Podcast: Greening Neighborhoods to Improve Health

[Intro music]

Ashley Ahearn (Narrator): You're listening to Environmental Health Chat – a show from the National Institute of Environmental Health Sciences that explores the connections between our health and our world.

I'm Ashley Ahearn.

There's a growing awareness among public health experts that *where* we live affects *how long* we live. Some research compared life expectancy across different zip codes within the same urban area and found stark differences. There are many factors that contribute to those differences – air quality, proximity to industrial facilities or freeways, socioeconomic factors, food availability – just to name a few.

Well here's another interesting factor – plant life. A growing body of research suggests that people are healthier and happier when they live in areas with more trees, parks, or other green spaces.

And turns out, their hearts may be healthier, too.

Aruni Bhatnagar is widely regarded for spearheading the new field of environmental cardiology – basically, it's the study of how environmental factors affect heart health.

Aruni began his career studying electrophysiology – the electrical currents of the heart – when he was getting his postdoctoral training at the University of Texas Medical Branch in Galveston.

But as the years went by and he developed expertise in all the different forms of heart disease, and how to treat them, he started wondering about the root *causes* of heart disease.

Aruni Bhatnagar: So the question that sort of bothered me for a long time was how does all this start and where can we focus our attention to prevent most heart disease. And so upon digging and doing some work, we came to this idea that maybe most of the causes, or what we shall say, the initiating factors for heart disease may lie in the environment.

Ashley Ahearn: There was a lot of research linking environmental exposures – like secondhand smoke or emissions from industrial chemical production – to cancer. But Aruni wanted to understand how exposure to air pollution could change blood pressure, lipids, and even heart rhythms, in ways that could lead to heart disease.

Aruni Bhatnagar: Then I started working, this was in the 1990s, on the effects of air pollution on heart disease. And we got really startling data then showing that most of the people who died prematurely because of exposure to air pollution, died from heart disease, and not from

cancer, or asthma, or COPD, that people were thinking at that time that might be the major outcome of breathing polluted air.

Ashley Ahearn: So, what's one way to clean up air? Plant trees.

Aruni is now a professor of medicine at the University of Louisville where he's leading some really interesting research comparing human health in neighborhoods with different amounts of tree cover. The Green Heart Study, as it's called, is funded, in part, by the NIEHS.

Aruni Bhatnagar: So the study works in the same study design as a clinical trial. So in a clinical trial you get some baseline information about your patient, you then give them a drug and you come in a few days later and see what the drug, you know, took away the pain or the whatever the complaint was.

Ashley Ahearn: But instead of distributing drugs, Aruni and his team planted trees.

Ok, it was a little more complicated than that.

First, they gathered detailed baseline health data from 700 to 800 Louisville residents. They took hair and nail samples. They measured blood pressure, cholesterol, inflammation, heart rate, and arterial stiffness. They also asked study participants questions about their smoking and alcohol consumption habits.

Aruni Bhatnagar: We, in addition, want to also document changes in stress. So, we ask them a series of questions for stress, and for physical activity, anxiety and depression, and finally, their social cohesion, how well they interact with other people around them.

Ashley Ahearn: Then they did a detailed analysis of air pollution levels in the area where study participants lived.

Aruni Bhatnagar: Then, in the areas which have high levels of air pollution, we planted about 8,000 to 10,000 mature trees and shrubs into the area. And then about a year later, we come back and see how that increase in greenery has affected the risk of heart disease in the community.

Ashley Ahearn: They managed to gather a year's worth of data before the COVID-19 pandemic hit, and they have some preliminary results that show that people who live in green spaces have better vascular function – basically their arteries look younger and are more flexible – than people who live in places with less greenery.

Aruni Bhatnagar: We found that when people are exposed to air pollution, like particulate matter, ozone, the arteries become more stiff. But if they live in green areas, then the effects of PM and ozone are very significantly attenuated. Which means that there is very little effect of air pollution if you live in green areas.

Ashley Ahearn: Aruni knew it was important to build strong relationships with study participants, so community engagement is an important part of the Green Heart Study. Before the pandemic, Aruni's team would hold open houses at schools and community centers. They'd organize public events around health education. They'd do movie nights. They even did a community art and literature showcase. The goal was to bring community members of all ages together and keep them connected to the research. And, they backed up the in-person engagement with online connection via newsletters, social media, and email. And it was all guided by a community advisory board made up of people who live in the study area.

COVID-19 presented challenges and delays for their research, Aruni said, but the team has kept in touch with study participants virtually throughout the pandemic.

Aruni Bhatnagar: You know, we organized free COVID testing in the area, we've been writing letters to them and say, you know, we haven't forgotten you we want to come back next year. And, you know, surprisingly, our feedback from the community has been very positive. Some people are very excited that, you know, we are very grateful you're doing this in our community, and they have felt like they have been neglected for decades.

Ashley Ahearn: Louisville, Kentucky is a great place to do this community-engaged research, Aruni says. It could provide valuable data to help public health experts combat inequality.

Aruni Bhatnagar: There is a very strong disparity in the city. There are areas that are very lush green, and high vegetation. And there are others that are really neglected, because of redlining, economic disparity, you know, structural racism**.**

Ashley Ahearn: Well, you're making me think of a really interesting point that we should bring up in this episode, which is, you know, that our zip codes do determine our lifespans in this country, unfortunately, and that there are these real disparities. And I would, I would love to hear your thoughts about how you see these other factors that it you know, it's not just trees that are going to help folks in these communities, you know, so there's a lot of other things we should be talking about here.

Aruni Bhatnagar: And, yeah, here and here in Louisville, we have about almost 15-20 years life expectancy difference. Now, I don't know in what scenarios such disparities are acceptable. But to me, I think it's the single most important problem that we need to address, right? I mean, it's not that we need to go out and discover new drugs or new methodology, we just need to be able to implement from what we know, to actually diminish this differential as much as we can. So part of that is, I think, geographic neighborhoods that have been redlined neighborhoods, that are close to Superfund sites and other dump areas, they have poor access to fresh foods, and grocery stores, and medical care. So we believe that these environmental changes can make the biggest difference. I want to come back to the idea of environmental cardiology, it's not that we give everybody a statin, right, or control their blood pressure, and say, well, that'll be fine we've taken care of heart disease, but it doesn't work that way. And so we have to start

at the more basic level of how people live their lives and in what areas they live their lives, right? If we can slightly improve the neighborhoods, make sure that there's fruits and vegetables, make sure that there are good medical facilities, there are educational opportunities, and good social cohesion between people in pleasant livable areas. I think that could be one step forward in addressing this horrendous disparity.

Ashley Ahearn: And, trees

Aruni Bhatnagar: And trees, yes! At least that's one thing that we can do and something that's sustainable, and I think essential. We have evolved to be around living things and that just having greenness around our neighborhood, you know, maybe lower the level of stress or anxiety or blood pressure, we've tried to find out what, but we do think that there is a good reason to believe that having green trees around your residence may be beneficial for your health.

Ashley Ahearn: The Green Heart Study is a partnership with NIEHS, University of Louisville, the Nature Conservancy, the U.S. Forest Service, and several other academic institutions.

Aruni Bhatnagar hopes that it can provide a blueprint for how to design more healthy, livable cities for all of us in the future.

I'm Ashley Ahearn. Thanks for listening to Environmental Health Chat.

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