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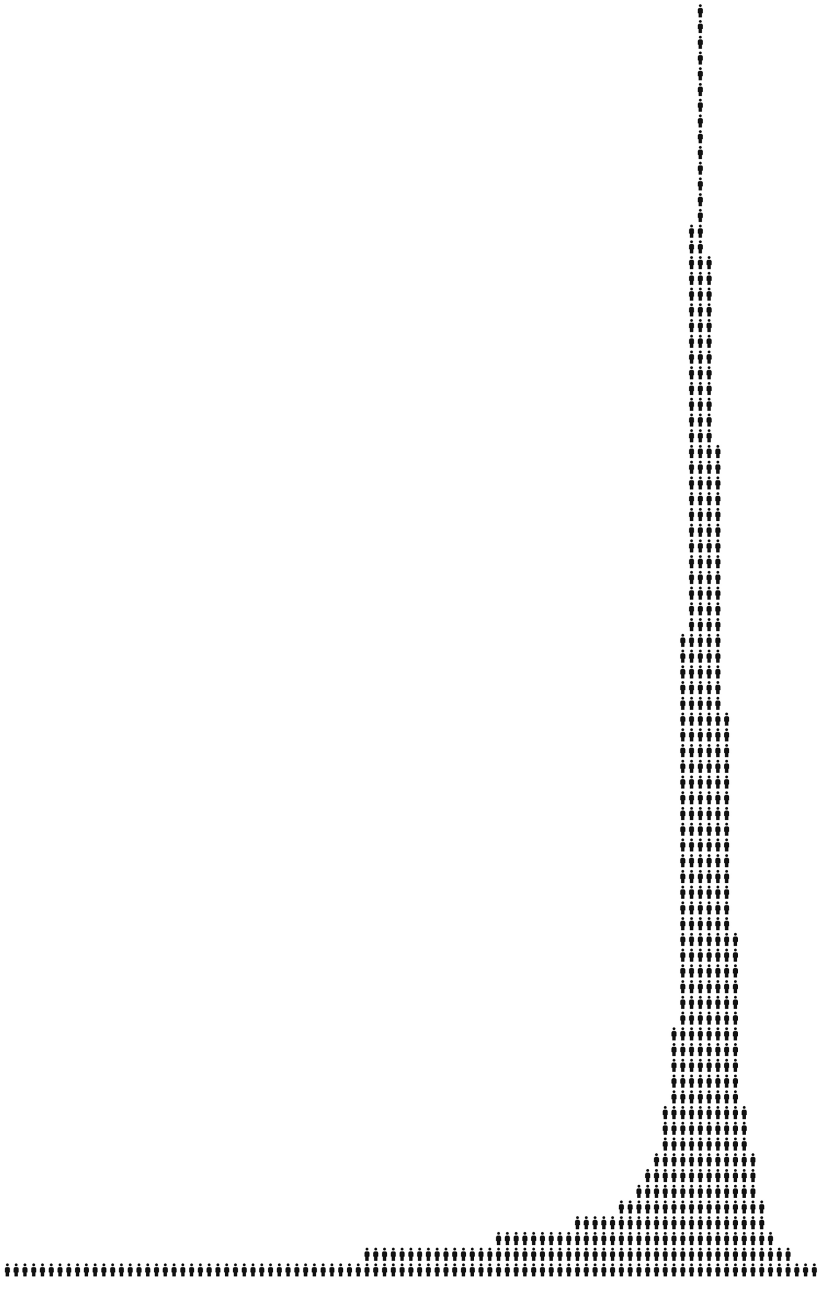

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After the Spike

Population, Progress, and the Case for People

Dean Spears and **Michael Geruso**

Simon & Schuster

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After the Spike

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Prologue

Humanity is on a path to depopulation.

You, your parents, their parents—any ancestors whose names you know—have been part of a growing population. And now a reversal is on the horizon. Birth rates have been falling everywhere around the world. Soon, the global population will begin to shrink. When it does, it will not spontaneously halt at some smaller, stable size. It will not fall to 6 billion or 4 billion or 2 billion and hold there. Unless birth rates then rise and permanently remain higher, each generation will be smaller than the last. That is depopulation.

This book explains why depopulation is likely, how we can know, and what the consequences would be. The story in this book is not the story of any one country or culture. It is not the story of how demographics will shape international competition and conflict and trade. That will happen, but the stakes of global depopulation are bigger. Depopulation will matter for everyone, everywhere. If the narrow perspectives of one country, one culture, or one generation are all we can muster, then we will miss the biggest story now unfolding. This book is about humanity as a whole.

How will depopulation matter?

It would be easy to think that fewer people would be better—better for the planet, better for the people who remain. This book asks you

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to think again. No one can know exactly what might be lost in a shrinking world. It would be a mistake of overconfidence to dismiss depopulation—either by shrugging off the consequences or by insisting that it can't happen.

Despite what you may have been told, depopulation is not the solution we urgently need for environmental challenges like climate change. Nor will it raise living standards by dividing what the world can offer across fewer of us. To the contrary, so much of the progress that we now take for granted sprang up in a large and interconnected society. We have flourished beyond the dreams of anyone living in our small-world past. That is no coincidence. Improvements and better lives don't come automatically, simply because time marches forward. *People* have to achieve them.

This book contrasts two possible futures. One possibility is that the population peaks at about 10 billion people within a few decades, then falls and never stops falling. This is where we are headed.

Stabilization is the other possibility. It's a path that looks similar for the next few decades, reaching a similar peak size and beginning a similar fall. But eventually the population stabilizes, roughly balancing the comings and goings of lives beginning and ending. How many people should our stabilized future hold? This book cannot say. It would be beyond the reach of today's social science or climate science or any other science to defend some specific population size as ideal. The stabilization that we argue for is only this: avoiding depopulation without end.

This book shows why stabilization does not look likely—unless societies choose it, invest in it, and work for it. So what would be the consequences of stabilizing instead of depopulating? Which sort of future should we *want* to happen?

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Some big claims

This book makes three big claims—with evidence. The first one is this:

> **Part I's big claim:** No future is more likely than that people worldwide choose to have too few children to replace their own generation. Over the long run, this would cause exponential population decline.

But what about the fact that birth rates aren't yet low everywhere? Or that some communities tend to have more children, and their children tend to have more children? Or what if something big changes? We may live at the cusp of a revolution—in AI, or accessible gene editing, or something hard to imagine. Perhaps humanity will unlock secrets that can slow aging and extend lifespans. Perhaps artificial wombs will arrive. Perhaps. And perhaps—even though longer lives and safer, healthier births could be wonderful—these improvements, if they come, would not tilt our path away from depopulation. We'll grapple with these questions and show why a weird future is unlikely to come to the rescue—at least not in any simple or automatic way.

Whether depopulation would be good or bad depends on the facts and depends on our values. We ask about those facts and values, building up to an overall assessment:

> **Part II and Part III's big claim:** A stabilized world population would be better, overall, than a depopulating future.

The middle chapters of this book consider the case against people (Part II) and the case for people (Part III). Sometimes it's complicated, and sometimes we say it's clear. This big claim does not deny that environmental harm, inequality, poverty, and other challenges matter. The question is whether a shrinking population would make things better or worse—in these ways and for everything else that matters. Chapter by chapter, we will see what stabilization and depopulation

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would mean for the climate, for equity, for gender gaps, for material wellbeing, for progress, for freedom, for the possibility of human extinction, for humanity's general welfare.

These chapters weigh the evidence and reasons and conclude that stabilization would be the better path. How to achieve stabilization is a separate question, so our last big claim is this:

> **Part IV's big claim:** Nobody yet knows how to stabilize a depopulating world. But humanity has made revolutionary improvements to society before—we can do it again if we choose.

It's time to join the conversation

It is time for a compassionate and serious conversation about how to respond to depopulation—how to share and ease the burdens of creating each future generation. This book invites you to join that conversation.

As we go, we might ask you to expand the reach of your values—to consider new questions. But we won't ask you to abandon them. We won't ask you to abandon your concerns about climate change; about reproductive freedom and abortion access; or about ensuring safe, healthy, flourishing lives for everyone everywhere. We won't ask you to consider even an inch of backsliding on humanity's progress toward gender equity. We insist throughout that everyone should have the tools to choose to parent or not to parent.

One place we'll invite you to think hard is on the difficult question of how to value lives lived centuries from now—lives lived by people who may only exist depending on the choices of people living generations before them. Many good lives, like yours or better, might be lived. Or humanity might depopulate and billions upon billions of lives that could have been good may never be . . . anything. One cannot compare such different futures without considering the ethics of population. Does it matter, is it better, if more good lives get to be lived, rather than fewer?

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We won't claim to have every answer. And we won't claim to represent the perspectives and experiences of all 8 billion of us alive today—or the many (or few) billions who will follow us next century. No two people born in a rich country in the twentieth century nor any other two people born anywhere, any time, could have the last word on such an important, unprecedented issue that impacts us all. What we do claim to have is facts and evidence for you to evaluate.

Discovering and publishing new facts and evidence is part of our jobs as professors at the University of Texas. The two of us became friends and research partners years ago when we were assigned to share an office as PhD students at Princeton. We studied economics then, and we teach it now, but our corner of economics is not concerned with interest rates or the stock market. We study people: their lives and choices, their health, their births, their deaths. We teamed up when we realized that we saw our vocation as economists in the same way, as a chance to uncover new facts about the wellbeing of people everywhere and to promote the wellbeing of people who need help.

As we wrapped up grad school, Dean and his spouse, Diane, started r.i.c.e., a nonprofit dedicated to research and advocacy for children in India. They moved to Uttar Pradesh, an Indian state where too many babies are born underweight and die early. From his postdoc at Harvard, Mike joined their board and supported their work.

Together over the years since, we wrote about healthcare, nutrition, disease, and sanitation. We wrote about how environmental pollutants affect people, and we wrote about how people affect the environment. We wrote about life expectancy, and we wrote about infant mortality. And all the while, we wondered what all these demographic details amounted to, zoomed out to the whole world and over the long run.

So we started asking broader questions. We asked those questions of the data, and we interrogated the theories. We began to write research papers where the time horizon was generations, not years. Where there were open questions, we looked for answers. Just how much does the lifelong carbon footprint of a child born today differ from a century ago, and how might it differ a century from now? How much could the

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trajectory of the global population be affected by small, high-fertility enclaves? What would happen if the birth rates that are now normal in India, Europe, or the United States became normal everywhere and stayed that way for a long time?

Mike was tapped to work in the White House, to advise on population trends and health policy as a senior economist at the Council of Economic Advisers. Dean went back and forth to India for his work there. We learned firsthand about parenting, too, becoming fathers in our thirties, and now raising kids in our forties. We kept up the conversation, found new experts to collaborate with, and continued our research. And we began to see the big, global story that this book tells.

In this book, you'll see stories from women in India who are caring for underweight, premature, or fragile infants in a government hospital. Dean and Diane support the hospital's program, called "Kangaroo Mother Care," through their nonprofit. These babies in India and the women who care for them are important—and it's important for a conversation about "population" to understand people and their lives, beyond the numbers and statistics.

In this book, you'll read stories of progress—progress that unfolded as the population expanded. For a long time, India was at the center of fears about "overpopulation." Today, lives in India are richer than ever. They are longer than ever. They are healthier than ever. So "overpopulation" did not bring doom to India—and we have plenty to say in this book about why not.

When we shared our depopulation research in a *New York Times* op-ed article in 2023, thousands of readers wrote back. We were glad that they did, because depopulation deserves not only attention but also serious engagement. Throughout this book, we will keep the conversation going. We will share some of the opinions and objections we've heard, and we will reply. Most claims and comments from readers (and some from our social science colleagues, too) shared a common feature: They were *certain* about something. Yet they pointed with certainty in conflicting directions. The facts that we share with you in this book will be more nuanced than the absolutes that you

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might hear elsewhere. We all can recognize that change is likely, and we can choose to care, without pretending that the future is certain.

This book does not say we face an immediate crisis. Depopulation is on the horizon. The challenges and risks it presents are vital. But we have a few decades.

Between now and then, humanity has a long list of other problems to solve, too. There are injustices to amend, lives to save, villains to thwart. So why spare any thoughts for depopulation now? Here is one reason: Because some of the people talking about low birth rates are diverting attention from real challenges and solutions. They are talking about depopulation to suit their agendas—of inequality, nationalism, exclusion, or control. If we wait, the less inclusive, less kind, less calm voices in our societies will call depopulation a crisis and exploit it for their purposes. The only way to make sure that more constructive voices are talking about depopulation is to add yours now.

This book is not about whether or how you should parent. It's about whether we all should make parenting easier.

This book asks how we should respond to depopulation, together. That is a question *about* everyone, and it is a question *for* everyone: What should societies, governments, and philanthropies do? The question of *what to do, together* about worldwide depopulation is not the question of choosing *your* family size. Choose your family size as you think best. Make it a big one, or a small one, if you choose.

But speaking for our own families, we might have had more children if caretaking and parenting were more valued. Or if being a parent didn't mean sacrificing so many other goals. Or if education and starting a family didn't often crowd one another out. Or if pregnancy and breastfeeding weren't sometimes so miserable. Or if things were a bit . . . easier for parents. And we know that our own families have it much easier than most!

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Where this book differs from what other thoughtful, compassionate people have had to say about low birth rates is this: We cannot agree that whatever each individual chooses, given the world as it is, must be the first and last word on what would make for a better future. No reasonable person would accept that answer to humanity's abuse of the environment. We would not say: However each person chooses to burn, trash, and pollute has no consequence that matters for the rest of us.

And so there is a tension. Whether to parent must be a free, personal choice. Yet whatever is chosen by each for themselves will have consequences for us all. We all matter for one another. We all have a stake in outcomes that affect society as a whole, including the size of the population. Resolving this tension requires seeing a different future—of work, of family, of the social infrastructure that supports parenting and caregiving.

Here's a start at the resolution that we believe in: Over the long run, if we help one another, there's more than one future that could emerge from free choice. The law says that pregnancy is a free choice in France and is a free choice in South Korea. Yet average birth rates in France are over twice those in South Korea. So, yes, to everyone choosing the family that suits them. And, no, that doesn't settle everything, because what people aspire to and choose depends on the world they see around them.

If somebody chooses to have no children or few children, it's not for us to say that they are making a mistake. Probably they're not. But we all are making a mistake, together, when we make it hard for people to choose larger families or to have children. If we want there to be a thriving future, then it's time to start taking better care of one another and of our caretakers.

Humanity needs a big, caring, factful conversation about what is coming and how to respond. This book is an invitation to learn the facts and join the conversation. Each chapter of this book tackles an important piece of humanity's choice between depopulation and stabilization. Each chapter is the single most important piece—according to somebody. Read each chapter, engage with each question and perspective. Then add your voice to humanity's conversation about its future.

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PART I

The Path to Here

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Chapter 1

The Spike

In 2012, 146 million children were born. That was more than in any prior year. It was also more than in any year since. Millions fewer will be born this year. The year 2012 may well turn out to be the year in which the most humans were ever born—ever as in *ever for as long as humanity exists*.

No demographic forecast expects anything else. Decades of research studying Africa, Asia, Europe, and the Americas tell a clear story of declining birth rates. The fall in global birth rates has lasted centuries. It began before modern contraception and endured through temporary blips like the post–World War II baby boom. For as far back as there are data to document it, the global birth rate has fallen downward—unsteadily, unevenly, but ever downward. So far, falling birth rates have merely slowed the growth in humanity's numbers. So far.

The view from the top of a Spike

There are quite a lot of people in the world. But that hasn't been true for long. Ten thousand years ago, there were only about 5 million of us. That's as many people as today live in the Atlanta metro area, and only a fraction of the number who live in Bangkok, Beijing, or Bogotá. A thousand years ago, our numbers had grown to a quarter billion.

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Two centuries ago, we passed 1 billion for the first time. One of every five people who have ever lived was born in the 225 years since 1800. A populous world, on the scale of humanity's hundred-thousand-year history, is new.

Getting big happened fast. And as soon as it has happened, it's about to be over. In the shorter run—soon enough to be seen by people alive today—humanity's global count will peak. There's a gap between the year of peak births and the year of peak population—a gap that we now live within—because the annual number of births, though falling, has not yet fallen far enough to reach the annual number of deaths. That will happen within decades.

Different experts predict slightly different timetables for when. The demographers at the UN believe it is most likely to happen in the 2080s. The experts at the International Institute for Applied Systems Analysis in Austria place the peak a little sooner in the same decade. The Institute for Health Metrics and Evaluation at the University of Washington projects a peak even sooner, in the 2060s.

These dates aren't exactly the same. But on the timeline of humanity, a difference of twenty years is not really a difference. Each group projects that birth rates will keep falling, so each group projects that we peak this century.

What happens after?

Figure 1.1 plots humanity's path. We call this picture—of humanity's past, present, and possible future—the Spike.

We first presented the Spike in a pair of publications in 2023: an opinion article in the *New York Times* and a matching research paper that filled in the scientific details. We asked: What if birth rates stay on their current course? The answer is that if they do, then humanity will depopulate. We do not mean that humanity would stop growing, reach some plateau, and stabilize near our present numbers. Every decade after turning the corner, there would be fewer of us. Within three hundred years, a peak population of 10 billion could fall below 2 billion.

The Spike is not a product of outlandish imagination. The possibility it charts does not assume some shift or reversal in the way people

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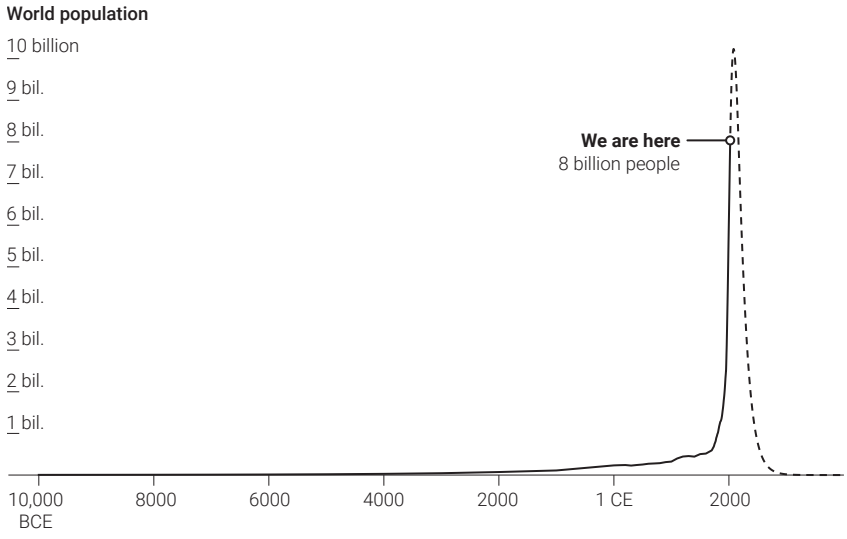
Figure 1.1. The Spike



live and behave. The Spike is what would happen if the whole world one day had the sort of birth rates that are already common in many places. In that future, like now, some people would have a few children. Some would have none. And many would have one or two.

We generated the Spike by projecting a future in which, globally, there were 1.6 children per pair of adults, a statistic that matches the current U.S. average. But, as we'll show soon, something like the Spike will happen as long as the worldwide average stays below two children per pair of adults. Below two children is what matters, because it means that one generation isn't replacing itself in the next generation. Is that kind of future likely?

> **Below-replacement birth rates aren't special anymore.** Already, two-thirds of people live in a country with birth rates too low to sustain their populations over time.

The United States' average of 1.6 kids is not exceptional. The birth rate is below two in Mexico, Canada, Brazil, Russia, Thailand, and

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many other countries. The European Union as a whole is at 1.5. The two most populous countries, India and China, are both below two. A birth rate below two is found within each U.S. state; when looking only among U.S. Blacks, whites, or Hispanics; and in every Canadian province.

What's normal now, around the world?

You stand now at the top of the Spike with 8 billion others. The story of the future starts with understanding the fact that most of those 8 billion others don't (or didn't, or won't, once they grow up) aspire to parent very many children.

One of those people is Preeti. In 2022, Preeti had a baby in a crowded government hospital in India. Her baby was born very small. So after a nurse rolled up a cart to weigh and assess her baby girl, Preeti was brought to the hospital's new program for underweight newborns, called "Kangaroo Mother Care." Preeti and her baby were assigned one of the program's ten beds in the next room.

Preeti lives in Uttar Pradesh, a populous, poor state in the north of India. She traveled to the hospital from a half-mud, half-brick home in a small village. The nurses down the hall don't have neonatal incubators, which are the standard treatment for underweight babies born in the rich places of the world. But they do have proven, low-cost procedures to keep tiny babies warm, fed, and alive.

The baby was Preeti's first. She expects to have one more. She already loves this girl. But it would be good, Preeti says, if the next one were a boy so she can "get the operation"—meaning sterilization surgery, having done her duty to have a boy.

Preeti's hope for two children is normal now, even in a poor, disadvantaged state in India. This book tells her story and her nurses' stories. Their choices, their lives, are also part of a wider story. A story in which women in rural Uttar Pradesh (where many women are poor, haven't had much schooling, and marry young) choose two children is

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a story in which many women, everywhere, choose even fewer. Preeti is one eight-billionth of the story that this book tells: Choosing fewer children is becoming normal, everywhere.

Rural India might seem like the middle of nowhere to someone who has never been to Uttar Pradesh. But to an economist or demographer, India is in the middle of the world's statistics: middle in income, middle in life expectancy, and middle in birth rates. And what happens in India is important for the planet as a whole. At some point between when Preeti's baby was born and now, India became the world's most populous country. If there's one thing that many non-Indians know about India, it's that there are a lot of people there: in 2025, 1.4 billion.

What fewer people realize is that India is on a path to a shrinking population, which is a corner that China has recently turned and Japan did in 2010. That's because many women like Preeti plan to have one or two children. In the most recent national data from India, women were having children at an average rate of two per two adults. Because that data point was from 2020, the average has almost certainly fallen to a little bit less than two by 2025. But even back in 2020, those who had been to secondary school (a growing fraction of girls and women in India) averaged 1.8, which matches the average for all U.S. women in 2016. The hospital where Preeti gave birth is in an especially disadvantaged state of India. But young women there said that they want about 1.9 children, on average. Small families are the new normal.

What's so normal about normal?

For many people, a society where women average 1.8 or 1.9 children would feel familiar. But so much familiarity is deceiving.

> **Normalcy will create something unprecedented.** Birth rates that are normal in most countries today will lead to an unfamiliar future of global depopulation.

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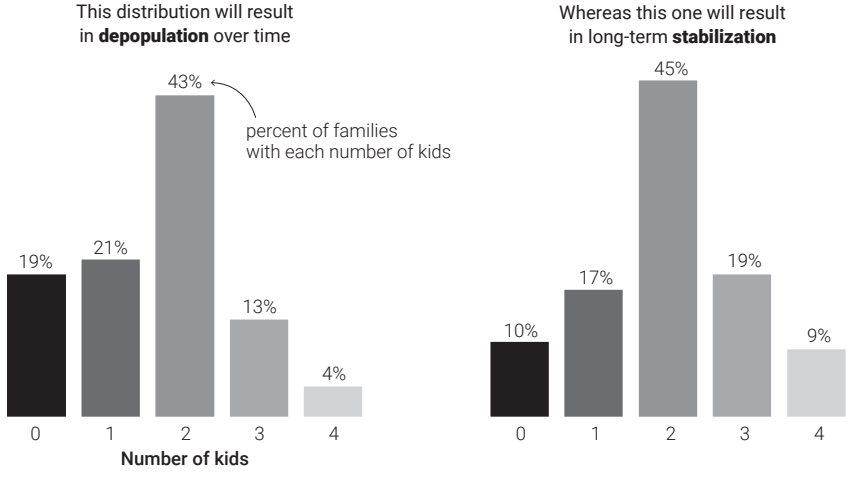
If today's normal stays normal, then big changes are coming.

And yet, looking around, you might not notice the difference between a society on the track toward depopulation and one headed for a stable future. Figure 1.2 diagrams two (of many) possible futures, with different fractions of people choosing zero, one, two, three, or four children. The taller a bar is, the larger the fraction of adults who have that many children. On the right is a distribution of family sizes that would make for a stabilized population, neither growing nor shrinking. On the left is a depopulating future, with 1.6 births per two adults, on average.

How different are the left and the right? It depends on what we're asking. The bars look only a little different, but their *consequences* are very different. Their implications are as different as a steady, stable global population, on the right, and a decline toward zero, on the left. The next chapter will trace out the arithmetic (painlessly), so you can see why for yourself. But here is our point for now: They don't look *that* different. Both include some families with a few children, plenty with none or one, and a bunch with two. Both look pretty ordinary if you live in a place like Austin, Texas, where we do. Professional statis-

Figure 1.2. Families in two futures: depopulation or stabilization



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ticians could tell the difference, if they had all the data. But could you tell the difference on a visit to the park, the grocery store, the pool? Could you see the difference at school drop-off, at the coffee shop, or jogging around the lake? Probably not. And that means the patterns of family life leading to a profoundly different future can slip past our notice.

We may not feel it. We may not see it. But we teeter at the tip of the Spike. Our times, when many people are alive, may prove to be unlike the entire rest of human history, past and future—if what is normal today persists.

Is this story four-fifths over?

Birth rates around the world vary in interesting ways: across countries and provinces, by race and religion, by education and income. In the United States, teen births are most likely to happen in January, but births to married moms are most likely in May. In India, Dalits—the disadvantaged caste group formerly called "untouchable"—tend to have slightly more children than people born into more privileged castes. The varied history is fascinating, too: France's fertility fell fast in the 1700s, long before its neighbors' did and long before hormonal birth control or latex condoms were invented. Experts have written thousands of articles about the details in scholarly journals. But those detailed differences don't help us understand what is likely to happen.

We learn what is likely to happen by seeing what people around the world *have in common*. Every region on Earth today either has low

Figure 1.3. Have four-fifths of humans already been born?

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birth rates, like China, India, or the United States (the three most populous countries), or has falling birth rates, like most African countries.

If humanity stays the course it is now on, then humanity's story would be mostly written. About four-fifths written, in fact. Why four-fifths? Today, 120 billion births have already happened, counting back to the beginning of humanity as a species, and including the births of the 8 billion people alive today. If we follow the path of the Spike, then fewer than 150 billion births would ever happen. That is because each future generation would become smaller than the last until our numbers get very small.

Right about now it would be understandable to think, "But come on! This is all too much confidence about an unsustainable trend! Surely people won't keep having fewer and fewer children forever."

Some trends are indeed unsustainable, and it would be a mistake to extrapolate them indefinitely. We're not making that kind of mistake here. People around the world could continue to have small families. Not smaller *than* today. Small *like* today. They could continue, for a long time, to make individual decisions that add up to 1.4 or 1.6 or 1.8 children on average. A depopulating future would arise from *steady* birth rates at these levels.

How long depopulation could continue depends on what people choose. Our numbers will fall decade by decade, as long as people look around and decide that small families work best for them. That's all it would take. There would never be more than 150 billion humans, if families continue to have a bit less than two children each, on average.

So if—*if*—humanity stays this course, then there would be only 30 billion more of us for the rest of human history. How exactly might we fizzle out in that future? Should anyone literally expect that humanity will depopulate down to the last two people?

No. In a world that sheds 8 billion people, something big would eventually break and knock us off this path, for good or for bad. We would not ride the precise math of the Spike down to the last few million of us.

The off-ramp from the Spike could be sharply down. The end could

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be some catastrophe that a larger population might have survived but a smaller population couldn't. We have a chapter about this possibility.

Or the off-ramp could be up. Maybe birth rates would rebound, after a disaster or disintegration that staggers us. How? If progress halts or reverses, if life becomes worse, then it would be like we moved toward humanity's poorer past. People had more babies in the poorer past than they do today and tend to have more babies in poorer countries than in richer countries. So perhaps the off-ramp is some disaster that regresses on social, technological, or political progress, knocking backward humanity's millennia-long history of struggle and growth. That might mean higher birth rates, and it might even stabilize the population, but it wouldn't be good.

Might matters reverse automatically, without big changes? The short answer is that that's unlikely. A reversal would break a centuries-old trend of declining birth rates. That trend is founded on social and economic changes that most of us view as progress and that none of us should expect to disappear.

We can learn about the odds of an automatic rebound from the histories of countries where birth rates have fallen low. Since 1950, there have been twenty-six countries, among those with good enough statistics to know, where the number of births has ever fallen below 1.9 births in the average woman's full childbearing lifetime.

Never, in any one of these twenty-six countries, has the lifetime birth rate again risen to a level high enough to stabilize the population. Not in Canada, not in Japan, not in Scotland, not in Taiwan. Not for people born in any year. In some of these countries, governments believe they have policies to promote and support parenting. But all of them continue to have birth rates below two. A 0-for-26 record does not mean that things couldn't change, but it would be reckless to ignore the data. If a reversal happens, it will be because people decided they *wanted* to reverse it and then worked to make it happen, not because automatic stabilizers kicked in.

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It takes two (to ever have a stable global population of any size)

Perhaps even at the end of this book you will not agree that a world of 5 billion flourishing people could be better than a world of 500 million equally well-off people. But do you think the size of the population should *ever* stabilize at *any* level—even a level much smaller than today's—rather than dwindling toward zero?

> **Some inescapable math.** For stabilization to ever happen at *any* level—even to maintain a tiny, stable global population—the same math applies: For every two adults, there must be about two children, generation after generation.

Wait, two? Exactly 2.0? Two for *everybody*? No, the next chapter explains. For now, it is enough to see that any population, large or small or tiny, continues to shrink if there aren't at least two children for each two adults. Dwindling toward zero is neither balance nor sustainability.

Notice what this inescapable math implies: Once the global average falls below two, which is a marker that we are likely to pass in a few decades, stabilizing the world population would require the global birth rate to increase and then to stay higher permanently. That has never happened before in recorded demography.

Maybe you feel confident that someday, somebody good and powerful will figure it out. Maybe you are more optimistic than the projections in the Spike that, after some decades or centuries of depopulation, humanity will manage to pull its birth rates back up to two. Even if you think so, read on.

For one, you might be wrong. This book will show that some popular beliefs about the history of how governments and movements have shaped birth rates are wrong.

For another, even if the global population will eventually recover, it makes a big difference *when* the recovery begins. Here are the stakes, even in the optimistic case of an unprecedented recovery: Each decade

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of delay in starting the rebound causes the final, stabilized population size to be 8 percent smaller, ever after. (Does that sentence leave you motivated, intrigued, or skeptical? You'll reach details in chapter 12.)

It is time to pay attention

Do you remember when you first understood that climate change is a seriously big deal? Most of us born before 1990 went through school without much awareness. Your authors grew up in a time when schoolchildren learned about the problems of an ozone hole, acid rain, and depleted tungsten supplies, not carbon emissions. The first book about climate change for a general audience, Bill McKibben's *The End of Nature*, was not published until 1989. But the basic facts have been known for a lot longer than the social movement has been around. Congress heard scientific testimony in the 1950s. In 1965, President Johnson included in a speech to Congress that: "This generation has altered the composition of the atmosphere on a global scale through radioactive materials and a steady increase in carbon dioxide from the burning of fossil fuels." That year, the White House released a report calling carbon dioxide a pollutant. Progress, such as it is, has only accelerated in recent years. But somebody got started in the 1950s.

Good thing they did, or the climate policy of today would not have the tools, the technologies, and the political awareness to make the progress it is finally making. Scientists in the 1950s and '60s had recognized the threat of climate change. They did not have a complete map to every solution. But they did not believe it was too early to get started, six decades ago.

The tip of the Spike may be six decades from today. (Or a few decades sooner than that.) Like the climate pioneers of the 1950s, all of us alive and working today are decades away from anyone having all the answers we need. But that does not exempt us from facing up to the facts. It's time to start learning. The first step is understanding the population today, where it came from, and where it is heading.

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Chapter two-point-zero

The dividing line between growth and decay

Seema is one of the nurses in the Kangaroo Mother Care program in Uttar Pradesh. She is helping Preeti learn to breastfeed and keep her baby warm. As a young woman from a rural village, Seema is remarkable for having a nursing degree and a job in a district capital city. She has already come a long way.

So has Uttar Pradesh. Two decades ago, only 43 percent of homes there had electricity. Over 8 percent of babies died before they were one year old. Now 90 percent of homes have electricity, and less than 5 percent of babies die in infancy. Today, whoever of Seema's three sisters, four brothers, and two parents is available each night uses a smartphone to join the family video call. But Seema remembers when her family first got electric lights and fans at home. These days—increasingly but still infrequently—some women like Seema work as professionals. Her older sister, Reema, a nurse at the same hospital, blazed the trail.

Families are changing, too. Seema's father, a parent of eight children, was one of eight siblings. A generation ago, eight kids was a big family, but not an outrageous one. Seema's parents sacrificed for decades so that all eight children could get an education. Now Seema works in the KMC ward, where she coos to the tiny babies as she weighs them. When her

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