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Residences are surrounded by Greenery Noise from Traffic, Air Pollution and Self-Perceived General Health

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Introduction

One of the most comprehensive and often used indicators of health status and a potent predictor of death is self-perceived general health (SGH). Only a small number of researches, meanwhile, examined the effects of several environmental exposures on SGH. Our goal was to assess the correlations between poor SGH in the Netherlands and combined residential exposure to nearby greenery, air pollution, and traffic noise. In order to create a study population of 354,827 adults, we linked data on long-term residential exposure to nearby greenery based on the Normalized Difference Vegetation Index (NDVI) and a land-use database (TOP10NL), air pollutant concentrations (including particulate matter (PM10, PM2.5), and nitrogen dioxide (NO2)), and road- and rail-traffic noise. Associations with the surrounding greenery and air pollution were often still present but lessened in multi-exposure models. The odds ratios of single-exposure models were lower than the joint odds ratios (JOR) of combined exposure to air pollution, rail-traffic noise, and less nearby greenery. Studies that only take into account one of these correlated exposures run the risk of underestimating the risk of multiple exposures while overestimating the risk of poor SGH attributable to the studied exposure. People are exposed to several environmental elements on a daily basis that may have an impact on their health [1].

Exposures that are sustained and repeated can cause pathophysiological alterations that affect how diseases develop over the course of a person's life and ultimately cause premature mortality. The term "exposome" refers to the total number of exposures that a person experiences from conception until death. The exposome is made up of various domains, including (but not limited to) environmental exposures including noise from traffic, air pollution, and nearby vegetation. Increased non-accidental and cause-specific mortality, such as that from cardiovascular and respiratory diseases, has been linked to air pollution. Additionally, several studies have linked air pollution to a rise in dementia, Parkinson's, and Alzheimer's disease [2,3].

Description

Traffic noise, air pollution, and environmental exposures are typically geographically associated [18]. Motorized traffic is a common source of both air pollution and road traffic noise, which explains their positive correlation. In general, there is a negative link between air pollution, traffic noise, and the surrounding green due to the lack of sources of air pollution and traffic noise in green spaces, as well as the restriction of emissions transmission. As a result, information about the risk of one of these exposures may be partially attributed to another correlated exposure, and using single-exposure models to estimate connections between the environment's greenery, air pollution, and traffic noise can lead to an overestimation of effects. To determine if lower levels of air pollution or traffic noise are viable pathways underlying potential positive effects of surrounding green on low SGH, we conducted mediation studies. Here, we hypothesised a causal relationship existed between the surrounding green and air pollution and specifically named air pollution and traffic noise as mediators of the relationships between poor SGH and surrounding green. For the mediation studies, we only chose the exposures that were significantly linked (increasedORs) with poor SGH among the potential "mediator" factors (air contaminants and traffic noise).

There are complicated interactions between the surrounding vegetation, air pollution, and traffic noise. As green barriers may limit the dispersion of traffic noise and air pollution or by scavenging air pollution, air pollution and traffic noise reduction could be on the putative causal pathway of surrounding green to health. However, only a portion of the empirical relationships between nearby greenery and air pollution and noise from traffic can be explained by these mechanisms. The fact that there are fewer sources of air pollution and traffic noise and, as a result, lower levels of air pollution and noise in greener areas is more significant. This does not indicate a link between the surrounding greenery and health; rather, it reflects a common source [4,5].

We specifically looked at the relationship and potential confounding effects of prolonged exposure to nearby greenery, air pollution, and road noise. Additionally, we looked at mediation to see if plausible processes behind potential advantageous connections of nearby green with low SGH included decreased levels of air pollution and traffic noise. As a result, for the confounding analysis, we assumed that air pollution and traffic noise were not on the causative pathway from surrounding green to health, but that they were on the pathway from surrounding green to the mediation analyses, where we hypothesised that they were. In order to determine if environmental exposures were linked to subpar SGH, we used logistic regression analysis. Using R 3.3.1, all analyses were carried out (R Foundation for Statistical Computing, Vienna, Austria).

Conclusion

As compared to single-exposure models, JORs of exposure to a combination of air pollution, rail traffic noise, and reduced greenery were always higher. This shows that only a portion of the information about the risk of one exposure is contained by the other related exposures, and that the overall effect of an intervention that affects exposure to air pollution, train noise, and nearby green spaces is underestimated if only one of these exposures is considered when calculating the effect. However, if one adopts the OR of the single-exposure model, the individual effect of air pollution particularly that connected to traffic (e.g. NO2), on poor SGH is overstated.

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