

## **Association Between Residential Greenness and Cardiovascular Disease Risk, Journal of the American Heart Association, 2018.**

**Conclusion:** Independent of age, sex, race, smoking status, neighborhood deprivation, statin use, and roadway exposure, residential greenness is associated with lower levels of sympathetic activation, reduced oxidative stress, and higher angiogenic capacity, therefore **decreased cardiovascular risk**.

Extensive evidence supports the notion that cardiovascular disease (CVD) risk is affected by many features of the built environment, such as residential characteristics and location, proximity to major roadways, availability of healthy food, and neighborhood walkability.<sup>1</sup> In comparison, the health effects of neighborhood green spaces have received less attention. However, there are emerging data to suggest that green spaces are important features of urban environments conducive to human health. Several recent studies have reported that individuals living in areas of high vegetation display fewer depressive symptoms, but greater neighborhood satisfaction, better social interactions,<sup>4</sup> and higher social support.<sup>5</sup> There is also evidence to suggest that exposure to vegetation could have beneficial effects on cardiovascular health. For instance, in an analysis of the entire population of England, it was found that the rates of cardiovascular mortality were lower in areas with higher levels of greenness.<sup>6</sup> It has also been reported that increased residential green space is associated with the reduction in both cardiovascular and respiratory mortality,<sup>7</sup> and the odds of hospitalization for heart disease and stroke are lower among adults who live in neighborhoods with highly variable greenness.<sup>8</sup> Individuals with ischemic stroke residing in close proximity to green spaces have survival rates higher than those who live in less green areas.<sup>9</sup> In addition, a temporal decrease in tree canopy (due to emerald ash borer infestation) was found to be associated with a progressive increase in CVD mortality.<sup>10</sup>

## **Residential Surrounding Greenness and Cognitive Decline: A 10-Year Follow-up of the Whitehall II Cohort, Environmental Health Perspectives, 2018.**

**Conclusion:** Higher residential surrounding greenness was associated with slower cognitive decline over a 10-y follow-up period in the Whitehall II cohort of civil servants.

The proportion of people over 60 y old in the world is expected to nearly double from 12% to 22% between 2015 and 2050 (WHO 2015). In addition, the number of dementia cases has been predicted to double worldwide, rising to 115.4 million cases by 2050 (WHO 2012). Urban residents often have limited exposure to greenness, while such an exposure has been associated with better health (Fong et al. 2018; Nieuwenhuijsen et al. 2017). Studies have shown associations with improved mental health (Gascon et al. 2015) and self-perceived general health (Dadvand et al. 2016; Triguero-Mas et al. 2015) and reduced morbidity (James et al. 2015) and mortality (Gascon et al. 2016). Through the proposed pathways for these associations, green spaces could also have beneficial impacts on cognitive decline. First, **greener neighborhoods are reported to foster social cohesion and social support** (de Vries et al. 2013; Maas et al. 2009a), which in turn could decelerate cognitive decline (Holtzman et al. 2004). Second, exposure to greenness could reduce stress (Gong et al. 2016), which could reduce risk of cognitive decline (Marin et al. 2011). Furthermore, **higher levels of physical activity have been demonstrated in older adults with higher greenness in their residential surroundings** (Gong et al. 2014), which could have a protective effect against cognitive decline and dementia (Blondell et al. 2014). Last, **greenness can reduce levels of noise and air pollution** (Dadvand et al. 2012, 2015b), while these are risk factors for cognitive decline (Tzivian et al. 2015, 2016).

**Stress recovery during exposure to natural and urban environments, Journal of Environmental Psychology, 1991.**

**Conclusion:** Restorative influences of nature involve a shift towards a more positively-toned emotional state, positive changes in physiological activity levels, and that these changes are accompanied by sustained attention/intake. Content differences in terms of natural vs human-made properties appeared decisive in accounting for the differences in recuperation and perceptual intake.