

Partitioning the Effects of Weather and Air Pollution on Human Mortality in Santiago, Chile: 1988-1996

Short Title:

Weather and Air Pollution Effects on Human Mortality in Chile

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Abstract

This study employs a the temporal synoptic index (TSI) to form weather and air pollution classes in order to quantify effects of stressful weather and elevated air pollution levels on cause-specific mortality in Santiago, Chile during the austral winters from 1988 to 1996. Prior applications of the TSI have formed classes solely on the basis of weather and may have systematically underestimated the impact of air pollution levels on daily mortality. The attribution of increased mortality risk was largely found to be dependent on the type of class formed, *e.g.* high mortality weather classes were found to have cold, dry, high pressure conditions while high mortality pollution classes had elevated NO₂, SO₂, and PM_{10-2.5} concentrations. Respiratory disease mortality was found to be more sensitive to air pollution levels, while cardiovascular disease mortality was more sensitive to weather conditions. Respiratory mortality was most sensitive to stressful conditions at longer lag times (3 to 6 days), while cardiovascular mortality was most sensitive at shorter lag times (0 to 2 days). In Santiago, the effect of weather on total mortality was strongest for a one-day lag (Relative Risk \pm 95% Confidence Interval = 1.05 ± 0.046), while the effect of pollution was strongest for the longest lag time considered, six days (RR = 1.07 ± 0.04). The combined effect of extreme weather and extreme pollution was greatest for a three-day lag (RR = 1.11 ± 0.07). By understanding the relative magnitudes of health risks associated with stressful weather and air pollution conditions we can improve existing air pollution/weather watch systems and better anticipate future risks associated with global climate change. The next phase of the project will assess future trends and periodicities in the occurrence of weather patterns that have been identified as 'high-risk' with respect to pollution or mortality, using the output of multiple General Circulation Models.