

## Green and Serene? Exploring the Relationship between Vegetation and Mental Health, with Rachel Banay

Ashley Ahearn

Can living in green surroundings make you healthier and happier? It's a tantalizing idea. In this podcast, guest Rachel Banay discusses her recent *EHP* study on depression in older women in relation to the amount of greenness near their homes. The study is part of a growing body of research that suggests there may, in fact, be health benefits associated with spending time in or near green spaces—although it is too soon to draw any firm conclusions about the nature and direction of the relationship, if it exists. <https://doi.org/10.1289/EHP6208>

NARRATOR [00:00:00]: *EHP* presents “The Researcher’s Perspective.”

[Theme music]

AHEARN [00:00:09]: It’s “The Researcher’s Perspective.” I’m Ashley Ahearn. If you live in a place with more trees and plant life, a growing body of research suggests you may be healthier than people surrounded by buildings and concrete. Studies have shown that people who live in greener areas may be less likely to be obese, less likely to suffer from cardiovascular disease, and more likely to have good birth outcomes.<sup>1,2</sup>

But what about mental health? Are people who live in greener areas less likely to be depressed?

A new study published in *Environmental Health Perspectives* explores the relationship between greenness and depression in a large cohort of older, mostly white women.<sup>3</sup>

Joining me to talk about it is the study’s lead author, Rachel Banay. She got her PhD in environmental epidemiology at the Harvard T.H. Chan School of Public Health, and she’s now a vice president at Ideas 42. It’s a behavioral science research and design nonprofit based in New York City.

Dr. Banay, welcome to “The Researcher’s Perspective.”

BANAY [00:01:04]: Thanks for having me.

AHEARN [00:01:06]: Ok, so lay this study out for me. How many participants did you have, and how, over how much time were you conducting this research?

BANAY [00:01:12]: So, the objective of the study was really to estimate the association between residential greenness and the subsequent risk of developing depression. So, we conducted it in a large cohort of U.S. women called the Nurses’ Health Study, and that’s a large ongoing prospective cohort study that was established in the ’70s. The nurses who are enrolled in the study all receive biennial questionnaires that collect information on their risk factors and health and sociodemographic information. So, we followed a total of 38,947 women who were in the study and did not have depression in 2000, up until 2010.

AHEARN [00:01:58]: And how did you measure greenness?

BANAY [00:02:00]: So, the way that we measured greenness was by using something called the NDVI, and that stands for the Normalized Difference Vegetation Index. It’s a standardized objective measure of greenness that’s derived from imagery collected by satellite that measures the light that’s absorbed and reflected by vegetative growth during photosynthesis.

AHEARN [00:02:24]: And you were exploring the relationship between depression and greenness, or proximity to greenness. How did you define depression and then quantify it, or measure it, in your study participants?

BANAY [00:02:34]: So, we defined incident depression from the biennial surveys that are collected from the study participants by using the definition of the first self-report of clinician-diagnosed depression or new and regular use of antidepressants that had occurred over the past two years since the previous questionnaire.

AHEARN [00:02:56]: And what did you find?

BANAY [00:02:58]: So, we found that those who were living in the highest quintile of residential greenness—that is, the greenest areas in the study population overall—had a 13% reduction in depression risk, compared to the people who were living in the lowest quintile of residential greenness, or the least green areas in the study population.

AHEARN [00:03:22]: That’s a pretty striking percentage.

BANAY [00:03:24]: It was striking. It was a bigger decrement than we expected to find, and it was surprising but, but consistent with a lot of the other research that has occurred in the field.

AHEARN [00:03:37]: I’m curious about how you define greenness, because what about people who live in, you know, natural areas like deserts that are still wild but may not fit that bill for the NDVI?

BANAY [00:03:50]: That’s a really great question, and I think one thing that’s interesting is that a lot of the research in this discipline really has concerned green spaces rather than other natural spaces and environments. I think really interestingly, from the research that I have read, these associations seem to be stronger in the summer in some analyses or when looking at, you know, annual average greenness levels. So that implies that absolute greenness or vegetative density does have some bearing on this relation to mental health.

One potential reason for that is around what’s called the biophilia hypothesis,<sup>4</sup> which posits that human beings seek out and thus experience some psychological or emotional benefit from being in settings where, you know, from an evolutionary perspective we could thrive. So green settings, in particular, that might suggest the availability of water, or you know, other species around who are surviving could fit within that framework.

But to your point, I wouldn’t want to foreclose the possibility that other natural environments offer similar restorative benefits. But interestingly enough, there’s an incipient literature on blue spaces<sup>5</sup> that has to do with, as you might guess, exposure to water, and it does not indicate that the same association between blue spaces and mental health outcomes exists yet, although it is a newer research area with fewer studies.

AHEARN [00:05:24]: So for people who live in greener areas, some research has shown that they’re also more likely to be physically active<sup>6</sup>...

BANAY [00:05:29]: Yep.

AHEARN [00:05:29]: ...and we know that physical activity can help with depression.<sup>7</sup>

BANAY [00:05:32]: Yep.

AHEARN [00:05:32]: How do you think that might have contributed or played into your findings?

BANAY [00:05:36]: It’s a really good question, and we looked at whether physical activity might be mediating that association between greenness and depression because, as you say, you know, green areas can promote physical activity, physical

activity is a known protective factor for adverse mental health outcomes. And we actually did not find that physical activity was driving that relationship between greenness and depression. There has been some other research around, you know, studies have posited that social engagement similarly might drive any association between greenness and depression. So we actually looked at both of those features in our study, and we didn't find that social engagement, as we defined it, or that physical activity was driving that association between greater greenness and, and lower risk of depression.

AHEARN [00:06:33]: Why do you suppose that is? Or why do you think that these two factors, you know, social cohesion and physical activity didn't kind of show up in your results or play a role in your results?

BANAY [00:06:41]: You know, it's a good question. I think there's a lot more work to be done in the discipline about what other mechanisms might be in play in instances where physical activity and social engagement and things like that are found not to be driving that association. I think one of the things that we do know, and disciplines like environmental psychology have demonstrated, is that simply being exposed to natural environments can be restorative and has been shown, you know, to be associated with better cognitive functioning, attention restoration, reduced stress, reduced mental distress, disruption of certain harmful cognitive processes. So I think even in cases where we don't see another, you know, "usual suspect" explanation, there might be other processes going on of which, you know, either we're not aware or we couldn't study in this particular case.

AHEARN [00:07:38]: There's evidence that people of color may be less likely to live near green spaces like parks,<sup>8</sup> and lower-income neighborhoods often have fewer trees and vegetation or community gardens, that sort of thing.<sup>9</sup> I'm wondering, how do you think your results would differ if you had studied a more socioeconomically or racially diverse cohort of people?

BANAY [00:07:56]: That's a great question, and our study population was not as diverse as one might hope, which was a limitation. I will say that some related research in the last few years has found that, you know, where an association between greater greenness and improved mental health exists, it is often more pronounced in lower-income areas or among those with lower income.<sup>10</sup> And it's unclear why exactly that should be the case. There is some speculation that potentially because there are, are enhanced opportunities for stress mitigation, social integration, physical activity, things like that, afforded by those green spaces that might be more limited in lower-income settings. So it's, it's hard to say what we might have seen, but you know there's a possibility that we could have seen a greater effect, you know, of that greenness–depression relationship had our study been more diverse.

AHEARN [00:08:57]: Meaning that communities of color or lower socioeconomic status stand to benefit more from being near green space?

BANAY [00:09:03]: Some evidence does seem to suggest that, yeah.

AHEARN [00:09:06]: Wow, that's really interesting.

BANAY [00:09:08]: Yeah.

AHEARN [00:09:08]: What are you, what are you curious to learn more about, Dr. Banay?

BANAY [00:09:12]: Well, I think these results naturally provoke a few questions, you know, along the lines of does this association look similar or more exaggerated or subtler among other populations—for example, if we were working with a younger cohort, if we had looked at the association among men, in a population with more socioeconomic diversity.

I think another compelling question is just what might be driving the association between greenness and depression. Because the evidence that we generated doesn't point to either physical activity or social engagement, which are two of the sort of leading plausible explanations. I think, you know, I think that's really interesting to think about are, is whether there might be visual or auditory pathways that we should be looking into. You know, given that we don't understand the mechanism, the implications for this research aren't entirely clear.

I think one thing that's interesting to think about is that we could possibly think about greening initiatives or living in green environments as being helpful for the elderly in a way that is not contingent on mobility since we didn't see that the benefit of green spaces for this population was related to physical activity.

AHEARN [00:10:32]: Dr. Banay, do you live near green space, and if so, how does it affect you?

BANAY [00:10:37]: I recently moved from the West Village in Manhattan to a, an apartment with a garden in Boerum Hill, Brooklyn, on purpose to seek out a little bit more green space in this concrete jungle, and it has been very beneficial anecdotally for my mental health.

One of the reasons that this discipline has taken off is that many researchers, and many readers, feel quite a strong intuitive pull.

AHEARN [00:11:05]: Dr. Banay, thanks so much for joining me.

BANAY [00:11:07]: Thanks for having me.

AHEARN [00:11:08]: Dr. Rachel Banay is a vice president at Ideas 42. It's a behavioral science research and design nonprofit based in New York City. She got her PhD in environmental epidemiology at the Harvard T.H. Chan School of Public Health.

[Theme music]

I'm Ashley Ahearn. Thanks for listening to "The Researcher's Perspective."

[Theme music fades up and out]

*The views and opinions expressed in this podcast are solely those of our guest and do not necessarily reflect the views, opinions, or policies of Environmental Health Perspectives or the National Institute of Environmental Health Sciences.*

## References and Notes

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10. Importantly, the NDVI cannot indicate the quality or accessibility of green areas. Thus, the potential benefits of a local green area might be much less if the area is unsafe or closed off.