

## ASSOCIATIONS BETWEEN GREENSPACE AND MORTALITY IN A POPULATION-BASED COHORT STUDY OF 574, 834 ADULTS IN ONTARIO, CANADA

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**Background:** Access and exposure to green space is associated with a wide range of potential health benefits. Few studies have examined the direct impact of exposure to greenspaces on mortality. We investigated the association between greenspaces and mortality using a population-based cohort design.

**Methods:** A cohort of 574,834 adults who were residents in one of 10 urban areas in Ontario, Canada in the early 1980s was assembled using income tax records. Vital status was determined through record linkage to the Canadian Mortality Data Base until the end of 2004. Six-character postal codes, representing a block face or large apartment building, from income tax records were used to identify the geographical coordinates for subjects' place of residence. To these locations we assigned the Normalized Difference Vegetation Index (NDVI) as a measure of greenspaces. The NDVI is derived from Landsat Thematic Mapper (TM) data at 30m x 30m resolution for the years 1989-1997. Rate ratios for mortality were estimated using the Cox model and adjusted for income, marital status, neighbourhood characteristics, ambient PM<sub>2.5</sub>, and smoking prevalence estimates from the 1990 Ontario Health Survey. Mortality endpoints studied included: all non-accidental causes, cardiopulmonary disease, ischemic heart disease, and stroke.

**Results:** A total of 181,107 non-accidental deaths occurred in the cohort. An inverse association was observed across increasing quartiles categories of 'greenspace'. For all non-accidental causes of death, the risks in the upper three quartiles relative to the lowest greenness quartile were: 0.95 (95% CI=0.94 – 0.96), 0.95 (95% CI=0.94 – 0.96), and 0.93 (95% CI=0.92 – 0.95). The corresponding risks for cardio-pulmonary mortality were: 0.95 (95% CI= 0.93 – 0.96), 0.94 (95% CI= 0.92 – 0.96), and 0.92 (95% CI=0.90 – 0.94). Inverse associations were also observed with ischemic heart disease, and stroke mortality.

**Conclusions:** Our study suggests that greenspace in urban environments is associated with lower rates of mortality.