

September 2007

Heat Advisory:

How Global Warming Causes More Bad Air Days

Read the full 2004 report online at <http://www.nrdc.org/globalWarming/heatadvisory/contents.asp>

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The number of unsafe air days would increase as a result of global warming for all 10 cities.



As global warming causes hot summer days to get hotter, concentrations of an air pollutant called ozone increase, forming lung-damaging pollution commonly known as smog. NRDC analysis—done in partnership with medical experts at Yale University, the Johns Hopkins University's Bloomberg School of Public Health, and Columbia University's Mailman School of Public Health in collaboration with University at Albany SUNY and the University of Wisconsin-Madison—assesses how much smog levels could rise over the eastern United States because of global warming, and what that could mean for public health.

New data focuses on 10 additional cities at risk for rising smog levels: Asheville, North Carolina; Cleveland, Ohio; Columbus, Ohio; Greenville, South Carolina; Memphis, Tennessee; Philadelphia, Pennsylvania; Raleigh, North Carolina; Virginia Beach, Virginia; Washington, D.C.; and Wilmington, North Carolina.



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The new data, published in the scientific journal *Climatic Change*, show that the number of unsafe air days—days when ozone levels exceed the health-based 8-hour air quality standard set by the U.S. Environmental Protection Agency (EPA)—would increase as a result of global warming for all 10 of these cities.¹ Global warming would increase the number of “bad air days” by as much as 155 percent in some of the cities studied.

More than 100 million Americans currently live in counties that do not comply with health-based air quality standards for ground-level ozone, commonly known as smog. Smog is formed when pollutants from vehicles, factories, and other sources mix with sunlight and heat, which means that key air quality measures are highly sensitive to temperature. Researchers project under a climate change scenario, holding precursor emissions constant, that by mid-century people living in 50 cities in the eastern United States would see a 68 percent (5.5 day) increase in the average number of days exceeding the health-based 8-hour ozone standard established by the EPA. The number of unhealthy “red alert” days would double. Correspondingly, these citizens would enjoy, on average, 15 percent fewer healthy air days in future summers because of global warming.

Measured over 1-hour and 8-hour periods, ozone levels are ranked on a color-coded air quality index established under the Clean Air Act to determine the threat to public health. On red alert days, everyone—particularly children and people with asthma—is advised to limit outdoor activity.

Exposure to ozone also heightens the sensitivity of asthmatics to allergens and impairs lung function, especially in children and the elderly. In many places, including Atlanta and Mexico City, ozone has been linked to increased hospital admissions for lower respiratory infections and asthma in children.

Figure 1: Projected Increase in Summertime Daily 1-Hour Maximum Ozone Concentrations Due to Global Warming

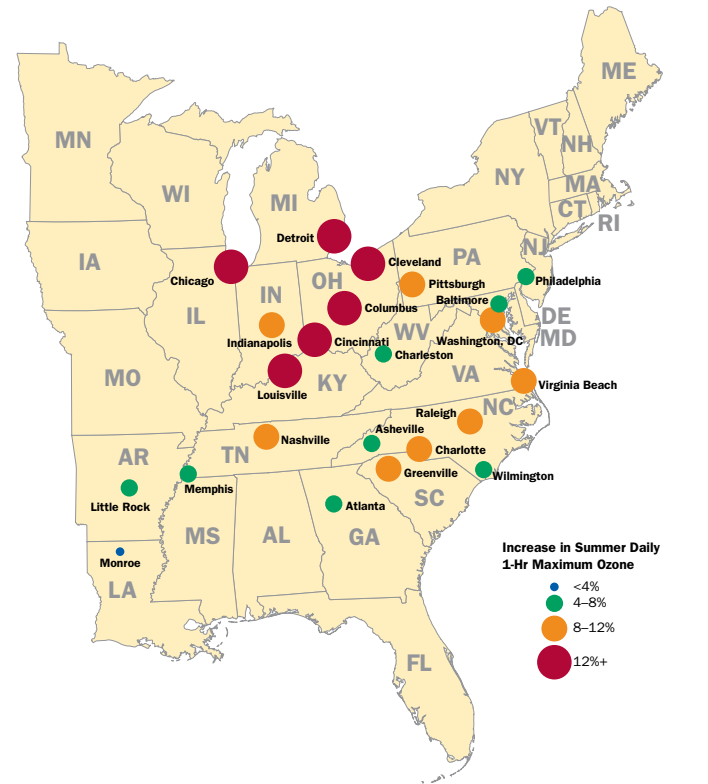
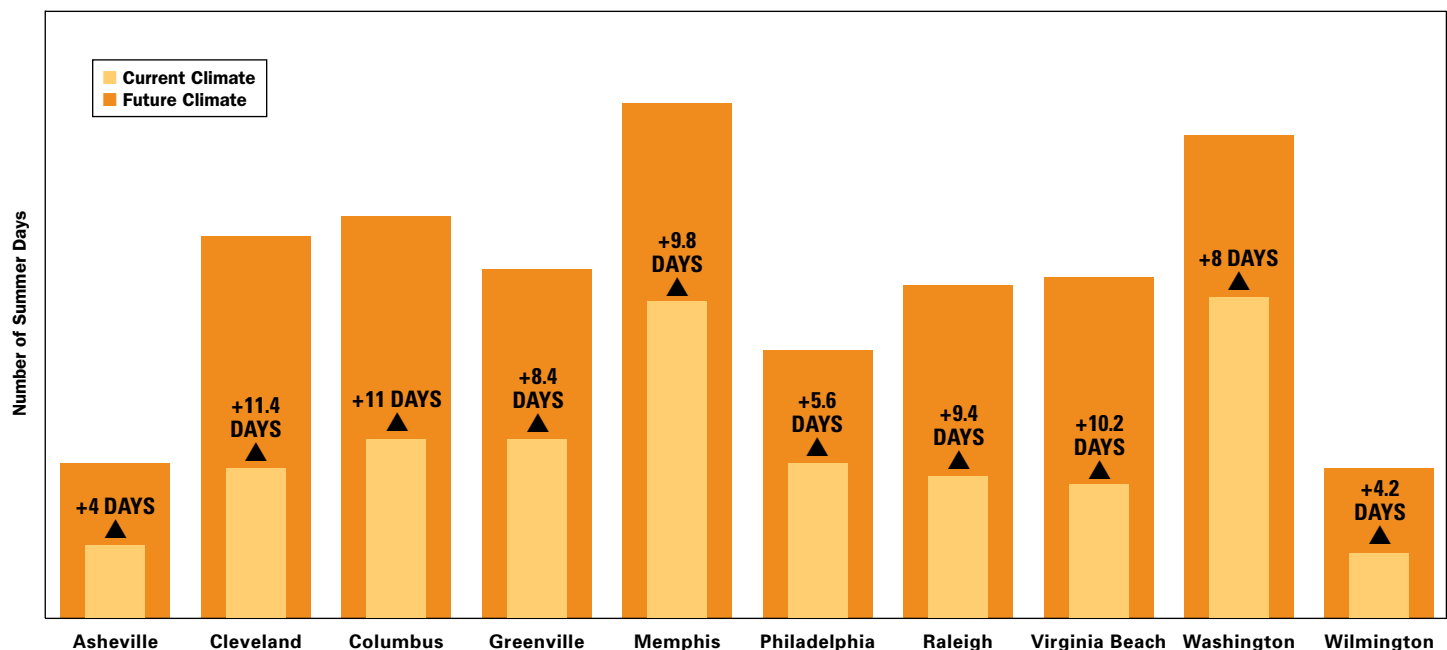


Figure 2: Changes in Number of 8-Hour NAAQS Exceedance Days Per Summer Due to Global Warming





The findings mean that many more people would be forced to restrict outdoor activities. Those with asthma and other respiratory troubles face the most serious threats.

Examples of projected city-specific consequences include:

- **Asheville, North Carolina**, would experience more than twice as many days when ozone levels exceed the health-based 8-hour air quality standard set by the EPA.
- **Cleveland, Ohio**, would see 11 more days per summer that exceed the EPA's standard.
- **Columbus, Ohio**, would see a 28 percent drop in the number of clean air days in an average summer.
- **Greenville, South Carolina**, would see nearly a doubling in the number of days that ozone levels exceed the EPA's health-based 8-hour air quality standard.
- **Memphis, Tennessee**, would see a 40 percent increase in the number of "red alert" days—days when air is considered unhealthy.
- **Philadelphia, Pennsylvania**, will see six additional days per summer that exceed EPA's 8-hour air quality standard.
- **Raleigh, North Carolina**, would see its number of days with air that is unhealthy for sensitive groups more than double.
- **Virginia Beach, Virginia**, would see two and a half times as many days that exceed EPA's air quality standard.
- **Washington, D.C.**, would see a 24 percent drop in clean air days per summer.
- **Wilmington, North Carolina**, would see its number of "orange alert" days more than double.

Higher smog levels trigger asthma attacks and make it difficult to breathe, particularly for children and the elderly. For people who have asthma, smog pollution can increase their sensitivity to allergens. And because carbon dioxide levels also are elevated, allergenic plants, such as common ragweed, produce more pollen.

Smog is a serious problem, and not only in the cities studied in this analysis. More than 100 million Americans live in counties that do not comply with health-based air quality standards for ozone. Ozone is a persistent environmental health problem, despite the significant efforts that have been made to control emissions since enactment of the Clean Air Act in 1970.

Future air pollution control strategies should address heat-trapping pollution, such as carbon dioxide, as well as the pollutants that are direct precursors to ozone. Otherwise, the Clean Air Act's goal to provide all Americans with clean, healthy air to breathe could choke, and many Americans will suffer preventable illnesses—even death.

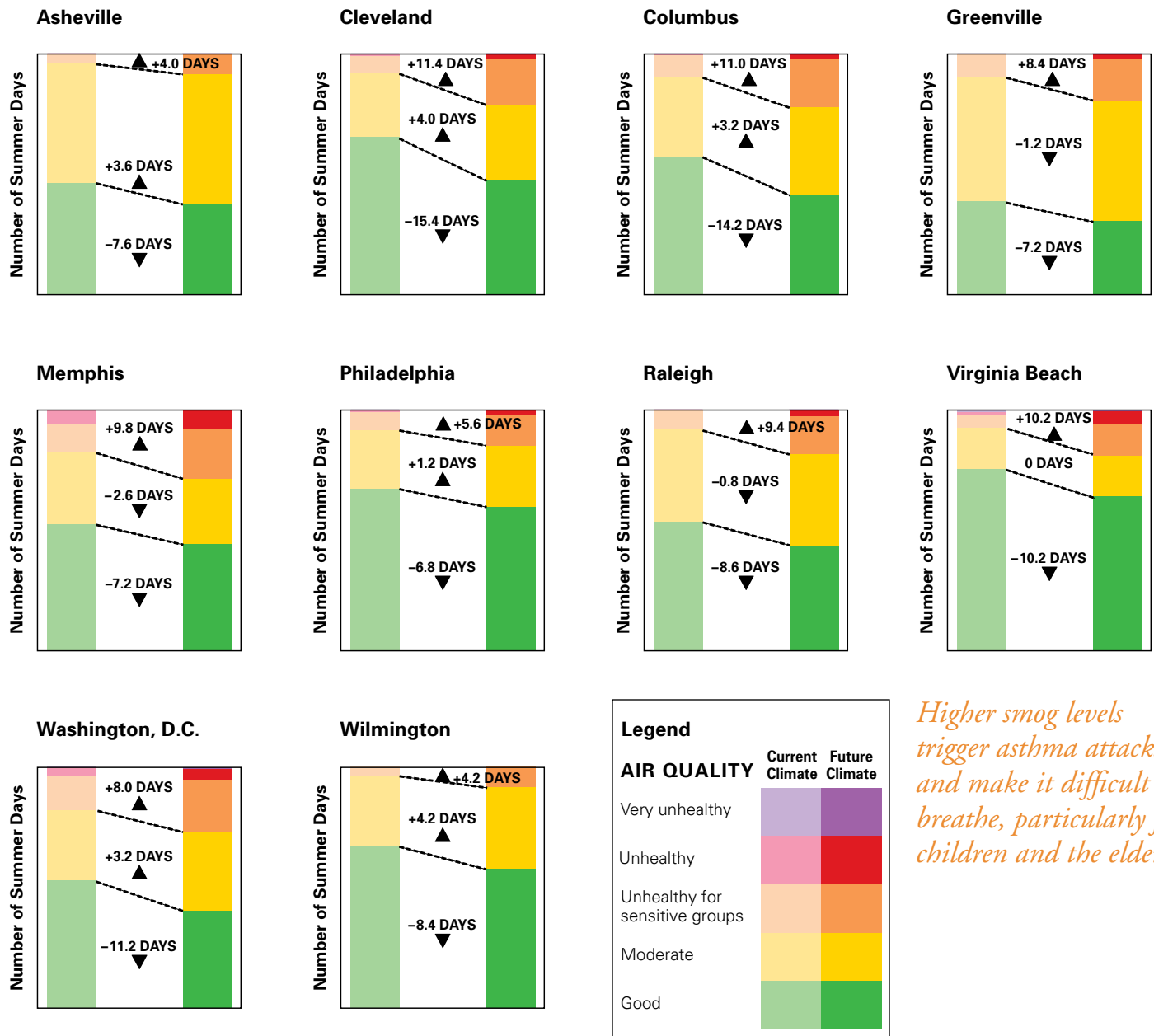
Global Warming Will Lead to Serious Health Problems

Outdoor work, play, and exercise increase the amount of air pollution people inhale. In controlled clinical studies, breathing ozone has been linked to reduced pulmonary function, increased cough, and chest tightness. Reduced lung function and physical performance, increased airway reactivity, and acute inflammation have been found at exposure well below 80 parts per billion (ppb), even in healthy adults.² Other health effects of ozone include an increase in hospital admissions and even premature mortality, and ozone exposure has been linked to school absenteeism and restricted activity days.

Exposure to ozone also heightens the sensitivity of asthmatics to allergens and impairs lung function, especially in children and the elderly.³ In many places, including Atlanta and Mexico City, ozone has been linked to increased hospital admissions for lower respiratory infections and asthma in children.⁴

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Figure 3: Number of Summer Days by Ozone Action Category, Current Versus Future Climate



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¹ Bell, M. L., R. Goldberg, C. Hogrefe, P.L. Kinney, K. Knowlton, B. Lynn, J. Rosenthal, C. Rosenzweig, J. A. Patz, 2007. Climate change, ambient ozone, and health in 50 US cities. *Climatic Change* 82:61-76.

² U.S. Environmental Protection Agency, *Air Quality Criteria for Ozone and Related Photo-chemical Oxidants*, March 2006. U.S. EPA, *Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information*, OAQPS Staff Paper, July 2007. Letter from Dr. Rogene Henderson, Chair, Clean Air Scientific Advisory Committee to Stephen L. Johnson, Administrator, U.S. EPA, re Clean Air Scientific Advisory Committee's Peer Review of the Agency's 2nd Draft Ozone Staff Paper, EPA-CASAC-07-001, October 24, 2006. Letter from Dr. Rogene Henderson, Chair, Clean Air Scientific Advisory Committee to Stephen L. Johnson, Administrator, U.S. EPA, re Clean Air Scientific Advisory Committee's Review of the Agency's Final Ozone Staff Paper, EPA-CASAC-07-002, March 26, 2007.

³ Koren, H.S. and P.A. Bromberg, Respiratory responses of asthmatics to ozone. *Int Arch Allergy Immunol* 107(1-3, 1995): pp. 236-238.

⁴ Romieu, I., Epidemiological studies of the health effects arising from motor vehicle air pollution, in *Urban traffic pollution*, D. Schwela and O. Zali, editors. World Health Organization. Exotox. EXFN SPON, New York, 1999, pp. 10-69.