Article Critique

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The last several decades have seen a growing interest in the relationship between human health and the natural environment. It’s been shown that the presence of green spaces like parks can contribute to physical health, and that exposure to natural environments can reduce negative emotions such as anger, sadness, and stress.\textsuperscript{1,2,3} In a now-classic study, published in 1984, researcher Roger Ulrich took a group of post-operative patients and put half in rooms with a view of trees and half in rooms with a view only of a brick wall; he found that the patients who could see nature recovered faster.\textsuperscript{4} Donovan \textit{et al.} set out to further explore this relationship by looking at areas affected by the emerald ash borer.\textsuperscript{5} In their paper, the authors attempt to draw a direct line from environmental damage to increased human mortality by looking at the correlation between tree loss and human deaths.

For this study, the authors collected two main groups of data. First, they used mortality data on the county level that spanned from 1990 to 2007, a period that included several years before and after the introduction of the borer. They specifically chose to look deaths from cardiovascular and lower-respiratory illnesses, as these are two of the leading causes of death in the U.S. Also, both also offer plausible pathways through which the presence of trees could affect the course of the illness.

The next hurdle was to collect data that captured tree loss. The emerald ash borer, which is native to East Asia, was introduced into the United States in the 1990s. Since its introduction, it’s become highly invasive and has spread throughout Michigan, Ohio, Wisconsin, Illinois, and Ontario, killing upwards of 100 million ash trees in the U.S. Because the presence of ash borers reliably leads to the death of ash trees in that area, the authors use data that tracks the spread of the ash borer as a proxy for tree loss. Using surveys from the U.S. Department of...
Agriculture (USDA), they created variables that accounted both for presence of the borer at the county level and the length of the time the borer had been present. They also estimated total tree canopy using National Land Cover Data maps and total coverage by ash trees using the percentage of ash by state.

A regression model was used to find the relationship between ash borer presence, mortality, demographic factors, including age and income, and tree canopy. The model showed that the presence of the borer had a significant impact on mortality, and also showed an interaction between presence of the borer and years of infestation as well as with median income. Wealthier counties were more strongly impacted by the borer; the authors suggest that the reason for this may be that wealthier areas tend to have more trees, meaning their loss would have a much greater impact than in poorer areas that had fewer trees to start with. In regards to the effects of years since infestation, the authors point out that borers take several years to kill trees, and that the loss of trees would also take time to manifest as illnesses developed or worsened. Both of these factors can explain the increased impact of the borer over time.

In their discussion the author’s present several possible causes for the relationship between trees loss and cardiovascular and respiratory illness. They point to studies that show that green spaces encourage physical activity and relieve stress, both of which can improve cardiovascular health. They also suggest that, because trees remove pollution from the air, they help lower rates of respiratory illness. Obviously, because this is an observational study, they have no direct evidence to support these theories, however all are plausible. It will be especially
interesting in the coming years to see whether scientists are able to design studies that will test the underlying mechanisms of this relationship.

Overall this was a very well done study. The authors found a novel way to find data for a variable—tree loss—that would be difficult to create experimentally. However, because this variable had to be constructed piecemeal from several data sources, there is the possibility for a high level of error in the calculations. The author’s point out that modeling a continuous process with a binary variable, which they did with the presence of the borer, can lead to upward bias, and it should also be noted that the canopy cover variables included data from several sources and therefore can only be considered a crude approximation of the actual amount of canopy covered provided by ash trees.

Obviously this is just one of many studies that will need to be done if we’re to paint a clear picture of the complex relationship between human health and the natural environment. Hopefully this study will spur further research in this direction. The tact of using a devastating invader as a proxy for environmental change can be applied in other settings and could prove very useful when it comes to measuring the effects that changes in the environment can wreak on the human body.


