? Day 12? Even after 6 months my cycle wasn't completely regular; I couldn't just assume it was day 14. Also, I quickly figured out that this was an opportunity to collect data. I couldn't resist!

There are three common ways to detect ovulation: temperature charting, checking cervical mucus, and pee sticks. The first two of these have been in use for many years; the pee stick method is relatively new.

**Temperature Charting:** Temperature charting (sometimes called BBT charting, for basal body temperature) relies on the mildly interesting fact that your body temperature is higher in the second half of the month, after ovulation, than before. You can therefore figure out when you ovulate by taking your temperature every day. The technique itself is not complicated. Every morning before you get out of bed (moving around affects your temperature; you ideally want to take it as soon as you wake up, before you do anything), you take your temperature using an accurate digital thermometer.

For the first half of the month, your temperature will be low—typically below 98 degrees. The day after ovulation, it will jump up, usually at least half a degree and sometimes more. This is the sign that you ovulated. Your temperature will stay high through the rest of the month, and then drop on the day your period starts, or (often) the day before. If you get pregnant, your temperature will stay high.

There are some very good things about temperature charting. In the month you are doing it, it can tell you with high certainty that you did, in fact, ovulate. If your cycles are regular, it can help you plan for the next month by showing you the day on which you generally ovulate. It can also tell you that you are pregnant. More than 14 days of high temperatures is a very good indication of pregnancy.

However, this isn't perfect. The biggest issue is that it tells you only after you ovulate. So although it is useful for predicting the next month, it doesn't help with this month. Also, it's not as simple as it seems. To really make this work you need to take your temperature at the same time every day, ideally first thing in the morning after four to five hours of continuous sleep. The results can get screwed up by jet lag, a fever, or a bad night of sleep.

I liked this method a lot, if only because it enabled me to feel like I was doing something proactive every day (and because it produced data, which I could use to make attractive charts). The downside is that I was never especially good at it.

My temperature chart from the month that I got pregnant with Penelope is on the next page. On one hand, the fact that my temperature eventually elevated and stayed up gave me a (small) clue that I was pregnant. On the other hand, all the jet lag and my generally poor sleep meant that it was almost impossible to interpret. I

initially thought I ovulated on June 9 because my temperature went up on June 10; then I realized this was just because of the time change when we got back from Europe. The sustained higher temperatures did not occur until I got back from Ghana. The only way I knew that I must have ovulated before that trip was that Jesse wasn't there!

#### Basal Body Temperature Chart, June 2010

We can be a little more scientific about how useful this is for the average woman. In a study from the late 1990s,<sup>8</sup> researchers followed a set of women trying not to get pregnant and evaluated how good various methods were at detecting ovulation. In this study they were able to pinpoint the actual date of ovulation using ultrasound, so they knew the truth. The temperature-charting method as used by these women accurately identified the day of ovulation about 30 percent of the time. Another 30 percent of the time this method pointed to ovulation one day before it actually occurred.

That day before ovulation is also good for pregnancy sex. Putting this together: if you have sex on the date indicated by temperature charting, 60 percent of the time you would manage to time sex on one of the two most fertile days of the month.

**Cervical Mucus:** If you really want to get serious about natural ovulation detection, you probably want to chart your cervical mucus along with your temperature. This is a bit more complicated than temperature charting and, at least for some women (read: me), there is an "ick" factor. Here's the idea: right around ovulation your body produces a type of mucus ideal for sperm to swim through. You can detect this mucus in and around your cervix.

Why ought to be this on the internet publication **Expecting Better: Why The Conventional Pregnancy Wisdom Is Wrong--and What You Really Need To Know By Emily Oster** You might not need to go somewhere to review the books. You could read this e-book **Expecting Better: Why The Conventional Pregnancy Wisdom Is Wrong--and What You Really Need To Know By Emily Oster** every time as well as every where you really want. Even it remains in our extra time or sensation tired of the tasks in the office, this corrects for you. Get this **Expecting Better: Why The Conventional Pregnancy Wisdom Is Wrong--and What You Really Need To Know By Emily Oster** right now as well as be the quickest person who completes reading this book **Expecting Better: Why The Conventional Pregnancy Wisdom Is Wrong--and What You Really Need To Know By Emily Oster**