

Living in 'leafy' areas may boost bone density and lower osteoporosis risk, finds study

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Living in leafy areas near gardens, parks, and green spaces, may boost bone density and lower the risk of osteoporosis, finds research published online in the *Annals of the Rheumatic Diseases*.

Lower levels of air pollution in [green spaces](#) is a significant contributory factor to the associations found, conclude the researchers.

Osteoporosis weakens bones, making them fragile and prone to fracture. It can lead to [chronic pain](#), diminished mobility, and poorer quality of life. Already a major health issue worldwide, its global prevalence is set to rise with the rapid aging of the population and changes in lifestyle, note the researchers.

Osteoporosis is caused by genetic, hormonal and environmental factors, and while exposure to green spaces has been linked to lower risks of poor health, it's not clear if this extends to the risk of osteoporosis, and to what extent genetic susceptibility might be influential.

To explore this further, the researchers analyzed data held in the UK Biobank on 391,298 people, average age 56, just over half of whom (53%) were women.

All of them had information recorded on their bone mineral density, and potentially influential factors including ethnicity, annual household income, [education level](#), employment status, residential area, [alcohol consumption](#), physical activity levels, smoking status, and diet.

Their genetic risk of osteoporosis was calculated using a polygenic risk score, and a widely used measure, called a normalized difference vegetation index (NDVI), which is based on [satellite imagery](#), was used to determine the amount of green space in their residential area.

The annual average exposures to the pollutants nitrogen oxide (NO₂) and particulate matter PM_{2.5} were estimated based on residential postcode and data from the ESCAPE project, which is looking at the long-term effects on human health of exposure to air pollution in Europe.

Each participant was monitored until a diagnosis of osteoporosis, death, or 31 March 2021, whichever came first.

During an average monitoring period of 12 years, new cases of osteoporosis arose in 9,307 people. They were more likely to be older, female, smokers, and retired. They were also more likely to have lower educational attainment and be more economically disadvantaged.

But a consistent association between the amount of green space and new cases of osteoporosis emerged. The authors estimated the NDVI in steps of about 300 meters of available residential greenness at a range of 300 to 1,500 meters. With each such increase of the NDVI they found an increase in bone mineral density and 5% lower risk of developing osteoporosis.

The key moderating factors in the association found between green space and reduction of the risk to develop osteoporosis were lower levels of NO₂ and PM_{2.5}.

Several studies have shown that exposure to air pollution can produce [oxidative stress](#), inflammation, and disrupt hormones, both of which increase the risk of osteoporosis, note the researchers.

People living in the leafiest areas will be exposed to a lower risk because the trees and plants act as natural filters, removing pollutants from the air.

Being physically active was also associated with a lower risk of osteoporosis, possibly because living in areas with green space affords more opportunities to exercise, suggest the researchers.

This is an [observational study](#), and as such, can't establish cause. The researchers also acknowledge several limitations, including that the

NDVI calculation was based on residential addresses so may not have accurately defined the actual amount of green space. And the study participants were generally healthy, so the potential for selection bias can't be discounted.

But they nevertheless conclude, "The findings from this study present the first evidence indicating that residential greenness is associated with higher [bone density](#) and decreased risk of developing osteoporosis."

They add, "These findings provide valuable insights into the potential of greenness in preventing the onset of [osteoporosis](#) and emphasize the significance of urban greening in developing effective prevention strategies."

More information: Associations of residential greenness with bone mineral density and osteoporosis: the modifying effect of genetic susceptibility, *Annals of the Rheumatic Diseases* (2024). [DOI: 10.1136/ard-2023-224941](#)

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