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Making Babies in the Year 2045

Huge pools of health data collected over the past generation allow you to pick many of your child's genetic traits. Are you comfortable with that?

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The year is 2045. The genomes of four billion humans have been sequenced, creating a huge pool of genetic information accessible to researchers. This process had been well underway in 2019, but accelerated rapidly once many countries realized that understanding human biology was the ultimate big data problem and a key to reducing health care costs and enhancing national competitiveness. Widely sharing deeply personal health information had alarmed privacy advocates. But supporters of sharing genetic data argued convincingly that the benefits to society outweighed the privacy concerns of individuals. The debate may have once seemed abstract. But now you are in a fertility clinic and the issues are fast becoming real.

The cascade of numbers overwhelms you as the doctor splashes the spreadsheet across the digital walls of her office.

"I hope you can see the wonder and possibility in these figures," she says, trying to put you at ease.

As you sit in the spa-like clinic, it's hard to imagine it was just last week when your assistant placed the miniature device on your arm that painlessly suctioned out a small amount of blood and started you on this journey. The spark of life that used to begin in bedrooms and the back seats of cars was now migrating out of the human body and into the lab.

"Take your time," the doctor continues. "You need to first select the early- stage embryo optimal for you. The numbers across the top list the 300 options for you that we've prescreened from the initial 10,000. The column down the left lists all the disorders and traits influenced by genetics that we have some ability to predict. The numbers populating the chart are our best predictions for how the genetic component of each trait would be realized if we selected based on that trait alone. We're looking for high composite scores emphasizing the qualities most important to you."

You scan the lists on the walls wondering if a human being can really be reduced to numbers. “Can you really predict all of these traits?” you ask.

“These are all probabilities, not certainties,” the doctor says. “Not all traits are equally genetic. And genetics is a trade-off, so we can’t choose to optimize every trait. Thirty years ago we could mostly just identify disorders determined by a single genetic mutation, but in 2018 we started using what we call ‘polygenic scoring’ to make better predictions about diseases and traits influenced by hundreds or thousands of genes.

“Our biology is still about as complex as it’s been for millions of years but the technology we’re using to understand it is getting exponentially more sophisticated,” she continues. “There may be magic in humans, but we aren’t made of magic. Our DNA is a type of source code we’re learning how to read and write.”

The idea of humans as hackable data sets may be increasingly common but still unsettles you. The numbers on the wall seem to confirm the doctor’s words. “And this 60 means that embryo would be good at math?” you ask, pointing to one of the options on the list.

“There are few genetic guarantees,” she answers, “but that embryo would have a greater than average possibility, with lots of other necessary environmental inputs, of being a very good pure mathematician. Comparing billions of people’s genetics with their test scores over the past 30 years has taught us a lot. Many people with the potential to be great mathematicians never realize that potential, but there are probably no highest-level mathematicians without the necessary underlying genetics.”

Your mind struggles to build a case for nature as it used to seem. “My mother always used to tell me I was perfect just as I was.”

“And you are,” the doctor replies. “We all are. These would all be your natural children just the same as if you had conceived through sex or old-fashioned in vitro fertilization. We’ve simply increased the number of options by turning cells from the blood sample you sent us into the stem cells we used to create more eggs. The great Japanese scientist Shinya Yamanaka won the 2012 Nobel Prize for pointing us in this direction. All of the qualities you’re choosing are entirely your and your sperm donor’s genetic inheritance. We aren’t altering those genetics in any way, just enhancing your choice and limiting your risk.”

You still struggle with the idea that the magic of life can be reduced to a series of percentages on a chart. “Is it really that simple?”

“Nature is no fool. Evolution isn’t random. It just made some trade-offs for us over the years that today don’t always seem that great. We have to approach all of this with a healthy dose of humility.”

Scanning the wall, you don't see humility. A few low numbers catch your eye. Would it possibly make sense to implant an embryo more likely to get Type 1 diabetes or early-onset familial Alzheimer's or to die young? You know that people with genetic disorders are just different. Some of them, like some people with autism, even have powers far beyond their so-called normal peers. What would it mean to select these conditions with a simple nod? You fidget nervously. "What if I pick to optimize a characteristic that makes sense today but could be less helpful in a different world tomorrow?"

"If our environment changes, we need to adapt," the doctor says. "But our ability to push changes more assertively has also increased rapidly since the genetic engineering revolution began in the 1970s, especially since our gene editing tools started really taking off around 30 years ago. It's not yet safe enough to make too many edits to the genomes of human embryos, but we can confidently make deletions, alterations and insertions to alter the expression of a few genes where the potential benefits seem to outweigh the risks — like for increased resistance to some deadly viruses, greater ability to build and maintain muscle mass, or a lower risk of cancer, diabetes, familial Alzheimer's, and coronary disease. Those are all part of our premium enhancement package."

You are relatively wealthy and living in an advanced country but it bothers you that many others can't afford or obtain this basic level of service, let alone the premium package. You wonder if it's right to select human traits as if they were features of a car, and if it's dangerous to frontally assault four billion years of evolution. You fear you might be fixing one potential problem only to inadvertently create another.

[As technology advances, will it continue to blur the lines between public and private? Sign up for Charlie Warzel's limited-run newsletter to explore what's at stake and what you can do about it.]

But then you close your eyes and imagine your grandchildren holding your future daughter's hand as her mind deteriorates from early-onset Alzheimer's or weeping at the cemetery after her premature death. Would you really play Russian roulette with your daughter's fate? Wouldn't you want more than anything else to give her the greatest genetic opportunity to live a long, healthy and successful life?

Your head suddenly stops throbbing. Your mind becomes clear. You open your eyes. "What's the next step?"

"You need to make hard choices ranking your priorities both for the embryo selection and the gene edits," the doctor says, leaning in. "Picking everything is like picking nothing. If having a good shot at a longer life and an outgoing personality are really important to you,

give those your highest ranking. If being a good long-distance runner is nice but not that important, put that lower."

Your mind is already transfixed on the range of possible futures. You breathe in deeply.

"Shall we begin?"

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