

THE **NEW** BAZAAR

September 16, 2021

EPISODE 6: A SHORT HISTORY OF LONGER LIFE

STEVEN JOHNSON ON THE INNOVATIONS THAT INCREASED LIFE EXPECTANCY

CARDIFF GARCIA: Hey, I'm Cardiff Garcia. And welcome to The New Bazaar. Today on the show.

STEVEN JOHNSON: All these things that have been quietly extending our lives over the last couple hundred years suddenly have become a lot more visible in a pandemic, like the one we've been living through.

CG: Steven Johnson on the short history of longer life.

For almost all of human history and prehistory, going back tens of thousands of years, the average human life expectancy was only about 35 years or less. That's as long as the average person could expect to live when they were born, just 35 years. Now, think about that for a second. In all that time, we invented agriculture, we built the pyramids. There was the rise and fall of Rome and big achievements in culture and the arts and literature and architecture, Shakespeare, the Renaissance. But we could not figure out how to help people live longer.

And then something changed. Starting roughly in the 17 and 1800s, there was a series of innovations in public health that finally started arriving one after the other that increased life expectancy to where it is now, more than 70 years or more than twice as long as it had been for all those centuries and millennia. And these new innovations often built off of each other. Like, for example, the invention of the sewer system separated drinking water from waste water. And it has saved more than a billion lives. But it would not have been possible without an understanding of water-borne disease. And that would not have been possible without a revolution in statistics and data gathering.

The author Steven Johnson has spent the last few years finishing a big project that tells the stories of all these innovations in a PBS series and in a new book called *Extra Life*. And in our chat, we discuss a couple of these innovations in some depth. But here, I just want to tease out one idea, which is that we under-celebrate these innovations to a degree that is frankly kind of embarrassing.

I mean, we celebrate war heroes, we celebrate our nation's founders or important politicians from the past, but we simply don't do a great job of celebrating all the civil servants and the statisticians and the scientific findings that have given us the thing that we yearn for most, longer and healthier lives for ourselves and also for our loved ones, and especially for our children. Steven Johnson calls this a crisis of mythology. And it's an idea that I have not been able to forget since he said it in our chat. Here it is.

CG: Steven, here is where I wanna begin. And it's with a quote from the prologue to your book. Here's what you write. "This book begins with these two simple but astonishing facts. As a species, we have doubled our life expectancy in just one century and we have reduced the odds of that most devastating of human experiences, the death of a child by more than a factor of 10." And Steven, can you just kind of take us through the project and set it up? What exactly happened that led to these wonderful outcomes?

SJ: Well, one of the things that maybe surprised me the most when I dug into the research on this project is how, um, little change there was in these kind of broad patterns in human health for really the entire history of our species. I mean, going back to hunter-gatherers as, as best as we can tell.

CG: Tens of thousands of years into the past, yeah.

SJ: Yeah. The, the, the, we basically think over that period, you know, with, with occasional geographic variation and occasional seasonal annual variation, if there was a plague or a particularly beneficial harvest, in general human beings lived about 35 years. That was the kind of, like, rough estimate of how long human beings lived. And, uh, a third of all children died before reaching adulthood. And that was just the state of play for tens of thousands of years all the way up really until about 1800.

So you think of all the advances of, you know, civilization over that period, you know, we create the pyramids and we invent algebra and, you know, we, we invent the printing press, all these amazing breakthroughs. We have cities and operas and all these extraordinary things that we do over that time, but in terms of actually that, that most fundamental measure of progress, how long do you get to live, we really didn't move the needle at all.

CG: Yeah. And so a few hundred years ago, we start getting one after another these incredible advancements and innovations. We're gonna go deep on a few of these. But can you just kind of list some of them for us so that people get an understanding of just how many different things have contributed to this wonderful series of outcomes for humanity?

SJ: Yeah. I mean, my original idea for this whole project was that I wanted to actually sp- specifically document exactly how many kind of extra months or years of life we got from each of these innovations. But that proved to be way too hard to do.

So in the end, we kind of divided it up into innovations that saved kind of millions of lives, then hundreds of millions of lives and then billions of lives, right? That's kind of the rough order of magnitude that you can do. And, and so at the so-called low-end of the spectrum in millions of lives, it seems like, you know, antimalarial drugs, insulin, kidney dialysis, pacemakers, but also things like refrigeration, seat belts in the last 50 or 60 years have been incredibly important. And then when you, you get into the hundreds of millions, you're looking at things like antibiotics, blood transfusion, chlorination, chlorinating the drinking water is really crucial, milk pasteurization.

And then in the kind of the big zone, you know, the billions of, of lives saved, it's, it's artificial fertilizer, which, you know, has played a key role in reducing famine around the world. Vaccines, of course, probably the most important one that we should be stressing right now. And then the, kind of the infrastructure of toilets and sewers, which is also related to chlorination in the sense of cleaning up the water supply and separating out waste from drinking water in big cities. That, that was a, that was a huge breakthrough.

But I should also point out that there are more subtle kinds of innovations that are harder to quantify but really, really important. So our ability to test and measure whether a given drug works or not using techniques like randomized control trials. That was something that had to be invented as well. And that has made a huge difference in our history. And the creation of institutions that help us, for instance, do something like eradicating smallpox. Like the mention of the WHO. There just wasn't a global institution 150 years ago, 200 years ago that was capable of doing something as mammoth as eradicating smallpox.

So it's both things like antibiotics and pacemakers and, and those kind of material breakthroughs. But also almost more meta innovations, like testing and, and developing a, kind of a global body like the WHO that also matter.

CG: Yeah. And Steven, you make the point that these innovations all started happening just a few hundred years ago, which, as you also point out, is a really tiny slice of the overall human experience in history and prehistory. Why do you think it was that they came in this huge batch in just a few hundred years instead of, I don't know, being spread out over time throughout history, throughout the past? Uh, what was it about this modern era that started a few hundred years ago that you think could've led to all of these innovations happening almost at once?

SJ: Yeah, it's a great question. I mean, the, the primary answer to that question is that, that these health breakthroughs are a secondary effect of the scientific method being created, um, that before 1700, 1800, it was very hard to kind of develop treatments and really, you know, detect whether they were working or not. Uh, there

is some evidence that before 1700 or so, that going to a doctor was, uh, on the whole, worse for you than just sitting at home and letting your immune system recover.

You know, you would go to the doctor and they would be like, "Oh, you're sick. Here, let me apply these leeches to your body, or perhaps you would like some arsenic." And that was because we really didn't have a way of testing whether these approaches worked. And we didn't understand things like our cell systems or, uh, in, in the 20th Century, our DNA.

And so, you know, we had to have the, kind of the scientific breakthroughs of the 17th Century, 18th Century. We, we needed microscopes, um, we needed the, the actual kind of intellectual process of the scientific method to begin to think in this way. And, and when those tools, those kind meta tools were developed, suddenly it became possible to think about disease, you know, and chronic disease. And infectious disease as something that we could actually combat with science and with medicine.

CG: There is another idea from the book that I wanna bring up before we get into some examples of these innovations, and it's this idea that you refer to as the invisible shield and how we just can't quite appreciate the specific innovations that have led to higher life expectancy. So can you just explain that for us? What is the invisible shield?

SJ: So I've been working on this, um, for about four years, more than four years now. And, uh, how, I had written most of the book, but, you know, I had written multiple drafts of the book by the end of 2019. Um, and so the, the book part of the project, and there's, you know, there's also a, a PBS/BBC series that accompanies it, the book part of the project was all written mostly pre-COVID, the first kind of drafts of it. And so I'd written this all along, you know, a history of public health and fighting disease and vaccines and all these things that, uh, I was thinking we needed to pay more attention to.

Um, and then all of a sudden, uh, you know, in March of 2020, um, the, you know, the world changed. And, and what I realized was that all of the things that I had been writing about to make visible, suddenly people were talking about, right? They were suddenly talking about clinical trials, right? They were suddenly talking about vaccine, um, you know, development and how fast can you scale up this, the, the new vaccines. They were talking about developing new therapeutics and test them, all these things that I'd been thinking about and writing about.

And so I realized that, that one thing that a pandemic does is on its own is just suddenly people are aware of what's been kind of humming along quietly in the background kind of keeping them safe without them thinking like, "Wow, there are all these people who have to make these drugs and test these drugs and distribute these drugs and ... or test, make sure the drinking water is safe or make sure that, um, my seat belt works," all these things that have been quietly extending our lives

over the last couple hundred years suddenly have become a lot more visible in a pandemic, like the one we've been living through.

And so that's when I started to think about this idea of the invisible shield. But the other thing about it that is really important ... And this is, this is kind of the paradox of, of progress in health as opposed to almost any other field. I think it's, it's kind of unique in this way. There, there aren't a lot other, a lot of other examples of it in that progress in health is, in a large sense, defined by things that, that didn't happen. And by that I mean, the, the progress is, you, you didn't die of smallpox, uh, when you were two, because smallpox was eradicated in the middle of the 1970s. And you didn't contract cholera from a glass of drinking water when you were 10, because our sewer systems were developed to separate them from the drinking water supply or we chlorinated our drinking water. Or you didn't die in a car accident, because seat belts were invented and, and mandated by law in all cars, right?

So, so that, the, the, all these things that didn't happen are actually the, the true measure of progress. And other forms, like technological progress, you can look at, you can point to your smartphone and be like, "Look, this smartphone didn't exist 20 years ago, and now it does. So that's progress. I can see it. It's tangible." But with health, it, it's much harder to see. And that creates that cloak of invisibility, I think, that, that shrouds a lot of this stuff.

CG: I wanna go back to the mid-1700s now, which is when the average life expectancy actually started going up finally for at least one specific group of people. And that specific group was British aristocrats or peers, basically the rich, the elite. Maybe not the most sympathetic group, but still a significant moment. So what actually happened?

SJ: Yeah. We, we believe that that first stretch in, in the second half of the 1700s where the European elite started to live longer was, was that they, they stopped dying of smallpox at such an alarming rate. And, and, you know, we should just pause for a second to just understand the magnitude of the, the, the menace that smallpox, that smallpox virus was to humanity. I mean, it dates back to the at least to Egyptian times. Um, hundreds of millions of human beings lost their lives to this horrible disease. Many of them young children. It was a terrible killer of, you know, three year olds and 80-year olds.

And because of that, probably because it was such a notorious nemesis of, of human beings around the world, arguably the first real medical intervention that made a difference in extending lives was developed to fight di- directly to fight smallpox. And it was this procedure of variolation, um, which is, as you say, a kind of a, a predecessor of vaccination. Um, you know, you take a little bit of, kind of scrape off a, a pustule of someone who has been infected with smallpox. It would create these kind of pox on, on people's, um, skin, uh, a horrible disfiguring disease. And you would then take those and just inject, or sometimes they would grind them up into a powder and people would snort them, um, which is kind of grotesque idea, and basically you would give people a, you know, just a low-grade case of smallpox. And

the hope was it, you know, because the dose was very small, that you would just get a little sick and you'd recover and then you would have lifelong immunity, um, because of your own, your own immune system. Now, you know, something like two to three percent of people who were variolated, that's the procedure of variolation, um, died and they got full-blown smallpox and they died. And so it was a dangerous procedure and a, and a particularly, you know, just the decision to variolate your children.

I mean, think of, like, again, you're, you're saying, "I'm gonna do this procedure, and it's a two percent chance that they will die because of this decision that I've made," you know, just a harrowing kind of a choice to make. But the odds of dying of smallpox were so much worse that it actually was the, statistically the, the right play to make, although the consequences of having decided to do something that ultimately killed your child would be very heavy to have to deal with.

And so it had, this procedure had been developed. We think it was developed independently, uh, like a lot of great inventions in history. There's some record of it coming out of China. There's some record of it coming out of Africa. Um, it came to the United States through the slave trade. Um, there were variolated enslaved Africans who showed up in New England and explained the procedure. And it kind of got adopted by people like Cotton Mather, who became an evangelist for it.

But the fascinating woman- woman who's at the center of this story is this woman, Mary Montagu who was a British aristocrat who had contracted smallpox herself. Um, she was a really interesting figure. She was a great intellect. She wrote poems and novellas and had a correspondence with Alexander Pope and all this stuff and, uh, you know, in her 20s. And then she moved to Constantinople, Istanbul, because her, uh, husband was the ambassador to the Ottoman Empire. And, and, uh, she observed these people in Turkey who were variolating their children. And she re- she also observed that they didn't seem to have as much smallpox there as they did in England.

And so at, you know, her instruction, her two children were variolated, one in Turkey and then one back in England. And they're believed to be the first British citizens to have been variolated. And because she was so influential, she eventually persuaded the Princess of Wales to variolate, um, her own, uh, children. And it basically took off among the, the elites, and, and in fact, among the rest of England as well.

So it became a kind of a standard practice. And it was, and, and Edward Jenner, who's famous for inventing the, the smallpox vaccine, the first real vaccine which used cowpox, not smallpox, to induce the immune reaction, he himself was variolated. And he had practiced variolation. And so it's an interesting story in the sense of how, how do these transformative ideas really happen. Like, what, you know, where do they come from on some level.

And in the case of vaccination, we always hear about Edward Jenner coming up with this brilliant idea, and it's a momentous turning point in the history of health, which it

it. I mean, vaccines are the, you know, they are different from variolation. Um, but it's an improvement on an existing intervention that was circulating around the world for hundreds of years. And if it hadn't been for Mary Montagu bringing that idea to, uh, Great Britain, it's, you know, it's unclear whether Jenner would've actually come up with the smallpox vaccine in the first place.

CG: Yeah, uh, I thought this, this chapter of the book was especially good on explaining why networks matter so much for these advances to take place, because there's this narrative that, you know, this lone genius came up with this thing maybe building off of some obscure thing that they came across before but that they deserve, you know, the lion's share of the credit. Uh, and not to deny any of the credit from someone like Edward Jenner, but in order for this to become a kind of mass thing for people to start accepting variolation as an acceptable way of preventing smallpox, you needed a lot more things to happen.

And in fact, I thought the, the, the way that it became, that vaccination became accepted in the US was just as instructive, because essentially this started with, uh, someone named Benjamin Waterhouse who I think received some version of the smallpox vaccine from the UK and then shared it with, uh, a Virginian he happened to know named Thomas Jefferson. And so that kind of started the process of vaccination becoming more accepted.

But you kind of needed, you know, in, in this case, you needed, like, the elites to start trying it themselves to make it known that they were trying it. You needed people like Charles Dickens publishing arguments in favor of mandatory vaccination that people would read. Um, and it required this kind of broader effort. It wasn't enough that vaccination was a thing that was proven to work by then or that somebody had come up with different vaccines. To get widespread acceptance, it required a kind of movement of sorts, and a movement that in some cases would take decades.

SJ: Yeah, that's right. That, that expresses it perfectly. So, you know, lurking behind all the stories in this book, it is this question of, how does momentous change happen in society, like enduring change? Like wh- how, like, what really drives it? And, you know, we hear a lot about science and technology driving change, and that is absolutely true. It does, it is probably the, the single biggest driver in, in many ways. But what I tried to do in, in these stories is to remind people that the science on it, on its own is not enough, right?

You can discover something in the lab and make that breakthrough in the lab, but if, if you don't have people fighting to implement your discovery and persuading people to adopt it or passing laws that mandate that people adopt it or, you know, creating political movements that support people adopting it or just explain it to people, uh, in a persuasive way, the scientific advance won't matter, right? The science doesn't exist in a vacuum, right? It has to have champions.

And, and in, in the case of vaccination, yeah, there's ... I mean, Jefferson, it, you know, Jefferson just got interested in vaccination and wrote to Waterhouse, this guy

in, at Harvard, and said, you know, I hear, I've heard about this smallpox vaccine, and I could probably run some, like, they didn't call it this, but they were basically clinical trials. Um, they weren't official randomized control trials, but they were, you know ... he tested it on a lot of people and tested their immunity. By the way, he tested it on his family, but the first people he tested it on, we should say were his slaves. So this was, this was Jefferson at, you know, his best and his worst.

CG: Yeah, that, that does feel like quintessential Jefferson, uh, as you note, at his best and at his worst, you know. So invested in the idea of an American utopia, but also in denial about the way that he was damaging that very idea. And so he's open-minded enough about the possibility that variolation might work while also running these experiments on enslaved people, and later on his family, and I'm guessing not caring too much about the harm that he might have inflicted on them.

I wanna turn now to another example of one of these innovations, one that also led to billions of lives being saved just as variolation and vaccines did. And this was the eradication of some water-borne diseases, notably cholera, that came with the development of a proper sewage system. And specifically the sewage system in London, which was kind of the prototype and which was the focal point not only of a chapter in this book, uh, Steven, but also the subject of a whole previous book that you wrote, *The Ghost Map*.

And I sort of see the silent hero in a lot of these stories, but especially in this story, to be the importance and development of statistics and data gathering as intellectual pursuits and how necessary an understanding of statistics was to just getting to the point where you could start to put in place the kinds of public institutions and public remedies that would get rid of some of these diseases. So let's start with this. Why don't you tell us about William Farr, who he was and the detective story that led to the London sewage system.

SJ: You know, one of the things that was, uh, on the face of it, a challenge, uh, of doing this kind of project, this is true of both of the book and the, and the TV series, is that on some level, I, what I was trying to do is celebrate data gatherers and statisticians and government bureaucrats and regulators. And these are not things that-

CG: Not the sexiest professions. Right.

SJ: You know, it seems, it seems the, anti- antithetical to, like, good storytelling. Um, but, but you said a really important point, you know, you said a really important phrase in there, which is, you know, detective story. And so many of these stories, what I think makes them compelling, uh, as narratives, hopefully, is that they are kind of mysteries. There's something strange happening in the society. And there are these clues, and the clues are in the form of data that people like William Farr are collecting, um, trying to make sense of the puzzle.

And I, uh, that's one of the things I worked on a lot is trying to, like, figure out a way to, like, make it feel almost like you're in the middle of a, a detective story, only it's starring not, you know, Sherlock Holmes but a, a government regulator.

CG: Who was William Farr, by the way? Tell, tell us about him.

SJ: So Farr, yeah, so Farr was a, actually trained as a doctor, but he was really a statistician. And he, he basically pioneered, he's one of the kind of founders of epidemiology. Um, it was a f- uh, it was, uh, the field in, uh, his day had this great name. It was called vital statistics, um, kind of like vital signs, like the statistics of life. And he had realized at an early age that by analyzing patterns of life and death and disease outbreaks and things like that in aggregate and sometimes by mapping those datasets and by looking at changes over time and over space, you know, comparing one community to another, that that data itself was a defense, a major defense, maybe the most important defense at that point against disease and immortality.

So he began, he would create these, um, annual abstracts, um, mortality reports basically for, for England and Wales, um, starting around 1840. And he had beautiful data visualizations and things like that. And he was the first person to notice that there was a kind of mathematical progression to an infectious disease outbreak. And so when we talk about flattening the curve and that language that we all became familiar with last year, the curve was first identified by William Farr and analysis of disease outbreaks in the 1840s. So he, he is, he's everywhere.

I mean, when we started looking at, like, uh, what's the infection rate in my neighborhood, like, what's, you know, uh, are deaths rising, what's the hospitalization rate, this is all stuff that William Farr largely invented, uh, about 180 years ago. And so he, we're, we're completely in his debt. Now, he, he was instrumental, although indirectly, in solving perhaps the biggest medical mystery or public health mystery of the 19th Century, which was the source or the, the agent responsible for cholera. And cholera was just a, like a killer, particularly in the rapidly industrializing cities of the world in the middle of the 19th Century that was in many ways as terrifying as smallpox had been.

Um, people are gathering into these, you know, unbelievably crowded spaces, uh, with no modern infrastructure for waste removal and things like that. And the water was getting contaminated with human waste, literally excrement. People were just eating other people's excrement. It's a crude way to put it, but that's just what it was. And that was causing people to come down with cholera and, and dying. You would get these terrible outbreaks that, you know, 10% of a neighborhood would die in three weeks from drinking contaminated water.

But the problem was, at the time, people didn't realize that the water was the source of the illness. People thought that it was in the air. They thought that people were breathing in or smelling some kind of noxious agent, um, that was causing them to get sick. They thought ... It was just known as the miasma theory. And it was an

understandable assumption, because these cities were incredibly smelly. So you kind of could reasonably assume that people had these cesspools in their basements where they would just dump their waste and, and they would just sit there.

So it was a terrible place to, to breathe the air, but it was not from, you know, breathing in fumes. It was from drinking contaminated water that people were getting sick. And using Farr's data, a very famous doctor and epidemiologist named John Snow, not the one from Game of Thrones, uh, in 1854, this is the hero of my earlier book that you mentioned, *The Ghost Map*, um, he figured out for the f- for the first time and convincingly established that cholera was in the water and not in the air.

And what's important about this is that he did it entirely with data. He was not able to see the bacterium that caused this cholera. He looked for it, but the microscopes of the day were not strong enough to, to detect. And so he did his own investigations, and he used a lot of analysis that, that Farr had assembled to basically map patterns of outbreaks and point to the fact that there seems to be, in one famous case, a contaminated well in the middle of Soho in, in London that had caused an outbreak. And through that kind of detective work and through that map making really, um, he was finally able to kind of turn the tide and convince people that the water was the problem.

And that led to the creation of the London sewers, which separated the waste systems from the drinking water systems. Then ultimately led to things like chlorination, um, of drinking water. And, and by the end of 1866 at the end of an outbreak that, that William Farr had helped to kind of solve, cholera was gone from London for good. Never, never to return, uh, in a, in a serious outbreak again.

CG: And one of the points you make is that when we walk around London, you know, you'll see enormous monuments to war heroes, you know. Entire squares named after them, entire parts of the city, um, dominated by the presence of these, you know, enormous statues and what not. And that happens also in, in many parts of the US as well. And we don't have similarly prominent public memorials to achievements like this one, even though in many cases, you know, the lives at stake were many times greater than the lives that were at stake in, in a particular battle or in a particular war.

Um, and you see that as, as kind of a problem, that, that there should be some way of celebrating this publicly and, and making it clear just what was at stake when these advances, you know, came through and just, just how incredible these achievements were.

SJ: Yeah. It's, it's, it's a, it's a kind of crisis of ... mythology, right? Like, who were the, who are the heroes that a society celebrates in our history? And, and when you, when you take that, you know, modern world history survey class in high school. Like, what, what is it, you know, how many pages are devoted to progress in human health versus military conflicts, right? And, uh, to me, like, the best example of this,

the kind of imbalance, is, you know, we, as I mentioned before, we ultimately eradicated smallpox, um, in the middle of the 1970s.

We, we just took this virus that had killed untold number of humans dating back thousands of years, and we just eliminated it from the face of the Earth. I mean, this is an incredible achievement. I mean, probably the single most impressive thing in terms of health that we've ever done as a species. And the analogy I always make is, like, "So, you know, every single schoolkid knows that we put a man on the moon in around that period. But how many of them know, you know, that we eradicated smallpox?" Uh, you know, and yet, which one really mattered the most in terms of your day to day life that you're no longer, you know, in, in peril of this terrible virus or that, you know, 50 years ago people walked on the moon?

Sure, maybe they're equivalent because getting off of Earth was such an amazing longterm achievement and will lead to future things that will be, you know, more momentous. But it should at least be equally famous as a story. And these that, you know, they disappear, they aren't celebrated. And, and I don't quite understand why, because they actually are, they're great stories. There's so many stories out there.

I mean, I had a, you know, I, I had too many stories to fit in a book, because they're, they're incredible achievements, incredible bravery and heroism and intellectual, um, you know, breakthroughs that, that make for great stories. But for some reason, we, we prefer to talk about astronauts.

CG: Yeah. I ... And by the way, Steven, I wanted to make sure that I included both, um, vaccination and, and the eradication of smallpox in addition to the story of, um, the sewer system, because those were a couple of the examples of these advances that saved an estimated billions of lives, right? Um, and there's a whole bunch of others, uh, in the book that I'm gonna, I'm gonna leave for the listener, um, to, you know, to pick up and, and check out themselves.

But, uh, I wanna, I wanna get to some lessons here. And one of the conclusions you drew at the end of the book was that when you look back on all of these different kinds of innovations and all of these different success stories, so not just vaccination and, and sewage, but also pasteurization and artificial fertilizer and, and also, you know, the reduction in automobile, automobile deaths, safety standards, things of that nature.

Um, you write that what's surprising to you was that not that many of these advances came from the private sector, that actually they required a lot of different types of public sector mobilization, you know, scientists, universities, you know, um, activist groups, things of that nature. So, uh, can you just kind of, like, take us through that? And, and give us a sense of what the private sector's role is in all of this.

SJ: Yeah, I'm glad you, you asked that question, because it's an important one. And, you know, we've just lived through something with COVID with the vaccines that maybe we take for granted. But we, we should remind ourselves that it's a relatively

new invention, which was that there was a wonderful, uh, public-private partnership in the creation of the vaccines. That there was, you know, amazing work done, uh, you know, in the early days, um, of, you know, sequencing the genome of the coronavirus and developing that kind of, like, platform for the, uh, mRNA vaccines. And a lot of that research had been funded by the NI- NIH over the years.

But it was in partnership with private companies like Moderna, kind of more of a start-up, and then a big established big pharma company like Pfizer. And that model re- worked wonderfully. I mean, the, the, the COVID vaccines are, uh ... And we'll look back and say this was one of the great breakthrough moments in, in our ability to treat infectious disease is the speed and efficacy of those vaccines. But it was, it was a combination of public investment and, and, and private investment basically.

But that is a very new model. And we really didn't see a lot of positive, um, developments in, in health coming out of the private sector, uh, really until the, the end of World War II. Um, you know, there were some out there, but for the most part, it was things like building sewer systems. It was things like, you know, water safety experts arguing for chlorinating drinking water, um, in public water works. It was things like passing laws that mandated that milk be pasteurized, because milk was a big killer in, in that period.

Um, and a lot of the drug companies that were selling drugs in 1900 were selling you, um, snake oil, right? It wasn't, they, you know, they weren't helping. And of course, we know empirically that overall, the, the emergence of industrial capitalism in the middle of the 19th Century was a huge killer. One of the first things that William Farr did that was really momentous in his statistical work was to track the differences between people living in the countryside versus people living in newly industrialized cities like Liverpool.

And in Liverpool in, you know, 1840, average life expectancy was 25. I mean, it was, it was a deadly place to live. And it was precisely because industrial capitalism had, you know, c- completed this crazy revolution in the city in, in 50 years, um, and crowded all these people together in these intolerable conditions.

Um, and so the private sectors impact on human health, I think, from the early days of industrialization into the 20th Century, I think if you added, it's very hard to do this, so this is, you know, this is a, a, a guesstimate on some level, but I, I would say it's probably in that negative. And the big interventions came out of academic research and public health interventions, um, you know, and government driven regulators making sure the drugs were safe and forcing automobile companies to, uh, put seat belts in, you know, against great resistance from, from the automobile industry. There was just a lot of work that had to be done to combat the health hazards that were being created by private companies in that period.

Now, that, uh, genuinely had ... I wanna make clear, I do believe that that has changed. And as we have started to de- ... We've made a major, uh, we, just an extraordinary advance in actually making therapeutics and medicines that really do,

uh, save lives now. And, you know, big drug companies, uh, play a role in that. They could, you know, they could probably do a better job, and we can have that argument about how we can make them more attentive to the needs of larger numbers of people and all that kind of stuff. But they do play a positive role now I think in society. But it's a recent development.

CG: Yeah and there, there might be one, I guess, more harmonious spin on the relationship between the public sector and the private sector, at least over the last, I don't know, half century, maybe a century. And I'm, I'm curious to get your take on it. Which is that the public sector, as you pointed out, often will partner with the private sector. But also, the private sector over time, you know, has also generated the kind of prosperity and material wealth, which can make it possible for the public sector to be properly funded to continue focusing on public health and on the other institutions that also, you know, protect people and drive better overall health outcomes.

And the material wealth, to be clear, that's generated by the private sector is not always equally or fairly distributed. And that can be a problem in and of itself. But at least it is providing the kinds of resources that can be taxed or, you know, distributed some other way or used by the public sector in order to focus on the things that historically it's been pretty good at. What do you think about that idea?

SJ: Yeah. I think that's, that's right, for the most part. I think that's ... and then I think that's an important thing to say. Um, historically, there has been this argument that, you know, some of the macro trends we've seen towards longer lives at the end of the 19th Century, beginning of the 20th Century in places like England and, or the United States that that was being driven by overall prosperity and, and arguably just having more food on the table and that, that forces were coming out of the private sector in market forces and so on. Uh, I, I think that theory has been kind of largely debunked.

Um, but, you know, and one place to look at it is during the Great Depression where obviously the, the market is going backwards, um, and people are having less food on the table and the, the economy's not working. But actually, it was a period where child mortality, uh, dropped dramatically in the United States. And that's because we were cleaning up the drinking water with chlorination during that period, a lot of the big, you know, public works projects. Um, and also milk pasteurization had kind of kicked in at that point, uh, you know, in the 20s and 30s and spread around. Uh, and so a lot of children weren't dying from contaminated milk as well.

And so you, you know, if it were entirely being driven by overall levels of prosperity and, and access to food, you would've thought that things like childhood mortality would've gone backwards during the Great Depression when in fact they kind of, they, they jumped up higher. So I, I think that there's, particularly in the 19th and early 20th Century, I think that, um, kind of s- non-market forces were probably the biggest driver during that period.

CG: Okay. We've gone through a few of the specific and quite extraordinary advancements, uh, over the last couple hundred years. I'm kind of curious to know what you think are the lessons of those earlier periods for right now. You know, we're in a new era, things are a little different. You've pointed out that, you know, the relationship between the public sector and the private sector has changed. But what do you think are the lessons that are, that transcend the fact that we're in a new era and, and that still apply now?

SJ: I guess I would say there are two big lessons, um, that come to mind. The, the, the first is that changes in life expectancy are huge drivers of change throughout the society, um, that they extend far beyond just the, kind of the health category. So, you know, we have the, the population growth we've had over the last 100 years from two billion to eight billion, you know, not because people are having more babies but because people are living longer and children aren't dying and the generations are, are stacking up. Um, and that population growth has then in turn driven climate change and, and all the problems that have come from that.

And so when you kind of mess with the dial of how long the average person gets to live, it, it changes everything. It changes politics. I mean, just think about the, kind of the aging of the American electorate and its impact on presidential elections recently, for instance. Um, so it is a, a tremendous force in the world when you see change happening at, at this scale, at this pace with something like how long the average person gets to live.

Um, and so I think we, we don't pay enough attention to it as a, a force for change in the world. And so when we think about what's coming next, are, you know, are people going to live to 120 or 150 or beyond that, we wanna think hard about what the potential consequences of, of that would be for the society at large.

And that kind of gets to the second point, which is that when we make changes like this to life expectancy, it, it fundamentally reorganizes kind of the, the rhythms and the, and the rituals of the arch of a human life. Um, to, to me in the past, the biggest change, uh, that I, I just think is so profound is the revolution in what childhood meant, that if you lived in a world where 30% of all children died before becoming an adult, you know, childhood was the most perilous time to be alive until you were very old. And if you were a parent, you know, the odds were that a third of your children were gonna die.

Um, and so the whole meaning of what it is to be a child and to be a parent has been transformed in just 100 years. Now it's the safest time of your life. And very few parents, uh, around the world, but particularly in a place like the United States, very few parents have to live through that incredible tragedy of, of losing a child. And it's enabled us as we live longer to kind of lengthen the time that we spend in that childhood state.

And, um, and so, you know, if you think about it on the other end, if we're gonna push the envelope out and live, you know, have more and more people living into

their 100s and maybe hopefully more and more people living healthy lives into their 100s, what does that mean? I mean, the whole idea that, "Well, you should retire at 65, because you're probably gonna be dead by 75," is, is a completely out of date concept if you are likely to be healthy and functional until you're 110 or 120.

And so when, again, when we, when we move the needle on these numbers, it changes, you know, not just society, but actually the way that we individually organize our lives and experience those things. Um, and so it's a ... I think that it is, um, as momentous a change, um, as any of the changes of the, uh, of the last two centuries is this, this overall extension of life.

CG: You know what your point about childhood made me think of?

SJ: What?

CG: Is that a lot of parents, especially in advanced economies, just put a ton of pressure on their kids to, like, get into Harvard or whatever. Like, let them enjoy their lives. The fact that they, you know, are likely to be safe, the likeliest time in history that they're gonna actually make it out of childhood, let them enjoy their childhood a little bit. Let them have fun. Let them play. Let them run around, uh, and not spend all their time freaking out about whether they're gonna get straight As or whatever, you know.

SJ: Yeah. I mean, if, if you've got another 140 years to grow up, you know, might as well enjoy being a kid for awhile.

CG: Exactly. Uh, and on that happy note I think, uh, is a good place to end the chat. Steven, thank you so much.

SJ: Hey, thanks for talking to me.

CG: And that's our show for today. You can find links to Steven's book *Extra Life* and to his PBS series of the same name in the show notes for today's episode. The New Bazaar is a production of Bazaar Audio from me and Executive Producer Aimee Keane. And speaking of living longer, I am convinced that the endorphins of joy that come from collaborating with Aimee are gonna make me damn near immortal. And that goes also for working with Adriene Lilly, our excellent sound engineer, and with Scott Lane and DJ Harrison of Subflora Studio, whose beautiful theme music makes me want to keep listening forever.

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