

Of moderators and mediators: Complex relationships between greenness, air pollution, noise, and health behaviors in driving health outcomes

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An increasing body of literature demonstrates that living in greener areas is associated with numerous benefits to health, including lower rates of obesity, mortality, and cardiovascular disease, reduced stress and improved mental health, and more favorable birth outcomes. There are many hypotheses regarding how these benefits are achieved, ranging from reduced exposures to noise, air pollution, traffic congestion and other stresses of urban life, increased opportunities for physical activity and social interactions, and increased opportunities for stress recovery.

The vast majority of published studies, however, consider only the relationship between a single exposure (e.g., air pollution, noise, or greenness) and the selected outcome of interest. Very few studies examine several of these factors simultaneously or seek to understand how they interact with each other to influence health or health behaviors, such that the mechanisms and pathways through which greenness is operating on health remain poorly understood.

The purpose of this symposium is to present findings from several large cohort studies demonstrating evidence of greenness acting as a moderator (i.e., influencing the strength or direction of the relationship) between an exposure variable and a health outcome, and health behaviors acting as mediators (i.e., explaining the relationship) between greenness and a health outcome. For example, we present results from the Canadian Census Health and Environment Cohort (n= 2.4 million individuals) showing that the association between exposure to PM2.5 and risk of mortality is greatly attenuated (i.e., moderated) in greener areas. Results from the US-based Nurses' Health Study (n=121,000) show that physical activity mediates the association between greenness and cognitive decline. Together, the findings from all of these studies extend our understanding of how living in greener areas may lead to improved health outcomes and behaviors.

The topic of this symposium exemplifies several key aspects of next-generation environmental epidemiology. Due in part to increasing access to and availability of novel environmental datasets, there is a clear move in this field towards studies that consider multi-factor impacts and exposures on health. An important future direction for studies on greenness, in particular, involves moving beyond identifying broad associations between "greenness" and health, towards trying to describe and understand the mechanisms through which greenness affects health and health behaviors. Lastly, all of the case studies described are centered on effects of place on health.