

Rationally Speaking #224: Rick Nevin on “The long-term effects of lead on crime”

Julia: Welcome to Rationally Speaking, the podcast where we explore the borderlands between reason and nonsense. I'm your host, Julia Galef, and I'm here with today's guest, economist Rick Nevin.

Rick is a senior economist at ICF International. He's done research on a bunch of things, but maybe what he's most well known for is his research on the effects of lead exposure at a young age.

He's written a lot of papers on the topic, in addition to a book titled *Lucifer Curves: the Legacy of Lead Poisoning*. That is what we're going to talk about today.

Rick, welcome to Rationally Speaking.

Rick: Thank you.

Julia: First off, what, Rick, is the phenomenon that the lead hypothesis was developed to explain? What's the pattern in need of an explanation?

Rick: There are several patterns. Probably the one that people are most interested in is crime. We experienced a long, seemingly relentless crime increase from the early 1960s through the early 1990s in the US. We've seen a precipitous decline since then.

It is well known that early childhood lead exposure affects brain development and lowers IQ, but also affects the brain in many other ways that affect impulsivity and behavior.

What I've found, and I started working on this around 1994, is, if you look at the rise and fall of crime, and map it against the rise and fall of lead exposure with a 23 year time lag, it was an unbelievably close fit.

That might sound like a coincidence. I have since discovered exactly the same pattern in almost a dozen other nations around the world. That international comparison is especially striking. The crime rate started rising much faster and earlier in the US, where the lead emissions started rising faster and earlier.

The US phased out lead in gasoline over the 1970s and experienced a dramatic crime decline over the 1990s. Britain didn't start getting lead out of gasoline until the late 1980s. They experienced a soaring violent crime rate over the 1990s.

It follows the same pattern in every country. There have been a number of other studies by other researchers. At the state level. The city level. Even at the zip code and suburb level. All of which shows a striking association between variations in early childhood lead exposure and crime rates about two decades later.

Julia: When we talk about lead exposure, are we talking only or primarily about leaded gasoline? Are we talking also about lead paint or other uses of lead?

Rick: All lead exposure is additive. By far, the two most pervasive sources of exposure in the 20th century were lead in paint and lead in gasoline. One of the striking things in my first study, that showed the effect from either source, is that we have murder rate data going back to 1900 from official mortality statistics.

What I found was that the murder rate increased almost tenfold from 1900 up through about 1930, then [went] low in the 1950s before it took off again and got back close to the peak it was at in 1930.

When you map the rise and fall of lead paint and the rise and fall of lead in gasoline, you see that it has tracked both of those trends. With about a two decade -- it was actually 21 years -- over more than a 100 year time period.

A lot of people, when they think about lead in gasoline, are thinking only about inhalation. In fact, by far the biggest sources of exposure for very young children is lead contamination in household dust.

The brain is in a critical stage of development at exactly the age when children are beginning to crawl on the floor and engaging in hand-to-mouth activity. The deteriorated lead paint in a house settles as lead in dust. The lead in gasoline emissions would settle as lead in dust.

That was the primary way, and a number of studies have shown this, that lead in dust is the key pathway for the exposure of very young children. They've got their hands in their mouth. They're wet. They're crawling and picking up the dust, putting their hands back in their mouth, dosing themselves with this toxic chemical.

Julia: There's a few links in this causal chain, right? Increase in lead in the surrounding environment causes increase in exposure to lead, consumption of lead, by children. That causes changes in their developing brain. That causes rises in violent behavior.

We've talked about correlational evidence connecting that first node in the chain to the last node in the chain. Do we have any evidence for the link going from "increase in lead in the environment" to "brain changes"? Before we get to the actual crime rates -- which is an effect, we think, of the brain changes -- do we have any evidence for brain changes in children exposed to more lead than other children?

Rick: Yes. The University of Cincinnati has done MRI studies that showed striking evidence that children with higher levels of lead exposure have reduced gray matter in the prefrontal cortex, which is the area that affects what they call "executive functions." Behavior, planning, and impulse control.

They also found that early lead exposure impairs and reduces the development of myelin, which is a substance that is deposited on the neural connections between synapses. It's like insulation on a wire.

As the brain grows, white matter increases. That's really the myelin being deposited on the connections between neurons. A number of researchers have documented that growth as we age, and associated it with more impulsive behavior among

teenagers and even young adults. The brain isn't fully wired. It isn't connected as completely as it is as you get older. That myelin growth continues through the age of 50. It's particularly important in the late teens and early 20s.

The impacts that have been demonstrated for lead exposure on brain growth are actually very consistent with what we already know from crime rate data about the peak ages of offending being in the teenage years and in the early 20s.

The other thing that is particularly striking over the last 20 or 30 years that I've documented is that we've seen a shift in that peak age of offending. The most dramatic declines that we have seen in arrest rates by age have been among juveniles, and then substantially among people in their 20s and 30s.

Although the overall crime rate is coming down, it actually would be coming down even faster, except that we are still seeing an increase in arrest rates for older adults. In absolute terms, people in their 40s and 50s are still less likely to be arrested than people in their teens or early 20s. In temporal terms, people in their 40s and 50s today are more likely to get arrested than they were 30 years ago.

There's an 80 or 90% decline in some crime categories for juvenile arrest rates. What you're seeing is that arrest rates are still being affected, even among the oldest age groups, by the years before the phase out of lead in gasoline. That's when those groups were born.

Julia: I don't yet understand how that connects to... the thing I'm about to say. Reading about the lead and crime hypothesis, and potential objections to it -- one of the main things that comes up was the claim that in the 1990s, in the latter half of decade and onward, the crime rate went down, but it didn't just go down among people who were born in early-mid 70s or later. It went down among a bunch of different age groups. Which seems like evidence against the hypothesis that it's a cohort problem, that it's like a group of people who are more like to commit crimes -- as opposed to a period issue, that there's something about cities in that era that makes people more or less likely to commit crimes. Like a crack epidemic or something like that.

Rick: Yes. There was a study that brought up that point in 2002. It was a good question to ask. It was a good study, in many ways.

They actually focused rather narrowly on homicide. Actually, on homicide victimization rates by age.

Julia: Oh. As opposed to committing homicide.

Rick: Yes. There's no data that is perfect. When you're looking at arrest rates, they might go up from one year to the next, even if the overall crime rate is going down, because the police might catch more of the people who've committed crimes.

They focused more on the victimization rate by age. They noted that there was a very strong correlation, historically, between arrest rates and homicide victimization rates by age.

Julia: Does that correlation mean that the age of the perpetrator is correlated with the age of the victim? Is that what you're saying?

Rick: Correct. Of course the most obvious example is street gangs. That was probably the biggest source of concern, particularly in the 80s and the 90s.

One of the things I point out in *Lucifer Curves* is that that correlation has weakened. The percentage of juveniles who are murdered by other juveniles has dropped substantially. Those who are still being homicide victims are more likely to be victims of adult homicide offenders.

More importantly, looking at other, broader category of arrest rates over a longer period of time, I've found an incredibly consistent relationship. The crime decline has now spread around the world, with most countries having phased out lead in gasoline during the 1980s.

If you look at arrest rates by age, not only is it very clear that we've seen a much deeper decline in juvenile arrests in the United States -- you're seeing exactly the same pattern in Canada. In Britain. In Australia. In New Zealand.

It's a very clear pattern that has become apparent since those studies questioned that cohort affect.

Another point on that subject is that we have a sometimes heated debate over incarceration in the United States that's going on now. It's been a little frustrating for me that people have not noticed the same cohort effect in the prison population.

The overall US prison population has been declining for the last few years. People feel like it should be much lower than it is. "What kind of sentencing reforms can we enact?" Some of those might be very good changes to make. But we should be aware of the fact that we've seen absolutely stunning declines of 70% or more in the male incarceration rate for 18 to 19 year olds. We've seen declines of more than 50% in the incarceration rates for men in their 20s.

Once again, the overall incarceration rate is not declining as fast because the incarceration rates are increasing for people over the age of 45 or 50.

Julia: Why would they be increasing? The lead hypothesis doesn't seem like it would predict that.

Rick: What is happening, unfortunately, is that recidivism rates among released prisoners are quite high, particularly among state prisoners. What is happening is that the percentage of people over the age of 50, that are in prison, is increasing in no small part because they have been to prison once or twice or more during the course of their lives, and have racked up another serious offense, and have gone back to prison as they've gotten older.

Here again, in absolute terms, the incarceration rate for people over the age of 50 is lower than it is for men in their 30s. But in relative terms, over time, the

incarceration rate is actually increasing over the last 20 or 30 years for people over the age of 50, as it has been plummeting for juveniles or young adults.

Julia: Were there any predictions that you or this theory made, when it was first being formulated in the late 90s, early 2000s, that were born out by the data since then? It's been 15, 20 years.

Rick: Yes. In the first study, I was anticipating continuing declines in the crime rate. You're looking at roughly a two decade lag. 23 years for violent crime. I found it was closer to 18 years for property crime, which is actually another source of evidence. Property crimes are much more likely to be committed by teenagers than violent crime is.

The implicit forecast was that there would be considerable ongoing declines in crime rates, especially in arrest rates for younger adults. That has been born out in the United States.

My 2007 study, that looked at seven or eight different countries around the world, had the same implicit forecast. In *Lucifer Curves*, I actually show the crime trend up through the last year of my peer reviewed, published analysis, and the show the stunning, in many cases, 50% decline or more in burglary and robbery rates in half a dozen different countries that have tracked what the earlier decline in lead exposure suggest would happen.

It's had better predictive value than any other criminal justice theory I'm aware of.

Julia: Conditional on the lead hypothesis being correct, and explaining a majority or a large plurality of the variance in crime, is it surprising that crime continues to go down in the 2010s? If lead was phased out decades ago?

Rick: We've always had a distribution of blood lead levels. There's no lower threshold that any research has suggested, below this level, there is no impact.

As blood lead levels continue to decline, with ongoing progress in reducing lead paint hazards and other sources of lead exposure, I'm keeping an eye on the percentage of children that still have a blood lead level above five.

At least one study that was very carefully done, I think this was also by the University of Cincinnati, found that there was an elevated risk of criminal behavior, at least above a level of five.

In the 1970s, five was an incredibly low blood lead level. Like a lot of other public health risks, there is almost certainly an interaction between the environmental exposure and individual variations in biological vulnerability, that we might not fully understand.

What that might mean is that, among a group of young children with blood lead levels above 30, you might have an incredibly horrific -- I'm making numbers up.

Just for illustration -- it might be 50% of those children end up in the criminal justice system.

If you looked at children with blood lead levels of 10 to 20, it might be 10% of them end up in the criminal justice system. It could be that you're still getting 4 or 5% of children with blood lead levels of 5 to 10 that end up in the criminal justice system.

We'll find out how much farther this goes. We have seen encouraging ongoing substantial decline in the percentage of children with blood lead levels above five.

The fascinating thing, that is not of my book but part of my ongoing work, is that the juvenile arrest rates are continuing to decline, tracking that earlier decline in the percentage of children above five. If it continues on this relatively consistent trend that it's been on over the last 25 years, juvenile arrest rates could be remarkable close to zero, sometimes around 2025. We'll see.

Julia: So you're saying that levels of lead have, in fact, still been going down -- so it's not surprising, conditional on the lead hypothesis, that we see crime [continuing to go] down.

Rick: Yes. The level of concern that the CDC has now set, and they're likely to lower it in the near future, they've said anyone above five.

I should pause here. From my perspective, I want all children under two. Not just under five.

The level they've tracked over the years has declined. In the 1960s, a child was not called blood poisoned unless they had a blood lead level above 60.

Julia: Whoa.

Rick: Yeah. It was horrific.

It dropped to 40 when they had large scale screening programs, in several major cities, in the early 1970s. Almost 1/3 of children tested were above 40. Then it dropped to 30. Then to 25. Then to 10.

Now it's at 5, and likely to go lower, as all the evidence continues to show there's no lower threshold where there's no impact at all.

I am a little bit concerned. I read news stories. Several other prominent researchers have noted the same thing in published reports. In a situation like we've had in Flint, where children are described as lead poisoned and are being given the impression that they are irreparably damaged because they had a blood lead level above five... the first national survey of children's blood lead levels in the late 1970s found that 99.8% of all children had blood lead levels above five.

I don't want any child to have a blood lead level above five. I don't even want anyone to have a blood lead level above two. But I don't want to scare the living hell out of

parents or children who have one blood lead test of six or seven. A lot of people have done just fine after having that experience.

Julia: That is a really good point. I'm actually surprised, given that ... I forget which year you said this was. The time when a large proportion of children were tested above 40, I'm surprised that crime wasn't even higher than it actually was, if that was the level of lead exposure.

Rick: That was in cities. The air lead levels in cities were much worse than they were in suburbs. This is another piece of the evidence that supports this theory.

The murder rate decline since the 1990s has been especially steep in the largest cities. We have the air lead data from 20 years earlier showing the greater traffic congestion in those cities naturally led to much higher ambient air lead levels in large cities than you ever saw in suburbs.

The concentration of crime that has been in cities, as opposed to suburbs and rural areas in decades past, was also consistent with the much higher air lead levels that had been recorded in cities 20 year earlier. We've seen the decline go down much more steeply in those areas where the air lead levels have come down the most steeply.

This also has had very important racial impacts. Black children were disproportionately concentrated, first, in dilapidated city slum housing that had horrible lead paint risks. Then in cities in general where the air lead levels were higher. In particular, in public housing projects, that we unfortunately built, in many cases, right beside new highways where the near fallout from the street was much worse than the overall ambient air lead levels.

This led to especially high arrest rates among black juveniles in the 80s and early 1990s.

Julia: Did we see those especially elevated arrest rates near the highways? Or are we talking about in general, among black people?

Rick: You don't have any systematic data. In my 2007 study, I specifically noted a notorious housing project on the South Side of Chicago that was eventually torn down. It had been built right beside ... I think it's the Dan Ryan Expressway that, at one point, is 16 lanes wide.

I described what we know about how much more severe the near fallout is. By the time they started emptying out that project and decided to tear it down, it was accounting for ... I forget what the percentage was. A shockingly substantial percentage of all of the murders in Chicago were occurring in that housing project.

There's anecdotal evidence that is very consistent with near road exposure being especially severe. Affecting not just the children. Children are especially affected by lead in dust. That's their main pathway.

But they're also affected before birth, through the mother's blood lead level. Pregnant women in those housing projects were breathing a horrific amount of lead, in and out, all the time that they were pregnant. All of the anecdotal evidence continues to line up with that.

As an aside, people are generally unaware of the fact that black juvenile felony arrest rates now are less than 1/2 of what the white juvenile felony arrest rates were in the early 1980s.

You can see the much steeper decline in black juvenile arrest rates over the last 20 or 30 years. That is, again, completely consistent with the much steeper decline in more severely elevated blood lead levels among black children 20 years earlier.

Julia: So the idea is that exposure to lead was greater among young black people than among young white people. Therefore, reducing lead in the environment produced a sharper decline in crime among young black people than white people.

Rick: Exactly. That racial disparity in lead exposure, especially in more severely elevated blood lead levels, has been very well documented since the 1970s. We know that happened.

Julia: Toward the beginning of this conversation, I was asking about the link in the causal chain between exposure to lead and changes in the brain. You talked about some of the neurological evidence we have for brain changes. Do we have any other evidence, in the population, of behavior?

If the reason that lead increases crime is because it makes people more impulsive, gives them lower impulse control, et cetera, do we have any evidence of trends that would also result from low impulse control, et cetera? People going into more debt or something. Making worse financial choices. That kind of thing?

Rick: There are two, actually. The phase out of lead in gasoline, the cost was justified by the anticipated benefit of better educational achievement and higher lifetime earnings as a result of that.

A researcher named Joel Schwartz, who actually won the MacArthur award, I believe, for his work on this subject, put together this perspective that there was a strong association between IQ levels and education attainment and subsequent lifetime earning.

There's a lot of research, even as early as the 1960s, especially in the 70s, that showed that lead clearly had an impact on IQ scores. Putting those two together, he said "If we reduce childhood lead exposure, you're going to increase education attainment and significantly increase lifetime earnings as a result."

One of the things I've looked at ... It's not as easy to map or analyze statistically. But the trends are pretty clear that, with significant increases in high school graduation rates, up through the 1950s, at some time in the 1960s, about 20 years after the air

lead levels took off after World War II, the progress in educational attainment mostly stalled for almost 20 or 30 years and, in some cases, went down.

What we've seen going on in education trends over the same years that the juvenile and young adult arrest rates have plummeted is that the high school drop-out rate has fallen to an all time record low and college enrollment rates have risen to an all time record high.

That, by itself, doesn't prove the association, but it's exactly what we would expect to see.

The other relationship that is really stunning, and people have a hard time wrapping their head around, is that a number of studies had already shown a link between IQ and criminal behavior and incarceration risk. Another study had shown that there was also a clear link with unwed birthrates.

At the same time that the crime rate rose, the unwed birthrates, particularly teenage unwed birthrates, really went up from the 60s all the way through the early 1990s.

My study in 2000, I looked at both unwed birthrates and abortion rates, and found that it was exactly the same pattern as crime. It had risen. In fact, the time lag fit with the age group... The birthrate for girls under the age of 15 seemed to map at a 14 year lag. For girls 15 to 17, it mapped at a 17 year lag. For 18 and 19, it mapped at a 20 year lag.

We've seen a massive, stunning decline in teenage birthrates in general, unwed birthrates in particular, and in abortion rates. It's the same pattern, if you look across age groups, that you see in the crime and incarceration rates.

The over 40 is the only group where unwed birthrates or abortion rates are still increasing even slightly. You've seen the massive steep decline in the younger age groups.

I'm currently working -- I've got the data but I haven't published anything -- on a study that shows exactly the same association, the same trends, in unwed birth and abortion rates in Britain and in Canada, linked to their lead exposure trends.

Julia: There's one thing I wanted to ask you about in your book. You talk about how people back in the 1800s were already worried about the effects of lead exposure. And it was higher lead exposure than just inhaling lead dust near a highway. There were kids working in lead mines.

First, can you give an example of concerns raised back in the 19th century about lead; and Second, if we knew back then that lead has these negative effects on people's brains, why did we suddenly start using widely in the mid 20th century?

Rick: There isn't a good answer to that question. It was a horrible mistake, obviously. It's a cautionary tale. People today think ... I said 99.8% of children have blood lead

levels above five in the late 70s. "How can you be at all worried about any percentage of kids being above five?"

It can still be affecting some part of the population. In the 1800s what happened is they actually would refer to the "lead trades." Lead poisoning, in the encyclopedia was called "a disease of occupations."

They were especially aware of the effects on painters. Typesetters had horrible exposure. There were other professions in the early decades of the Industrial Revolution where lead exposure was widely recognized as a serious occupational hazard for a variety of workers. We were talking about people dying. We weren't talking about losing a few IQ points.

There was no understanding, at that time, of how this might be affecting very young children. They would be affected by industrial emissions.

There was increasing concern about the paint lead levels. France actually started reducing their paint lead levels in the mid 1800s. Actually, around 1840. I've found crime data from the 1800s that showed a steep decline in French crime over the 1800s, and a similar shift in arrest rates by age in Britain to what we're seeing now.

The term "juvenile delinquency" actually was first used in the early 1800s, at the dawn of the Industrial Revolution, about 10 to 20 years after there had been explosive growth in the number of patents for lead paint and the production of lead to be used in lead paint.

Over the 1800s, Britain caught up with France, phasing out the lead in paint. They saw not only a significant decline in British crime over the late 1800s. They also saw a shift from juvenile delinquent to much older offenders. That's just recently been documented in a study I cite in *Lucifer Curves*.

You're seeing this pattern, in hindsight, going back all the way to 1800. When they first added lead to gasoline, there were people, prominent public health advocates, who were trying to block this. They had been working to reduce lead in paint, trying to make people more aware of the hazards to workers from lead poisoning.

There were people who, when they were discussing this possibility, were saying "If this gets to a point where there are a lot of cars and this is being spewed everywhere, it seems like it could have some very profound, pervasive effects."

Of course those warnings turned out to be right. To give you an idea of how little regard they had for the warnings that they were facing at that time, the tetramethyl lead manufacturer, when they first started producing this to reduce engine knock with gasoline lead additive, they had ... They called it "loony gas." At the plant where it was made, a number of workers died. A lot of others were taken away in straight jackets.

Lead additives were pulled off of the market for gasoline for ... I think it was a year or two. Then there was corporate pressure. The federal government was involved.

They announced "They didn't have the proper ventilation in the plant. It's not going to be a problem in the gasoline."

Leaded gasoline was back. That was the beginning of the long rise in air lead levels.

Julia: Are there any specific villains? I want someone to be mad at. Is there a person who made this decision?

Rick: There are a lot of good candidates. I know that there have been other books that are written on that subject. I haven't really focused on that. I'd rather not call them out by name.

The funny thing is, one of the leading scientists was working for the oil companies, and Octel, the manufacturer of the lead additive, they tried to get him involved in a defense of lead paint companies. He refused to help them defend that case. He said that he had seen evidence of children in the 1940s, when they first recognized the link between lead poisoning from paint chip ingestion and other sources of lead ingestion in children, and the risk of what is now called "intellectual disability."

That was discovered in the early 1940s. The same scientist who was saying "Yes. I've seen this effect myself. It's a serious risk. I can't defend the paint companies," I think he was the same scientist urging the use in lead in gasoline. People can be blinded.

I hope I have that story correct. I should have emphasized, again, before I got into it, that this is not where I focus my research. I'd rather get rid of the exposures we still have. There are a lot of other people out there who have sued the paint companies. I wish them well, but that's not where I can probably do the most good.

Julia: Understood. How has the reception to the lead hypothesis been? Also, what do you think it would take to get mainstream consensus on board and taking action in response?

Rick: For many years, it was largely ignored. I got a very good article in the Baltimore newspaper when my 2000 study was published. I thought it would generate another call and some more interest. It never did.

The Washington Post did a great article after my 2007 study was published. Then they actually had a front page article in the Post two years later about how crime was continuing to decline and no one could explain why.

Julia: You're over there waving your hand like "Hey! Hey! Over here!"

Rick: I called the reporter who wrote the story on my research two years earlier and said "Have you seen this?"

He said "Yeah. I talked to them before they published it. I sent my earlier study. They decided to ignore it. Don't know why."

I've had more luck in the last few years, thanks to Kevin Drum and Mother Jones who did a cover story.

Julia: That's where I heard about it.

Rick: Kevin not only wrote the cover story on this. As a daily blogger, he's continued to follow-up on this and directed people to all of the different research.

He's also posted a blog post on how they had tried to interest The New York Times or the LA Times or other newspapers into showing this relationship. He would do a shortened version of the article he did for Mother Jones or update things. For some reason they're not interested. It's rather frustrating.

It relates, as I say, not only to the lead hypothesis, but to clear effects of this that you would think people would be acknowledging. If we're having the debate we're having today about mass incarceration, someone should be paying attention to the fact that we're already seeing a 70% decline in the 18 and 19 year old incarceration rate and that that is going to roll through the prison system over time.

Even simple capital expenditure decisions. Alabama or Mississippi the last couple years have been debating a massive spending program to replace aging prisons. It would be financed over a 30 year period of time with 30 year bonds.

No one has looked at what's happening by age group in prisons to know that there's no way they're going to need that much prison capacity in 30 years. You would think at least those facts would be considered.

Julia: Just from the self-interested financial perspective, I wonder if it would be helpful to make some concrete predictions for the next 5 to 10 years, say. Probabilistic predictions about a bunch of things.

If you can demonstrate the strong predictive power of this hypothesis, then in 5 to 10 years that might ... Especially if you could get people to agree ahead of time, "If some percentage of those predictions come through, we will consider that strong evidence for the lead hypothesis."

Rick: The funny thing is it's still the same prediction. I can't tell if there is some baseline crime rate level that would exist with zero lead exposure. I'm starting to think that there might not be.

Julia: Really? But there was crime before lead, right?

Rick: It might be remarkably close to zero.

The truth is lead paint started spreading in Europe in the 1700s. I don't think we have data on anything in history without lead exposure.

Julia: But there was violence at least, right? Steven Pinker's talked about rates of violence well before we had lead paint. We might not have called it "crime" back then, but...

Rick: I don't know. This is getting into material I haven't published. I've actually come across a couple of historical things about a period of accentuated warfare that couldn't be explained among Native Americans in the Southwest United States. For some reason there was horrifically violent warfare that didn't seem to compare with anything at other times or in other parts of the country.

I've come across evidence that Native American tribes in that era discovered lead at the Cerrillos Mountains. There were incredibly high lead content levels in the ceramics that they ate and drank from.

Julia: That is interesting.

Rick: I keep seeing it over and over again. This is particularly relevant to IQ.

The very first IQ tests were created at the beginning of the 20th century, around 1900. The Binet test in France was in 1904. That was one of the first and most significant advances in IQ testing.

Of course France had already dealt with what they had understood was a dangerous increase in lead in paint, starting a hundred years before that test. Now people look and they talk about "How does lead exposure affect IQ?"

I'm starting to think we should be asking them a more profound question. "What does IQ even measure in the absence of any lead exposure?"

I'm not sure we know. I know for certain that these studies that have shown an incredibly strong correlation between IQ and education attainment and unwed birthrates and criminal behavior.

As you see, particularly among juveniles, those rates plummeting over 25 years, establishing a trend line that, as I said before, shows them getting close to zero in 2025.

The way that they calculate IQ is always relative in relative terms. Some percentage of the population will always be under 75. Some percentage will be between 90 and 110. Et cetera. But it's not going to mean what it used to mean.

Julia: Meaning that there will actually be less variance in the population?

Rick: You can still come up with "This person has a very low score" in relative terms. But in absolute life terms, "How much does that affect their potential?" I don't think anywhere near as much as it did in the 1960s or 70s, when the biggest part of what you were measuring with IQ tests was how severe was the early childhood lead exposure for this child.

Julia: Does that model fit with the significant hereditary-ness of IQ?

Rick: One of the things I've pointed out is that there are two trends that have been well documented in IQ. One is that this is mostly done siblings that are separated. Especially twins. That's the ideal data.

If they are separated very early in life, you find that the genetic siblings that never knew each other after the age of one, their IQs tend to be closer than either of them are with their adopted siblings that grew up in the same household.

The impact of lead is very substantial before birth through maternal blood lead. The peak period of ingestion is when children are learning to crawl around the age of six months. I've looked at some of these adoption studies. It's very often children who were adopted-

Julia: After six months?

Rick: At around the age of one or older.

Julia: Interesting. I didn't think of that.

Rick: People are assuming they have nothing in common from their birth life. No. They crawled on the same floor and ingested the same lead dust and shared the same maternal blood lead.

Furthermore, they could inherit the same biological vulnerability to lead exposure.

Julia: That's true. Modifiers, yeah.

Rick: That would be irrelevant if we eliminated lead exposure.

Julia: Interesting.

Rick: A guy by the name of Flynn actually discovered comparing IQ test norms over many decades in, I think, more than two dozen countries around the world has shown that IQ scores have been rising substantially, for more than a century, everywhere in the world.

The way they calculate IQ obscures that rise. Every new IQ test, your IQ is calculated relative to the other people in the norm sample for that IQ test.

When they have a new IQ test, they also give people the older IQ test to prove that it's consistent, that the new IQ test is scoring people as having high IQ if they had high IQ on the old test and low IQ if they had low IQ on the old test.

What Flynn discovered is that when you look at these norm comparisons, as they're called, the new IQ sample always, or almost always, scores above 100 on the old test, on average. 100, by definition, was the average for the people who were the norm sample for that test, 20 or 30 years earlier. That means IQ is actually increasing.

In my 2000 study, I pointed out that a lot of the data that Flynn had was consistent with the steep declines in lead paint exposure that would have occurred in Europe, starting in the mid to late 1800s. In the United States, starting around 1900.

People have never really been able to explain the Flynn Effect. They've had different speculative ideas about that.

Julia: Like maybe our education system is teaching analytical skills more. Something like that.

Rick: Mm-hmm.

Julia: That is interesting.

One other question that I had meant to ask earlier, but forgot, is: have there been any attempts to exploit pseudo-random variation in looking at these correlations?

Obviously, we can't do a real randomized control trial where we assign some children to grow up with lead and others not. But sometimes economists get very clever about exploiting these natural experiments.

Rick: I think the most striking natural experiment is the fact that I mentioned earlier. The US increase in lead emissions after World War II was much greater and much earlier than it was in Britain and other places that were struggling to recover from the devastation of that war and had nowhere near the number of automobiles that nowhere near the gasoline consumption that we had in the 1950s.

Then the fact that the phase out of lead in gasoline occurred at different times, sometimes 10 or more years apart, in different countries. Then you see that you've got the same time lag explaining the rise and fall in crime in every one of the countries that I've looked at, predicting another dozen years of steep declines in those countries.

It's the lag related to the rise and fall of lead within that country. That's a pretty striking natural experiment that no one planned on, that confirms the relationship overall.

The other thing is the change by age that I think is the most striking, that we're still seeing such steep declines, ongoing declines, in juvenile arrest rates.

Julia: That's probably a good place to wrap up. Before I let you go, Rick, I wanted to ask you to nominate a book or article or website or something like that that either had some significant influence on your thinking or that you consider to be a great representative of your field, a really well conducted experiment or well argued something like that. What have you got?

Rick: This is not really about lead poisoning, directly.

Julia: That's fine.

Rick:

There's a book called *The Rising Curve*. It was edited by a very well respected academic by the name of Ulric Neisser, who passed away a few years ago.

When the book *The Bell Curve* came out, which was extremely controversial, it came out in the early 90s and talked about how IQ affected crime and unwed births and education attainment. They cited the research showing IQ was inherited.

Ulric Neisser was the person that the American Psychological Association chose to be the chair of the committee that produced a paper, called *Intelligence: Knowns and Unknowns*, to try and deal with the extreme controversy created by *The Bell Curve*.

In the course of writing that paper, he found that the research on the Flynn Effect and related trends on the narrowing of black and white achievement score differences in school were two really fascinating subjects that he wanted to look at more.

James Flynn was the author of one of the chapters of that book. He also had other distinguished academics authoring -- this is the *Rising Curve*.

After the publication of *The Bell Curve*, *The Rising Curve* was published. Got nowhere near as much attention as *The Bell Curve* did, but I think is a really interesting piece of background to provide perspective on other things that you might have heard about IQ.

I've been lucky enough -- both James Flynn and Ulric Neisser had traded emails with me when I was first doing this work around 2000, encouraging me, because the mystery had not been solved. They thought I might be onto something.

I would strongly recommend *The Rising Curve* as a good example of really rigorous and principled academic thought, including an acknowledgement of "We can't really explain this yet."

In the case of James Flynn in particular -- Flynn gets more credit -- they actually call the rising IQ trend the "Flynn Effect" now. Even though he was credited with discovering it, he makes it clear in *The Rising Curve* that he doesn't think that any of the explanations for it are satisfactory, that there's something else missing.

I'm convinced that it's lead.

Julia:

That sounds like a great recommendation. Personally, because I have a weakness for book titles that reference earlier book titles as a response to them.

There was a pair of books -- I forget the authors -- One was titled *How the Mind Works*. The second one was titled *The Mind Doesn't Work That Way*. I guess Steven Pinker was one.

Now we have *The Bell Curve* and *The Rising Curve*. That's great. I'll add that to my list.

Rick: That was the inspiration for the title of Lucifer Curves.

Julia: Oh really? Nice. We have a trio.

Rick: I explain in the first chapter that there's actually relationship between lead contamination in the atmosphere and the origin of the word "Lucifer." What I'm suggesting is that both the IQ bell curve and the rise and fall of violent crime, I have both of those on the cover, those are both impacts of lead exposure.

It's following on The Bell Curve and The Rising Curve. Now you've got a trio.

Julia: That's perfect. Tell me about the word Lucifer. Where does that come from?

Rick: It's a fascinating tidbit that I picked up that I realized I could use. The word "Lucifer" is commonly thought to be another name for Satan or the devil. Biblical experts say this is actually a mistake of ancient biblical translation. The word Lucifer refers to Venus as the morning star.

In the Latin version of the Bible, Luciferian or however the Latin word was phrased, was used in many reference to Jesus Christ, that were then translated into the English Bible as "the rising star" or "the morning star," in references to Christ.

There was an Old Testament reference to a Babylonian king who likened himself to the Babylonian god of Venus. It was a ridiculing commentary to call him Lucifer. For some reason, when the Bible was translated into English, I guess the King James version, that was the only place that the word Lucifer was kept.

Rick: I pointed out that the reason that Venus is so bright in the sky, the reason the morning star is so bright, we now know from space expeditions is because of its incredibly dense, incredibly toxic atmosphere that reflects light. The heat on the planet is so high that it actually melts late on the surface. That lead settles on the mountains as a glistening reflective shield.

I pointed out, as a new perspective on crime, that Lucifer isn't actually the name of the devil and doesn't even represent anything inherently evil. It just refers to the impact of an extremely contaminated, toxic, lead environment. That was the link.

Julia: That's great. I love some good etymology with my epidemiology. Public health.

Rick, thank you so much for coming on the show. This is fascinating. We'll link to The Rising Curve and the Lucifer Curve, as well as to a couple of your papers on the topic, for our listeners.

Rick: Terrific. Thank you.

Julia: This concludes another episode of Rationally Speaking. Join us next time for more explorations on the borderlands between reason and nonsense.