

Podcast Title: A Community Approach to Studying Noise and Health

Narrator: Many of us know that exposure to certain factors in our environment, such as air pollution, can harm our health. But did you know that noise is also an environmental exposure that can affect health? Research shows that noise exposure can increase stress levels, disrupt sleep, and affect cardiovascular and mental health.

Our guest today is Dr. Erica Walker. She's a noise researcher at the joint Boston-Harvard Center for Research on Environmental and Social Stressors in Housing Across the Life Course where she studies how noise affects cognitive development in children. She also leads a citizen science effort to engage communities in documenting their own noise environment.

According to Walker, noise is something that most of us deal with every day. But some people, depending on where they live and how much they earn, are more affected than others. For example, people living in cities are frequently exposed to noise from transportation, commercial, and construction activities. These noises can be worse depending on a person's income.

Dr. Walker: There is a significant difference in noise levels in poorer communities and wealthier communities for two main reasons — The first reason is that poorer communities are usually located near louder sources, like abutting a major highway, next to industrial land use, next to bus lines, whereas wealthier communities may have more trees, may be less adjacent to major transportation networks, etc. Then also, in poorer communities, if there are noise issues, they seem to take longer to be dealt with. So not only are there spatial differences in poorer communities compared to wealthier communities, there's just also more attentiveness given to wealthier communities overall.

Narrator: And while many people accept noise as part of their daily lives, most of us don't consider it as being dangerous to our health.

Dr. Walker: When looking at the relationship between sound and health, we've seen a wide range of cardiovascular outcomes, such as hypertension. The research is generally geared towards cardiovascular health, but there is a growing amount of literature that's starting to look more at the mental and cognitive health outcomes as well.

Narrator: Traditionally, most studies examining the health effects of noise have used what's called the A-weighted decibel system to measure noise in the environment. This system focuses on the loudness of mid-frequency sounds, which are the sounds the human ear hears most easily. But the A-weighted decibel system discounts lower-frequency sounds — like a deep rumble of a bus — and higher-frequency sounds — like an ambulance siren, which may be more relevant to lower income communities. According to Dr. Walker, the A-weighted decibel system may not be sensitive to the unique needs of communities.

Dr. Walker: If you are using an A-weighted decibel system, you are subtracting out the parts of the sound that are really bothering people because the A-weighting system tells us that it's only

loudness along certain frequencies that's important. So going back to what we were talking about earlier, about disparities in noise pollution in poorer communities and wealthier communities, because poorer communities are often located near major transportation networks, using the A-weighted system and saying that we're going to subtract out these lower frequency and higher frequency noises really underreports the true sound condition because transportation noise sources have major components of low-frequency and high-frequency noise.

Narrator: To test the idea that when it comes to health, noise frequency matters, Dr. Walker exposed a group of healthy males to high- and low-frequency sounds and examined their cardiovascular and stress response. She found that low-frequency sound negatively affected the participants' heart rate variability, a measure of cardiovascular health, and slightly increased their levels of the stress hormone cortisol. This study gave Dr. Walker the green light to continue her noise frequency research.

Dr. Walker: After doing that heart rate variability study, I decided to go out in the City of Boston and measure not only how loud sounds are but also sounds along the frequency spectrum. I wanted to capture unfiltered noise from the lowest frequencies to the highest frequencies. So in doing that, I'm out in the community all times of the night measuring noise, and that was really a great process because I began to talk to people and just think about community sound in a way that I hadn't before. So in that process, I continued to measure noise at all of these sites, but I also developed a survey, which was called The Greater Boston Neighborhood Noise Survey. And I wanted to know more about people's perceptions of noises because I was just getting all these really fascinating responses like, 'highway noise doesn't bother me' or 'highway noise really bothers me and keeps me up at night.' So I wanted to get a sense of the perception of noise in these different neighborhoods.

Narrator: Dr. Walker ended up measuring sound at 400 sites around Boston, and about 1,200 community members took her noise perception survey. The result of this project was The Greater Boston Neighborhood Noise Report, which Dr. Walker created to share the noise data she collected with the people of Boston.

Dr. Walker: I wanted to make sure that I shared my results with people because these communities hosted me. I'm out talking to people and people are letting me monitor sound levels in their backyards, so I just wanted to make sure that I shared my results because that was very important to them. So the Greater Boston Noise Report was just a big, thank you to the community, I wanted tell them about what I found, and I wanted to start a conversation.

Narrator: But something was bothering Dr. Walker. She knew the data she collected for the Greater Boston Noise Report only provided a snapshot in time of the city's noise environment.

Dr. Walker: Noise is a very dynamic exposure, so I knew that as soon as I pressed the publish button for the Greater Boston Noise Report that the work had just started. I wanted to make the

Greater Boston Noise Report dynamic by allowing people to discuss noise issues in real time. And I thought the best way to do that would be through a smart phone app.

Narrator: With funding from Harvard University, Dr. Walker and her team created NoiseScore, an app that allows people from all over the world to document the noises they experience in their daily lives. This data is fed into the NoiseScore app to create a live map where people can access up-to-date noise data.

Dr. Walker is currently working with a group of community members living near a large concert venue. They are using the app to measure noise levels, document noise events using photo or video, and answer questions about the noise event, such as how it made them feel. They will use this data to support a proposal for noise regulations in their community.

Dr. Walker hopes others will also use the NoiseScore app to document and raise awareness about community noise issues.

Dr. Walker: I would like to see communities using the app to organize and gather data to fight for a cause that's important to them along the issues of not only noise levels but perception as well. To actually give people in the community a voice to document and create an argument for themselves with concrete data, for me, that would be amazing. And I encourage people to reach out to me because I may be able to help you to create an argument using data for a community noise issue that you're currently dealing with.

Narrator: Thanks to our guest today, Dr. Erica Walker of Boston University!

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