

**Mary Alice Yeskey**

Welcome to the Hopkins Press podcast. I'm Mary Alice Yeskey with the Hopkins Press Journals Division. Our guest this week is Dr. Robert Karp. Dr. Karp is emeritus professor of pediatrics at SUNY Downstate Medical Center in Brooklyn. A native Philadelphian, he is a graduate of Central High School, Muhlenberg College, and Thomas Jefferson University Medical College. He did his residency in pediatrics and fellowship in nutrition at New York Hospital Cornell Medical Center and completed training as chief resident at St. Christopher's Hospital for Children in Philadelphia.

He stayed on the St. Christopher's staff in a war on poverty school health and nutrition project. His 14 years in Philadelphia are summarized in his 1993 text, *Malnourished Children in the United States: Caught in the Cycle of Poverty*. The remainder of his active career was in Brooklyn at SUNY Downstate where he was director of residency training and service clinics at Kings County and SUNY Downstate hospitals. While at Kings County, he read a study from 1962 by Harold Jacobziner and Harry Raybin describing the epidemiology of lead poisoning in New York City. Many of the children attending Kings County lead poisoning clinics were from the three lead belt neighborhoods in North Brooklyn described. More recently with publication of FHA maps of 1934, he recognized that the same neighborhoods as being redlined.

His commentary on this connection, *Redlining and Lead Poisoning: Causes and Consequences*, followed and was recently published in the *Journal of Healthcare for the Poor and Underserved*. Thank you so much for joining us today, Dr. Karp. I really appreciate you taking the time to talk to us about your research.

**Robert Karp**

Well, thank you. Thank you for inviting me. I appreciate this. I'm honored to be invited to be a participant in a podcast from Johns Hopkins University.

**Mary Alice Yeskey**

Wonderful. The first question we like to ask all our guests is, can you tell us your academic origin story? What is your specific area of research and how or what brought you to that area of academic focus?

**Robert Karp**

OK, I graduated college in June of 1962 and took a year off before entering medical school in September of 1963. And it was really quite fortuitous for an idealistic young person to be on the streets of Philadelphia at the peak of the nonviolent civil rights movement. During the year, I worked as a substitute teacher to pay my own way. And on weekends and those days when I was not called the substitute, I spent much of my time at the Philadelphia chapter of the Congress of Racial Equality, known as CORE. At that time, CORE was focused on massive racial

discrimination against Black Philadelphians in both housing and employment. And I participated as a young fellow would participate. And my assignment for the trip to Washington, the March on Washington at the end of the summer, was to find buses, and we filled 13. So, one week after the march, I was a student at Jefferson Medical College, quite a transition. I didn't have a clear goal for my future, only that I wanted to do something in public medicine, what we would now call care for the poor and underserved.

After graduation, I began a residency in pediatrics as an intern at New York Hospital Cornell University Medical Center in New York. And the following two years, I was a fellow in nutrition working at New York Hospital under a National Foundation for Birth Defects grant. This was during the war on Vietnam when there was a mandatory draft. And I could not be a pediatric resident because I had applied for conscientious objector status. And I received conscientious objector status, in fact, that fellowship—the time in the fellowship—and my work there was my alternative service.

I completed my residency in pediatrics back in Philadelphia as chief resident in pediatrics at St. Christopher's Hospital for Children, which was part of the Temple University medical school system. And the next 14 years were spent as a pediatrician in various war on poverty projects. The most important and the most long-lasting was a school health and nutrition project in Philadelphia Public Schools, six public schools where children who had been in Head Start came. And our goal was to maintain the strengths of their experience in Head Start and the academic elements of this work. There was academics, and I'll describe those later, were summarized in a text for which I was principal author and editor called *Malnourished Children in the United States—Malnourished Children in the United States: Caught in the Cycle of Poverty*. And it was published in 1993.

Well, the next 28 years after the war on poverty experience was at SUNY Downstate Medical Center in Brooklyn. It's the State University Hospital. I had been recruited to direct the high-risk social risk clinic at Brooklyn's municipal King's County Hospital. We took care of children, teenage mothers, their babies, low birth weight infants, children with tuberculosis and lead poisoning was a very important part of the project. We had a state-mandated grant. Now you asked me about my areas of research, and they were basically in medicine and any academic career, really. First, you publish something and then you become a mini expert—well, very small level—and then you follow the path that goes. So, I continued my work in nutrition and the first work really continued through my career were malnutrition and poverty relationships, the origins, identification, consequences, interventions.

As I said, my first work was in the Head Start program in Philadelphia. It's important to describe how effective Head Start was. 70 to 80 percent of the children in these six schools—and there were several thousand—lived in families with incomes below the poverty level. 70 to 80 percent. And yet the majority of the children were reading and had math skills at national average, which is quite an accomplishment from Head Start. And our job was to maintain it, which we did, and these kids did well. Documentation from Head Start shows that children graduated high school, went to work, paid taxes, and stayed out of jail, which is really

something that changed with the end of Head Start. But there were about 15 to 20 percent of the children who weren't doing well, and they weren't really experienced the gains you expected from Head Start. And these had some common—one or more of three conditions. One was lead poisoning, second was iron deficiency, and the third was protein energy malnutrition. Now my own work was with the latter two, iron deficiency and protein energy malnutrition, at least at that time in Philadelphia, only subsequently.

And now, our clinic at Downstate included a lead poison prevention program. And at that time, I read a paper by two New York City epidemiologists, Harold Jacobziner and Harry Raybin and they describe lead belt neighborhoods of Brooklyn, the ones that sent our patients to our clinic. And they were Crown Heights, Bedford-Stuyvesant, and Fort Greene. And in 1962, the first nine months of '61, there were 42 children, at least, with lead levels above 60 micrograms per deciliter. And for those not familiar with lead poisoning, that's a level which is associated with convulsions, encephalopathy, and death. And in fact, Jacobziner and Rabin reported 14 deaths in the city of New York at that time.

Now this was before, long before I arrived in Brooklyn. And this is the origin of my current commentary in the *Journal of Healthcare for the Poor and Underserved*, having to do with lead poisoning in neighborhoods. Now my academic focus on iron deficiency began in my residency or my chief residency when I read a passage in the Nelson textbook of 1969 that said that iron deficiency did not occur at an early school age. Iron deficiency did not occur at a school age. And I said, no, I don't think this is true. And so my first paper was—this is the first paper I published on my own while I was at Cornell, I did the work of my supervisor, my mentor, which was on the growth of kidneys, actually. What happens when you take out one kidney and to the growth of the other kidney, which is—kidney disease is very important. I'm sure you don't want me to talk about that. I certainly don't. I guess I could if I read the paper again. (laughter)

In any case, here I'm going to read a couple of papers, if you'll pardon me. The first paper was "Iron Deficiency in Families of Iron-Deficient Inner-City Children," and that was published in 1974. And that was followed by "The School Health Service as a Means of Entry into the Inner-City Family for the Identification of Malnourished Children." And then a paper that I think was actually very important, which was the "Effects of Rise in Food Costs on Hemoglobin Concentrations of Early School-Age Children." I showed that with the oil embargo of 1972, there had been a fall in hemoglobin levels. And it's something we hadn't seen since the Great Depression, that is as food costs rise, food selection narrows, food characteristics of higher income disappear. There's a high concentration of calories and a diminution of nutrients, and children became iron deficient.

Now, the final work in the series, this is now 2012, my last thought paper while working was "Demonstrating Nutrient Cost Gradients: A Brooklyn Case Study." And this paper showed that whether you judge it by cost per serving or cost by energy, iron, folate and choline are the most expensive nutrients. And they're the ones that are essential for neurodevelopment. Iron in utero and choline and folate are important for maintaining pregnancy. And one of the reasons we see early delivery and low birth weight in poor families is there's an absence of folate and

choline in the diet. I think I covered the points in your, that you asked me, specific area of research and what brought me to my area of academic focus, including a mention of how sort of not quite there yet with the paper on lead poisoning.

### Mary Alice Yeskey

Right. And that's exactly where I was going to go next, which is your essay, your paper in the *Journal of Healthcare for Poor and the Underserved*. What it looks at is public policy in the United States dating as far back as 1898 to trace how housing regulations have directly tied into lead poisoning rates in children. Could you explain to our listeners, why is it important to understand how this failure in policy, this sort of non-tangible thing, has had such a profound effect on the health of children and residents in this country?

### Robert Karp

Okay. Well, first, let me fill in a little blank. What I noticed in 2019 or so was that the FHA published its redlining maps and I'll be darned, these were the same neighborhoods, Fort Greene, Bedford-Stuyvesant, Crown Heights. My first thought was that redlining caused lead poisoning, but it's not that simple. That's an oversimplification. What happened was that the federal government's failure to regulate lead, to allow lead in the environment, was the first cause. The second cause was that the redlining took what was permitted, that is racial segregation, and codified it and made it obligated, transferred voluntary segregation by realtors and individuals and made it the law that neighborhoods would be segregated. And then the last thing was that the local governments did not restrict access to apartments without having them inspected, which is now the law in New York City and many other cities, I think most cities now. So that was how it happened.

So let me start with the poisoning of lead itself. You have to see why lead is such a toxic substance. Lead is a divalent cation—it has two charges—and it follows other divalent cations—two charges—in the circulation, but the body has no unique character, no ability to recognize that lead is lead. It recognizes calcium and takes the divalent cation lead into the bones where lead is stored, into the deciduous teeth of children, which gets to how it was recognized and stunts growth and affects probably kidney function that way.

The major one for neurodevelopment is iron. Iron is an essential nutrient for the central nervous system. Many central nervous systems are catalyzed, enzymes are catalyzed, monoamine oxidase, cytochrome oxidase are catalyzed by iron. And there are nuclei in the brainstem, very important in terms of the hyperactivity problem of lead children, because the brainstem controls activity. And these are—iron is stored there. And when you are lead poisoning, lead takes the place of the iron and that's all it causes, it's toxicity. So now in terms of how this was understood, it's a very important principle in statistics and medicine that you never, you can never take associations alone and say that because two things are associated that one causes the other. Sometimes you get it backwards.

People, for example, believe that rather than alcohol causes mental retardation, it was accepted through the eugenics period that mental retardation causes alcoholism. That's reverse

causality. And sometimes it's coincidence. So the definitive case was made by an extraordinarily important person in pediatrics and toxicology, Herbert Needleman. And he did something called the tooth fairy study. Now I mentioned that lead is stored with calcium and calcium goes into the deciduous teeth, the teeth that are shed. And he collected teeth from children in Boston called the Tooth Fairy Project. They got a little something for it. And then he had two ways of measuring it.

First was the teachers made a subjective evaluation of each child. What is this child like in school, in the classroom, how are they doing? They also did something objective. He used either the Connors or the Vanderbilt score. I've forgotten which one for attention deficit disorder hyperactivity. And so they did a rating of hyperactivity. And then the schools did a battery of tests. I don't like using the term, quote unquote, I'm doing air pops here. But the measurements of development that were used on all the children. And then they then they compiled the data. And it was just astounding how they lined up.

Every single parameter lined up with the lead levels. The lead level predicted how the child did in the Connors hyperactivity. How well it did in the developmental tests of math and English and whatever, and processing. And it also lined up with the teachers' subjective evaluation of what this child was like. That was a major study to which Herb was—I knew him personally, so Herb—was excoriated. He was subject to enormous pressure. University of Pittsburgh, where he was on the faculty, a suit was brought and he was called before a committee. No one found that he ever did anything wrong. Some of the data analysis did not meet the highest level of analysis that people were expecting to have. It was very much like trying to prove that smoking tobacco causes lung cancer.

### Mary Alice Yeskey

It was a lot of forces that didn't want it to be true. Right. Right.

### Robert Karp

Well, it's an imprecise measure. I'll get to some of that when I get to the deep grass of how environment is affected by lead poisoning and how the child is affected. So, because not everything occurred, some children with lead poisoning did better than others. And there were children without lead poisoning who did worse than others. So, there's no doubt about that.

There was a similar study in Australia and in a mining community. I don't think it's necessary to go through that, but it came out with exactly the same data. So, the public policy issues here related to first allowing lead in the environment. There's a very important person in the history of toxicology and in women in medicine, also, Alice Hamilton, who lived in the early 20th century, I think up into the 50s. She was quite long-lived, an amazing figure. And in 1911 or 12, she published a paper showing the toxic effects of lead in adults, people working in it. And then in 1925, when the idea was presented that lead should be put into gasoline, lead into gasoline, which is a cheap way of increasing the octane and knocking quality, much cheaper than actually refining it to a higher level.

There a committee was formed by the Surgeon General. And interestingly, the history of it says that the committee was heavily weighted by representatives of industry. And yet, the committee said, "Don't do this, don't do this, this stuff is"—they didn't write it this way—"this stuff is very dangerous." That's not how they wrote it, but that's essentially what they said. It's really dangerous, but they allowed it anyhow, they allowed it anyhow, and they did allow it, and lead in paint and lead-based paint is amazing. You can cover a black wall with one coat of white paint if it's lead-based, and lead-based paint is 50 percent lead by weight. So, the fingernails—a fingernail, a thumbnail size of lead would poison the child.

So, those were the lead part. Now, the redlining issue is the other part on the other side of this equation. One is the lead in the environment. I didn't mention the public policies—and this gets into landlords and the power that they had to keep renting apartments that were contaminated, although it was well-known what that did—and what that meant was because not only could you—a black person could not live in a green, blue, or yellow coded area and they had to live in red areas, and the red areas not only didn't they get loans, but you couldn't get loans to repair either. You could not get loans to repair.

That meant there was a concentration of people living in housing that was, by definition, deteriorating. So, you had exposure. And if it was an old house, as they all were at that point, actually, no—take back. I'm going back to an era when there were no restrictions on lead-based paint. And also, there was a high degree of traffic going through these neighborhoods. The children were going to be lead poisoned. And so, there is a graph in the paper showing that all poor children were poisoned more than higher-income children, to children from poor families were more likely to be at higher levels than people from more affluent families.

And all black children were more affected by than children from similar incomes, similar incomes. But what's important to notice that all children were lead poisoned at that time. They all were. Every child in the United States was, fair to say, I can say categorically, if you lived in the United States at that time, you were lead poisoned. And that's a characteristic that you see actually with almost every public health issue, that everyone is affected and poor and black are most affected. I think the most striking issue is lack of universal health care.

### Mary Alice Yeskey

Can you briefly explain what redlining is for our listeners who may understand its definition, but not necessarily its wider generational impact?

### Robert Karp

Let me quote William Julius Wilson here, the most profound commentator on these issues. The enduring effects of slavery, Jim Crow segregation, public school segregation, legalized discrimination, and residential segregation of black neighborhoods by the FHA and policies in the 1940s and 50s: these policies have had a profound influence on the experience of current generations. And of course, now you throw in the question of lead poisoning. Wilson is describing the social environmental effect. But, we want to look at the redlining of the lead poisoning effects puts a biologic characteristic. Now there are many people who have

commented that there is an association between—there's a role of lead poisoning and the difference between white and black and school performance and these IQ measures and other things. The data have never been clear enough for that alone to make a cause-and-effect model. But if you create a cluster model where you say, here we have the biologic effect, which is lead poisoning, and you have the social environmental effect, which are the things that Wilson said, then you have a case to make. And I think the impact on schools are worth noting here. If you have a school that has some children who are educationally disadvantaged, whatever you mean by that term, educationally disadvantaged, they don't come to school quite ready for school, a school where there are, say, three or four in a class of 20.

The teacher can do a great deal. The school can do a great deal. But if you're like a friend of mine as a principal in an inner-city school, and only two percent of the children are coming prepared for school. Now, if you have a class where there are 20 children and 18 of them are not prepared, the school is overwhelmed. So, you have both the biology of lead poisoning, and you have the social environment of cramming children into impoverished neighborhoods. And it's ghettoization, it's ghettoization, that's what ghettoization has done to these families and leads to transgenerational effects.

#### Mary Alice Yeskey

Beyond the redlining, what are some other factors that you cover that are affecting the consequences of lead poisoning? I know it's sort of got an exponential ripple effect.

#### Robert Karp

One thing you have to look at is what it means to the country as a whole to do what it did. You'll see a description in the paper of a direct quote from a researcher, Louis Lee Woods. He said, as documented by Louis Lee Woods, despite the fact that one in 13 or seven point six nine percent of all World War Two veterans were African-Americans, these former servicemen only received zero point seven percent of V.A. mortgages. Now, looking at the actual dollars, you can actually look at the actual dollars.

A house in Levittown, New York, at that time using today's income would be about seventy thousand dollars, which was about twice a working man's yearly salary and quite affordable. Right now, a house in Levittown is four hundred thousand. So, there are two things. One is it's no longer affordable by a working man, certainly not at that level as it costs so much more. But also, there's at least a three hundred-thousand-dollar deficit to any family that was denied the right to live in Levittown. In fact, it wasn't simply that they couldn't buy. But even if they could buy, they were faced with violence if they did buy. So, the effect of racial segregation would codify the fact that what was permitted now became law is catastrophic. And we still had the underlying unwillingness of the white population to accept African Americans, Black people as neighbors in that they all fit together.

And so redlining is a piece of a large puzzle. It's a very significant one. It's one that tells us how deeply we have failed. And it touches on the fact that this isn't just prejudice, but it is

structured. It is structured into the society at large. It isn't just people's prejudice. It was the law. And that will affect people's lives greatly.

### Mary Alice Yeskey

How do you respond to those who challenge the assertions that you've made with an argument hypothetically such as if racism and poverty and lead poisoning are such destructive forces, how do you explain the success of this person who grew up in all of those things and is now wealthy and successful and doing well and living the American dream? What do you say to someone who brings up these exceptional arguments?

### Robert Karp

Please appreciate that that could be asked in two ways. It could be asked by somebody who's generally curious and say, "Well, you know, I can see that redlining and racial prejudices are wrong. Explain this." And it also can be used by somebody who doesn't really buy into it and said, well, if that's the case, what about—oh, I don't know what about you know, you can name any person. I have several things. In judging the consequences of a problem, you don't go to the extremes. You look at the median effects and the overwhelming majority of children who were affected by redlining and lead poisoning had catastrophic effects. One might look at why some people succeeded. That's very important. What is it that we could do to help people succeed? And you also have to look at why people didn't, which is what, of course, turns up when you study lead poisoning.

The second thing is lead poisoning and everything else I've talked about is a mediator and not a modifier. Now, by mediator, by modifier, I would say this. If you put your foot on the brake, you know, you're going to slow a certain rate and you put your foot on the gas pedal, you're going to speed up. But lead poisoning isn't like that. Lead poisoning is a mediator. It's like rocks in the road. You're driving down the road, and there are rocks in the road. You don't know what will happen. You may drive right through or you may end up crashing off the side because it depends on how it affects that particular individual, the biologic specificity that has to be considered. And you also have to take a look at the protective effects that this child has in this family and this social environment.

I'm always struck when I read biographies like James Baldwin, W.E.B. Du Bois, how there was always a pivotal person who's provided the help that that person needs to get their way through. And I think everyone has a responsibility to do that. And looking at people and you don't have to worry so much about cause and effect. There are people who do great things, who don't believe a single word of this, but they know it's their responsibility. You don't have to believe a single word that I've said and still go out and do something to help people who are in need. And I always appreciate when people, I'm sometimes more comfortable with people who disagree with me, who do the right thing, than people who agree with me, who don't do anything.

### Mary Alice Yeskey

Right. Amen to that, I agree.



Robert Karp

I've experienced that. I try to do the right thing myself.

Mary Alice Yeskey

Lead poisoning is, you know, is it still a danger to the children in the United States and what progress has been made recently with legislation to remove the threat? Can you give us a snapshot of where are we now?

Robert Karp

Well, where are we now is with the residual of one hundred years. Lead is in water, and it's in pipes, and it's in-ground, highways. Every highway was spewing lead to its environment and the soil around it. So, it's an ever-moving target. There was a crisis—many have read about in Flint, Michigan—where the town, where the state reversed the flow, reversed the very slow-flowing Chicago River and the muck and the detritus of that river ended up in the water supply of Flint and children were poisoned. That's happened elsewhere. It could happen again and again and again.

It requires vigorous, vigorous enforcement of lead rules for preventing lead in the environment and substantial cleanup. Newark, for example, is replacing pipes, replacing its pipes to make sure that lead is not in the pipes that deliver water. And there are multiple other ways. And there are reports now that with the COVID pandemic and children at home, lead levels did increase because they were—children were spending more time at home and there still is residual lead in apartments and houses.

And by the way, this crosses economic lines—racial lines, certainly—but economic lines too, because older houses will have lead in the paint and every family is subject to it. But it gets into the question that began with you cannot have a policy that only protects, that is narrow in particular. You have to have a universal policy for lead poisoning that affects everyone. And then you have to take care of the special considerations of the most vulnerable, which in this case has traditionally been Black and poor and non-white. But everyone is affected.

A very important work was done looking at an environment. It's the deep weeds of this that Urie Bronfenbrenner, a magnificent figure in the study of psychology, described an environment in a two-by-two table. What's big and what's small and what's close and what's far away? So up close, the proximal microenvironment is the family. And of course, that's enormously important. The proximal macro environment are the schools the child goes to. And then on the distal side, you have the social environment of the child. The element that we've been talking about is that last category, which is the distal macro social.

The distal macro social means how do these policies get made? Who says that there should be schools? Who says that there should be schools at all? Who said there should be Head Start? Who says that the size of the classroom? Who says whether there's a library? And that's the

policy. That is where the redlining came in. It took a public – it made public policies that were terribly to the disadvantage of people who were poor and black.

**Mary Alice Yeskey**

Thank you so much. I really appreciate you taking the time, and I'm very grateful that your paper has been made open access so that anyone who wants to read the further details can do so regardless.

**Robert Karp**

Oh, thank you. And once again, it's a real honor and privilege to be able to do this.

**Mary Alice Yeskey**

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