More than clean air and tranquillity: residential green is independently associated with decreasing mortality

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Author(s) Vienneau, Danielle; de Hoogh, Kees; Faeh, David; Kaufmann, Marco; Wunderli, Jean Marc; Röösli, Martin; Study Group, S. N. C.
Author(s) at UniBasel Vienneau, Danielle ; de Hoogh, Kees ; Röösli, Martin ;
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Green space may improve health by enabling physical activity and recovery from stress or by decreased pollution levels. We investigated the association between residential green (greenness or green space) and mortality in adults using the Swiss National Cohort (SNC) by mutually considering air pollution and transportation noise exposure. To reflect residential green at the address level, two different metrics were derived: normalised difference vegetation index (NDVI) for greenness, and high resolution land use classification data to identify green spaces (LU-green). We used stratified Cox proportional hazard models (stratified by sex) to study the association between exposure and all natural cause mortality, respiratory and cardiovascular disease (CVD), including ischemic heart disease, stroke and hypertension related mortality. Models were adjusted for civil status, job position, education, neighbourhood socioeconomic position (SEP), geographic region, area type, altitude, air pollution (PM10), and transportation noise. From the nation-wide SNC, 4.2 million adults were included providing 7.8years of follow-up and respectively 363,553, 85,314 and 232,322 natural cause, respiratory and CVD deaths. Hazard ratios (and 95%-confidence intervals) for NDVI [and LU-green] per interquartile range within 500m of residence were highly comparable: 0.94 (0.93-0.95) [0.94 (0.93-0.95)] for natural causes; 0.92 (0.91-0.94) [0.92 (0.90-0.95)] for respiratory; and 0.95 (0.94-0.96) [0.96 (0.95-0.98)] for CVD mortality. Protective effects were stronger in younger individuals and in women and, for most outcomes, in urban (vs. rural) and in the highest (vs. lowest) SEP quartile. Estimates remained virtually unchanged after incremental adjustment for air pollution and transportation noise, and mediation by these environmental factors was found to be small. We found consistent evidence that residential green reduced the risk of mortality independently from other environmental exposures. This suggests the protective effect goes beyond the absence of pollution sources. Environmental public health measures should not only aim at reducing pollutant exposure, but additionally maintain existing and increase residential green in areas where lacking.
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