



The Our American States podcast—produced by the National Conference of State Legislatures—is where you hear compelling conversations that tell the story of America’s state legislatures, the people in them, the politics that compel them, and the important work of democracy.

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Brain Development and Childhood Adversity | OAS Episode 50

Welcome to “Our American States,” a podcast of meaningful conversations that tell the story of America’s state legislatures, the people in them, the politics that compel them, and the important work of democracy. For the National Conference of State Legislatures, I’m your host, Gene Rose.

On this episode of “Our American States,” we explore early brain development and adverse childhood experiences, which are stressful or traumatic events in childhood that have long-term impacts for health and wellbeing.

Later in the program, we will talk with Dr. Ross Thompson, who is a distinguished professor in the Department of Psychology at the University of California, and he’ll discuss the latest research around early brain development.

We’ll begin this podcast with a recognized expert on adverse childhood experiences and how they impact children, and the consequences they have when those children become adults. We have the pleasure of speaking with noted pediatrician, Dr. Nadine Burke Harris, who is the founder and chief executive officer for the Center of Youth Wellness. Dr. Burke Harris, welcome to the program.

Dr. BH: Thank you for having me.

Gene: I would like to start out by clarifying what we’re discussing. You’re an expert on adverse childhood experiences, or commonly referred to as ACES. Talk to us about how they relate to childhood trauma and toxic stress. Can you walk us through some of the basic definitions?

Dr. BH: Sure. The term “adverse childhood experiences” comes from the landmark study that was done by the Centers for Disease Control and Prevention and Kaiser Permanente where they looked at 10 specific categories of adversities that can be experienced in childhood.

Those include: physical, emotional and sexual abuse; physical and emotional neglect; or growing up in a household where a parent was mentally ill, substance dependent, incarcerated, where there was parental separation or divorce, or domestic violence.

The really remarkable things about this study that have been now repeatedly found in multiple large-scale studies are really two things: 1) these adverse childhood experiences are incredibly

common, I think much more common than folks had previously thought; so, two-thirds of the population had at least one of these adverse childhood experiences, and 1 in 8 folks had four or more. So that was one major finding.

And the second major finding was that there was what's called a "dose response relationship" between these adverse childhood experiences and health outcomes in adulthood. So, for example, a person with four or more adverse childhood experiences had double the risk for heart disease, right, which is the No. 1 killer in America, as compared to someone with zero adverse childhood experiences.

And since that research was published by the CDC, now 20 years ago, in the intervening time science has really gone a long way in understanding: How is it that adversity in childhood leads to long-term health problems? And what we now understand is that when children are repeatedly exposed to high doses of adversity, that it activates their biological stress response system, the fight-or-flight system.

And if it's activated too often and without the support of a buffering, nurturing caregiver to help to calm that stress response, then it can lead to a condition called toxic stress, which is an over-activity of the stress response, and that leads to long-term changes in children's developing brains, their hormones, their immune systems, so they're at increased risk of infection, and even the way that DNA is read and transcribed.

And so, this is the amazing science that has really unfurled over the past two decades and we're now beginning to understand: OK, how do we use this science for prevention and early intervention of these negative health outcomes?

Gene: Those statistics that you gave us there seem alarming to me. What are some of the contributing factors involved? Does it simply have to do with the times that we're living in now?

Dr. BH: So that's really been fascinating. Here in California where I live and where the Center for Youth Wellness is located, California has been tracking the prevalence of adverse childhood experiences since 2008, and our initial statewide prevalence was 61.7 percent of individuals that have at least one adverse childhood experience.

And what we're seeing now as California has made a commitment to track adverse childhood experiences moving forward is that prevalence has actually gone up. It's now just a little over 64 percent. So yeah, we're seeing unfortunately increases in the places that are tracking over time.

Gene: Are there any indications on what the symptoms might be? I'm probably not using the right word here.

Dr. BH: Yeah, yeah. What some of the manifestations might be, right?

Gene: Thank you.

Dr. BH: The interesting thing about the original research and a lot of the large-scale studies that came out of the adverse childhood experiences study was that they were looking at health outcomes in adults. Right? So, if you have four or more adverse childhood experiences including double

the risk for heart disease, there's actually also more than double the risk for cancer, more than triple the risk for chronic lung disease, increased risk—almost 11 times the risk for Alzheimer's ... So there are these really strong associations across a number of diseases.

And what I and my colleagues have done at the Center for Youth Wellness is really look at: Well, what are the manifestations of toxic stress in childhood? Right, because it's important to know the adult health problems, but we also want to know if we're trying to do early detection and early intervention, we have to know what this looks like in kids.

And what we see is that as early as infancy, signs and symptoms of toxic stress can be manifest in disrupted sleep, poor growth, frequent infection, increased risk for asthma, increased risk for autoimmune disease. And then the most common manifestation is, frankly, learning and behavior problems. Right? And that is a little bit the canary in the coal mine.

Because children's brain development is so active and rapid in the earliest years of life, what we see is that kids who are exposed to high doses of adversity often manifest symptoms of what folks have been calling ADHD or Attention Deficit Hyperactivity Disorder. Right? ... Difficulty paying attention and regulating in a classroom setting or in other settings.

Sometimes it's manifest as anxiety or behavior disorders. But what we're increasingly understanding is that the root of much of that behavior is an overactive stress response and its impact on the brain.

Gene: Tell us how you personally became interested in this issue.

Dr. BH: I really became involved in this issue now ... well, I guess it was about a decade ago. When I finished my pediatrics residency training at Stanford, I wanted to work in a community where I felt needed and I wanted to be someplace where I was of service. And so I helped to found a clinic in a very underserved neighborhood of San Francisco.

And as a pediatrician what I was seeing in my patients were very high rates of not only complaints of learning and behavioral problems like ADHD, but also complaints of weird rashes and frequent infections, autoimmune disease. And what I was seeing was that my patients with the highest exposure to adversity were the ones who were having the worst health outcomes.

And, in fact, I'll never forget—I had a patient who was a 10-year-old girl who I was treating for asthma and as I was sitting down with her mom to review her asthma triggers and try to think of everything that we hadn't already treated or dealt with, as I sat down with this mom and said: OK, what is it that we could be missing that might be triggering your daughter's asthma? And this mom said to me: You know, doctor, I notice that my daughter's asthma tends to act up every time her dad punches a hole in the wall. And for me that was really powerful, and that really set me on a course in diving into the science about how early adversity affects the developing brains and bodies of children.

Gene: So, based on your experience and research, what are the best ways to address adverse childhood experiences?

Dr. BH: No. 1, first and foremost, is early detection and early intervention, and that is what all of the science is showing us, is that when we identify early and we intervene early, there's actually ... children have a tremendous capacity for healing. What we see even in randomized control trials where children who have been exposed to maltreatment are randomized to safe, stable and nurturing relationships and environments, and it's sad that kids have to be randomized into safe and nurturing environments ... but that we actually see improvement of white matter structures of the brain on MRI studies.

So, when we're talking about improving health and outcomes for kids, we're not just talking about oh, they look better. We're actually seeing improvements on MRI.

So, in addition to early detection and early intervention, the interventions that the science is showing us make a difference, right: No. 1 are these safe, stable and nurturing relationships; but in addition: exercise, right, certain types of nutrition, mental health care, meditation or mindfulness—all of these play a role in regulating the stress response and helping it to function more normally.

So that's the key—it's really reducing the dose of adversity, enhancing the ability of caregivers in that child's life to be a buffer to their stress, because we know that biologically, caregivers can help to regulate their kids' stress response, right, and then also adding the interventions that we know help to regulate an overactive stress response.

Gene: And I should let our audience know that you have written a book: "The Deepest Well: Healing the Long-term Effects of Childhood Adversity," that was called indispensable by The New York Times. I was intrigued by one of the chapter titles called "Lick Your Pups." Can you share a bit of what that chapter title refers to?

Dr. BH: Yeah. This was fascinating. I had a lot of fun writing the book, as you can tell. In that chapter what I'm referring to really was one of the pieces of the science that I find most fascinating, which was the fact that early adversity literally gets written into our genetics, right, so what we find is that one of the ways in which early adversity impacts health over the long term are changes to not our genetic code, but something called epigenetic regulation.

So, if you were to imagine the genetic code as being musical notes and sheet music, epigenetic regulation would be the musical notations that tell you how loudly or softly to play a certain piece. Right? So, it tells our body how we should express our genetic code.

And the title refers to the research of Dr. Michael Meaney, who did really groundbreaking research. He found that if they took rat pups shortly after they were born and stressed them out and then gave them back to their moms, some moms kind of naturally did high levels of nurturing caregiving, and some of the rat moms did less nurturing caregiving. Right? They didn't have high levels of nurturing caregiving.

And what they found was that the rat pups who had received high levels of nurturing caregiving, they performed better on cognitive tests, they had a more normally functioning stress response system, they were more tolerant of stressful situations, and the remarkable thing was that when they grew up to be adult rats, they themselves were nurturing caregivers.

And then what Meaney and his researchers did, which was truly amazing, was that when they looked at their DNA, what they found was that these behaviors and the biology of the stress tolerance were associated with changes to their epigenetic regulation. And then the really neat part was that they took these rat pups and then for the next generation switched them at birth. And what they found was that the biological profile, the performance on cognitive tests, the stress reactivity of the baby rats, was associated with the mom who raised them, not the mom who was their biological mother.

So, when they took the pups of moms who were highly nurturant and gave them to a low nurturing mom, those pups did really poorly. When they took the pups of the moms who had low levels of nurturance, but gave them to a very highly nurturing mom, those pups did really well and had a better stress tolerance and had better cognitive function. And then when they grew up, they ended up being highly nurturant themselves. And what they found was that those epigenetic markers came from the mom who raised them, not from their biological mom.

So, this was really, really fascinating research showing the critical importance of nurturant caregiving... the critical importance of nurturant caregiving on our biology.

Gene: I know you keep track of a lot of research and I'm sure there are some policy directions you would like to promote to encourage further assistance for people facing these types of problems.

Dr. BH: Absolutely. So, one of the things that the science is showing us is that caregivers have this critical role to play in buffering a child's biological stress response. The point of all this science and one of the things that we understand is not that we're supposed to remove all stress from kids all the time, right, like that's not feasible; that's not reasonable. But what we find, as we saw with Michael Meaney's study and the rat pups, is that when kids have safe, stable and nurturing relationships and environments is that their bodies can heal and can regulate even when they're exposed to stressful situations.

And what that means is, in terms of policy implications, are a couple of things. We need to support parents and caregivers with the tools to be able to be a supportive buffer to their children. Right? So that has critical implications in terms of issues like parenting leave; it has critical implications in terms of supporting programs that help to support parents to be able to be that buffer for their child. Home visiting programs have extensive evidence of helping to support caregivers to be able to do that and in improving the health and wellbeing of both children and caregivers.

We also understand that a parent is not able to be that nurturing buffer if they themselves are so overwhelmed with the accumulated burdens of economic hardship or stress or trauma in their own communities, they cannot regulate their own stress response.

So, I think those are some of the critical policy implications of this science.

Gene: We've been talking with Dr. Nadine Burke Harris, who is the founder and chief executive officer for the Center on Youth Wellness. Dr. Burke Harris, thank you for sharing your time and expertise with us today.

Dr. BH: Thank you for having me.

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Gene: Our guest for this segment is a distinguished professor in the department of psychology at the University of California, Dr. Ross Thompson. Doctor, welcome to the program and why don't you start out by telling us how long you've been studying this issue and why you decided to focus on it.

Dr. R: Sure, Gene. I'm a research scientist at the university. I also teach classes. My focus is on early childhood development, particularly children's social/emotional development in the context of the relationships they develop with people who are important to them, especially their parents.

It's just impossible to study this without understanding the remarkable advances in the study of early brain development, because in many respects it is the developing brain that helps to account for young children being who they are, learning as quickly as they are, and depending as much on the close relationships that surround them as much as they do. So, brain development has been an important part of what I do for many, many years.

Gene: So in researching this, and I think most Americans would probably say that they understand that early childhood brain development is critical and that early experiences affect their development of brain architecture. In fact, for the first few years of life I saw there were more than 1 million new neural connections form every second in a child—tell us about the core story of brain development. What does early childhood brain development look like?

Dr. R: Well, you said an amazing thing. We've actually had to raise our estimates of the numbers of neural connections that are formed each second in the early months of life because the new science keeps astonishing us with how much is going on. And I think that the reason that brain development occurs at such a rapid pace in the early months and years is that this is really when the brain is learning about the world and how to live in it. That's basically the brain's task in the early months and years of life.

You know, you can easily think about the process of brain development as being like the construction of a house and the first steps of that construction are laying the foundation on which everything depends. There's a lot that goes on later in constructing that house, but if the foundation is not strong and secure, then the entire structure is really at risk. And that's what brain development is all about in the early months and years of life.

As you mentioned, Gene, early experience is a major driver of that process. Heredity is important. But early experience is what really shapes the brain in the most important ways. And the central ingredient to that early experience are the people who interact with the child on a regular basis and care for the child, especially parents, of course, because they're central to the child's world.

And the reason that those social interactions are so important is that it's in those everyday interactions that the brain is stimulated cognitively, that it is supported emotionally, and that the child learns life skills like self-confidence and persistence and curiosity.

I think most parents would be well advised not to go out and buy the latest toy that purports to support brain development, but really to spend time interacting with children in that serve-and-return style that we talk about so much.

I think the other part of this story, however, is that just as positive early experiences help to really make a good foundation for the brain's development, negative early experiences can be absolutely devastating. And indeed, a lot of the advances in research have been showing how much the brain's structure and functioning is altered from as early as the first year of life by experiences like being threatened or victimized, by being traumatized, but also experiences like poverty.

And we think that one of the reasons this occurs is that one of the most important questions the brain seeks to understand really as soon as the child is born is whether the world is safe or dangerous. And being threatened or being deprived conveys signals that the world is a dangerous place and we know that brains develop differently when the brain detects that the world is dangerous compared to when the world is safe.

So, these early experiences are really important.

Gene: Is there some context or some data, quantifiable data that you can point to that shows that we're in a dangerous place here, that there's a certain part of the American children who are growing up that are getting those negative experiences that you've talked about?

Dr. R: Well, when researchers in my field try to model the effects of early adversity on brain development, what they turn to are the experiences of children growing up in poverty. I don't know if you and your listeners know that basically in the United States, the younger a child is, the more likely they are to be living in a family in poverty. And so that children ages 1 to 3 or birth to 3 have a higher proportion living below the poverty line than at any subsequent age level.

And researchers who have done neuro imaging studies are already finding within the first years that the brain is looking differently, it's developing differently in a physical way; it's also functioning differently. And the easiest way of thinking about that is that brains that develop in adversity, and economic stress is a real source of adversity for young children partly because of how it affects all the people around them, but the brains that develop in the context of adversity become very vigilant. They become aware of potential dangers or losses in the world around them.

By contrast with brains that are growing up in safe and secure environments, they can focus on exploration and discovery. And we're already seeing those differences within the first year based on brain imaging research and that's really been quite astonishing for us.

Gene: And is there some particular research that you can point to, Doctor, that would be revealing for our audience here?

Dr. R: Well, work that Joan Luby is doing at Washington University in St. Louis has been doing some of the brain imaging stuff as well as work by Seth Pollak and his colleagues up at the University of Wisconsin. And what they're simply showing is that when you are looking at brain scans ... we're

talking about fMRI and research procedures ... that you are finding that areas of the brain that have to ... white matter, for example, that reflect the consolidation of brain signaling pathways, that there's simply less of that white matter in brains of infants and young children that have grown up in economic adversity. We're talking about children who are living in families in poverty; also children who are in low income, and this is twice the poverty level, which I think every economist recognizes is a family in economic stress.

So, we're seeing things like lower amounts of gray matter; we're seeing smaller brain structures in areas having to do with consolidation of memories, in areas having to do with self-regulation, in areas having to do with language learning. And so the fact that we're seeing this in the early years I think is part of our concern.

One study showed, for example, that the kind of physical differences they were seeing in young children in these areas mapped onto the extent to which these children fell behind on standardized tests of language and cognitive functioning and memory. So, you see a direct connection between what's going on in the physical development of the brain for kids in adversity and what is going on in their actual performance in the early years.

Gene: So, what can policymakers do about early brain development? What are the implications of not doing something?

Dr. R: Well, I think that we all recognize that parents are a child's central figures in their environment of relationships, and parents are a child's first teachers and care providers. So, parents are really ultimately the ones who are providing what children need.

But parents are under a lot of stress and many of them are, of course, struggling with the challenges of poverty or lower income themselves. They're often working multiple jobs and they're needing a high-quality place to have their child grow and develop when they're working. So, one of the things that I think we might focus a lot of attention on, and legislators are, is helping to provide access to high-quality, affordable childcare.

I think the term childcare is a little bit of a misnomer. I think we ought to be thinking about every childcare center as an early brain development center because that's exactly what's happening. The brain is developing in every environment in which a child is living. And so thinking about these environments, not just as a safe place a child can be parked while parents are working, but as really places that are going to stimulate a child's developing brain and provide those learning opportunities with care providers who know exactly how to do so is I think where a lot of policy is going in this area, both in the development of state QRIS as quality maintenance programs, but also the financial incentives for centers to invest in improving quality.

I think another area where there's been a lot of interest is developing really high-quality, voluntary, evidence-based home visitation programs, because parents often know about the importance of the developing brain, but they don't know quite what to do about it. And so, having a home visitor who can provide that kind of guidance at the time of a child's birth can be absolutely wonderful and we know about the kinds of programs that show evidence base for effectiveness and those that don't, and states I think are paying attention to that in trying to implement those kinds of programs for families with very young children.

And then again, I think there's a lot of attention now, or a lot of concern about the fact that many parents are having to go back to work immediately after a child's birth. That's really not good for children. It's not good for parents. It's not good for the bonding that occurs naturally in the early months of life. So there's been a lot of attention now to family leave, but not unpaid family leave, because the parents who need it the most can't afford to engage in unpaid family leave.

And so, we're thinking about, you know: How do we create a program of paid family leave? California uses the Unemployment Disability Compensation Fund extended to provide a period of time for paid family leave for families in that state, and I think many states are looking at that as an example.

So, these are some of the things I think that policymakers can consider in thinking about: How do we wrap a set of supports around that family to help ensure that children really get a good start to life?

Gene: And, Dr. Thompson, what haven't I asked you that really should be shared with state legislators and staff across the country?

Dr. R: Well, you know, one question I sometimes get asked is: Why should policymakers be concerned about this at all? You know, after all, this is something that maybe is something within the private sector, something that families ought to deal with on their own.

And, of course, one answer I think that's implicit in everything that I've said is that investing in young children, especially the things that promote early development, is an investment in our future. And that's important, but it's also within a very long-term time horizon. And when we're thinking about the things that we're doing that will result in an adult workforce, we're looking 15, 20 years down the line.

I want to suggest that another reason that legislators ought to be concerned about early brain development is it's something that adults care about today. You know, one of the most important things that young adults care about is the quality of care for their children, and this begins very early in life. And so, this becomes not just for businesses an important tool for employee recruitment and retention, but it's also important for legislators to think of as a place that makes communities more attractive to business, is to know that families can come and know that they can afford high-quality childcare while they're working.

And then finally I think the last justification I'd offer is that it's simply just the right thing to do. Children are our youngest citizens and they really deserve more support than they have received. A generation ago when I was young ... it was a long time ago ... it was older citizens who had the higher proportion of their segment of the population below the poverty line. We've cured that problem. Older citizens don't have to deal with poverty as much as they used to. And now it's time to devote some time to our youngest citizens I think.

Gene: And where would you direct people for more information on this topic or to learn more, Doctor?

Dr. R: I think probably the first place I would send them is the website of the Harvard Center for the Developing Child, and if you google that term, Harvard Center for the Developing Child, or Center for the Developing Child, you'll be introduced to a whole wide range of really scientifically founded materials that are also written for the rest of us to be able to understand easily covering this and many other topics that science has revealed about the importance of the early years in brain development.

Gene: We've been talking with Dr. Ross Thompson, who is a distinguished professor in the department of psychology at the University of California. Doctor, thank you so much for your time today.

Dr. R: This has been a great pleasure for me. Thank you, Gene.

Music and Gene VO:

And that concludes this edition of "Our American States." We invite you to subscribe to this podcast on iTunes and Google Play. Until our next episode, this is Gene Rose for the National Conference of State Legislatures. Thanks for listening.