

AirAtlas • Visualizing the link between Air Quality and Mortality

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What is AirAtlas?

AirAtlas is an interactive data dashboard designed for the Canadian Environmental Health Atlas to visualize the link between air pollution and death. AirAtlas allows you, the user, to learn about levels of PM2.5 in your area and the additional number of deaths it can cause.

Why is AirAtlas unique?

While there are other pollution visualization tools that make use of mapping technology, ours is different. Our solution is designed to answer questions a lay-person might have, such as "How bad is the air pollution where I live?" or "Why should I care about air pollution?" The feature set consists of a multi-tab dashboard led by a clickable map that reveals statistical changes in health outcomes, based on air quality of a particular place. For example, you can select a postal code, or zoom in on the map, and see the local pollution measurement, and alongside that, some projected increases in risk of death or hospitalization associated with that pollution level.

Where does the pollution data come from?

We started with a large scientific dataset of nearly 4.7 million records from the Atmospheric Composition Analysis Group at Dalhousie University. The dataset contains ground-level PM2.5 values derived from NASA satellite spectroradiometer imaging from 2001-2006. Recent innovations in satellite imaging, combined with complex statistical modeling, have made it possible to derive pollution data for most of the world. The biggest limitation to satellite imaging, at present, is the unit of measure, which is 10km x 10km. That's fine for thinly populated areas, but less useful for urban areas. A future version of this tool would incorporate ground-based monitoring to achieve neighborhood level resolution.

Does air pollution really cause disease and death?

Research has been mounting for decades connecting air pollution to adverse human health effects. For example, some longitudinal studies like the Harvard Six Cities Study, the Women's Health Initiative, and the Nurse's Health Study have been tracking the effects of air pollution on study participants for years. This is not new or fringe science. This is well established work going back 40 years and more and is recognized by mainstream research bodies and governmental entities like the American Heart Association, The American Cancer Society, Environment Canada, and the World Health Organization. As recently as January 2013 the US EPA published new regulations that lower the acceptable annual PM2.5 level to 12 µg/m³, so as to provide "increased protection against health effects associated with long- and short-term exposures."

How did you come up with your mortality estimates?

Based on a public health risk assessment framework as applied by Knowlton, et. al, we estimated excess mortality rate per 100,000 people with increased exposure of PM2.5. For each 10km x 10km grid area on the map, mortality impacts were computed as $M = B \times HR \times E$, where M is the estimated number of increased ischemic heart disease deaths attributable to PM2.5 concentrations, B is the baseline number of ischemic heart disease deaths expected across Canada, HR is the known hazard ratio of PM2.5 exposure, and E is the recorded PM2.5 exposure level at that location, averaged over years 2001-2006.

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Dan L. Crouse, Ph.D, Health Canada • Paul A. Peters, Ph.D, Statistics Canada, Catherine Karr, MD, Ph.D, University of Washington • Jason Schumacher, Tableau Software The Macallan

Primary Reference Citations

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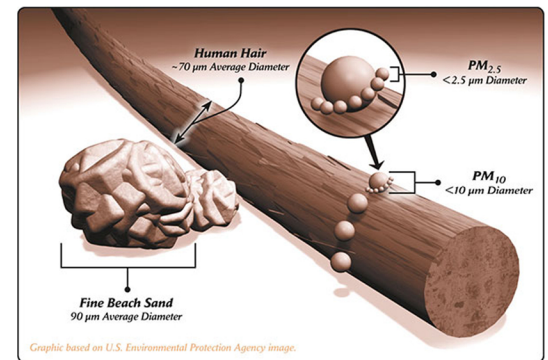
What is PM 2.5?

Particulate matter, or PM, is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke. Others are so small that individually they can only be detected with an electron microscope.

Particles less than 10 micrometers in diameter (PM10) pose a health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than 2.5 micrometers in diameter (PM2.5) are referred to as "fine" particles and are believed to pose the greatest health risks. Because of their small size (approximately 1/30th the average width of a human hair), fine particles can lodge deeply into the lungs.

An extensive body of scientific evidence indicates that long and short term exposures to PM2.5 cause premature death and adverse cardiovascular effects, including increased hospitalizations and emergency department visits for heart attacks and strokes. The evidence also links PM2.5 exposure to harmful respiratory effects.

US Environmental Protection Agency



Santa Barbara County Air Pollution Control District

Sizes of particulate matter smaller than 2.5 microns in diameter (PM2.5) and smaller than 10 microns in diameter (PM10) are compared against the average diameter of a human hair, which is approximately 70 microns in diameter.

Poster Image Citations

Van Donkelaar, A., Brook, R., NASA, Getty Images

Link to AirAtlas

public.tableausoftware.com/views/AirAtlasv4/Main

Link to Canadian Environmental Health Atlas

www.ehatlas.ca

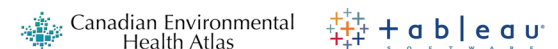


Table 36

Canadian Environmental Health Atlas:
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