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Combined Impact of Extreme Weather and Air Pollution on Mortality

Background:

- Toronto Public Health, in partnership with scientists from McMaster University and the federal government, has completed a major investigation of the combined impacts of weather and air pollution on mortality. The study examined the combined effects of extreme temperatures and air pollution over a 46-year time period (1954-2000) in four Canadian cities (Toronto, Montreal, Ottawa and Windsor) and makes projections on future impacts arising from global warming.

Results of Historical Analysis:

- Extreme heat/cold temperatures and air pollution were associated with premature mortality in all four cities. About 80% of this premature mortality was associated with air pollution and the remaining 20% with extreme heat and extreme cold.
- In an average year in Toronto between 1954 and 2000, 120 premature deaths were heat-related, 105 were cold related, and 822 were related to acute exposure to five common smog pollutants.
- On those few days of the year with extreme heat, the average daily mortality was almost twice as high as for comfortable days, taking account of air pollution levels. Heat-related mortality was significantly higher for the elderly and those with cardiovascular illness than other individuals.
- Protecting vulnerable populations during extreme heat episodes can prevent premature mortality. Preventing premature mortality from air pollution is far more challenging because air pollution occurs year round.

Projections for the Future:

- Using historical data, the study estimated the combined impacts of air pollution and global warming on premature mortality in 2050 and 2080. Based on climate change scenarios and current air pollution emissions remaining relatively constant, the study projects that heat-related mortality will double by 2050, and triple by 2080. Air-pollution related mortality will increase 20% by 2050 and 25% by 2080, largely because of increased ozone levels from global warming.

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Policy Implications and Recommendations:

- This study confirms the significance of air pollution as a major risk factor leading to premature mortality, in large part because air pollution is a year-round phenomenon. Extreme heat is a very serious issue when it occurs. With global warming, mortality due to extreme heat days is projected to increase unless actions are taken to protect at-risk populations.
- Prolonged exposure to heat over several days without cooling intervals can lead to death if core body temperature increases by 5°C. Seniors are at increased risk due to a decline in temperature-regulating mechanisms with aging. Other factors contributing to heat stress include underlying medical conditions (such as cardiac problems), obesity, alcohol consumption and medication use.
- Heat warning systems and heat response protocols can save lives. In Toronto, the declaration of an extreme heat alert by the Medical Officer of Health triggers a coordinated response among key city agencies and community partners. This includes media announcements, activation of a Heat Information Line, home visits to at-risk persons, facilitating emergency medical attention, opening of public cooling centres, outreach to homeless persons and distribution of bottled water.
- Many municipalities have expressed an interest in adopting similar systems. Given widespread interest and health benefits, it is recommended that Environment Canada, in collaboration with Health Canada, implement a national heat-warning system. It is also recommended that the combined impacts of air pollution and heat be taken into account during development of a national heat-warning system.
- Central to any improvement in air quality through reductions in smog and greenhouse gases is the progress that must be made by the federal government in ensuring implementation of the Kyoto Protocol. There is growing concern with the current direction to rely increasingly on voluntary and educational mechanisms.
- In light of this study's findings on current and projected health impacts, it is recommended that the Federal Ministers of Environment, Natural Resources and Health ensure that Canada meets its Kyoto targets as scheduled, and that greater emphasis is given to mandatory rather than voluntary measures.