

Ozone Kills

- There is strong, consistent evidence that links ozone (commonly referred to as smog) to premature deaths. Cleaning up air pollution will save thousands of lives.^{i, ii}
- In fact, reducing ozone pollution from the current standard of 0.085 ppm to 0.075 ppm could save about 4,000 lives per year, in 95 U.S. cities studied. The larger the ozone pollution reduction, the more lives that would be saved.ⁱⁱⁱ
- A study of 95 U.S. cities found an increase in deaths following exposure to heightened levels of ground-level ozone.ⁱⁱⁱ A multi-city European study came to the same conclusion.^{iv}
- Three recent independent analyses that used statistical techniques to synthesize the results of different studies found a remarkably consistent link between ozone exposure and premature mortality.^{v,vi,vii} Four earlier meta-analyses have also reported evidence that ozone contributes to early death.^{viii}
- People may die from ozone exposure even when concentrations are well below the current standards.^{ix}
- The death effect of ozone is distinct from the effect of temperature and particle pollution.^{x, iii}
- African-Americans may be at higher risk of early death from ozone pollution than the general population.^{xi}
- The World Health Organization recently tightened its air quality guidelines for ozone because of concern about deaths from exposure to low concentrations.^{xii}
- EPA's peer-reviewed science assessment concludes that the overall evidence is highly suggestive that short-term exposure to ozone increases the risk of early death.^{xiii}
- EPA's independent science advisors (the Clean Air Scientific Advisory Committee – CASAC) unanimously recommended that EPA lower the ozone air quality standards due to evidence of death and disease at levels below current standards.^{xiv}

“The understanding of the associated science has progressed to the point that there is *no longer significant scientific uncertainty regarding the CASAC's conclusion that the current 8-hr primary NAAQS must be lowered*. A large body of data clearly demonstrates adverse human health

effects at the current level of the 8-hr primary ozone standard. Retaining this standard would continue to put large numbers of individuals at risk for respiratory effects and/or significant impact on quality of life including asthma exacerbations, emergency room visits, hospital admissions and mortality.”^{xv}

- The science advisors endorsed inclusion of mortality risk estimates in the risk assessment for ozone.^{xvi}
- In California alone, an ozone standard of 0.070 ppm would reduce annual deaths from ozone by an estimated 630 cases.^{xvii}

ⁱ Bell ML, Peng RD, Dominici F. The Exposure-Response Curve for Ozone and Risk of Mortality and the Adequacy of Current Ozone Regulations. *Environ Health Perspec* 2006;114:532-536.

ⁱⁱ Bell ML, McDermott A, Zeger SL, Samet JM, Dominici F. Ozone and short-term mortality in 95 US urban communities, 1987-2000. *JAMA* 2004; 292:2372-2378.

ⁱⁱⁱ Bell ML, McDermott A, Zeger SL, Samet JM, Dominici F. Ozone and short-term mortality in 95 US urban communities, 1987-2000. *JAMA* 2004; 292:2372-2378.

^{iv} Gryparis A, Forsberg B, Katsouyanni K, Analitis A, Touloumi G, Schwartz J, Samoli E, Medina S, Anderson HR, Niciu EM, Wichmann E, Kriz B, Kosnik M, Skorkovsky J, Vonk JM, Dortbudak Z. Acute effects of ozone on mortality from the “Air Pollution and Health: A European Approach” project. *Am J Respir Crit Care Med* 2004;170:1080-1087.

^v Bell ML, Dominici F, and Samet JM. A Meta-Analysis of Time-Series Studies of Ozone and Mortality with Comparison to the National Morbidity, Mortality, and Air Pollution Study. *Epidemiology* 2005; 16:436-445.

^{vi} Levy JI, Chermerynski SM, Sarnat JA. Ozone Exposure and Mortality: An Empiric Bayes Metaregression Analysis. *Epidemiology* 2005; 16:458-468.

^{vii} Ito K, De Leon SF, Lippmann M. Associations between Ozone and Daily Mortality: Analysis and Meta-Analysis. *Epidemiology* 2005; 16:446-429.

^{viii} Levy JI. Assessing the Public Health Benefits of Reduced Ozone Concentrations. *Environ Health Perspect* 2001; 109: 1215-1226; Thurston CD, Ito K. Epidemiological Studies of Ozone Exposures and Acute Mortality. *J Exposure Analysis and Environ Epidemiology* 2001; 11:286-294; Anderson HR, Atkinson RW, Peacock JL, Marston L, Konstantinou K. Meta-Analysis of Time-Series Studies and Panel Studies of Particulate Matter (PM) and Ozone (O₃). Report of a WHO Task Group. Copenhagen: World Health Organization, 2004; and Stieb DM, Judek S, Burnett RT. Meta-analysis of time-series studies of air pollution and mortality: Effects of gases and particles and the influence of cause of death, age and season. *J Air & Waste Manage Assoc* 2002; 52: 470-84.

^{ix} Bell ML, Peng RD, Dominici F. The Exposure-Response Curve for Ozone and Risk of Mortality and the Adequacy of Current Ozone Regulations. *Environ Health Perspec* 2006;114:532-536.

^x Schwartz J. How sensitive is the association between ozone and daily deaths to control for temperature? *Am J Resp Crit Care Med* 2005; 171: 627- 631; Huang Y, Dominici F, Bell ML. Bayesian hierarchical distributed lag models for summer ozone exposure and cardio-respiratory mortality. *Environmetrics* 2005; 16: 547-562.

^{xi} Bell ML, Dominici F. Effect Modification by Community Characteristics on the Short-Term Effects of Ozone Exposure and Mortality in 98 U.S. Communities. In press. *American Journal of Epidemiology*.

^{xii} World Health Organization. WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. Global update 2005. Summary of risk assessment. Available at:

<http://www.who.int/phe/air/aqg2006execsum.pdf>

^{xiii} U.S. Environmental Protection Agency. Air Quality Criteria for Ozone and Related Photochemical Oxidants (Final). Washington, DC, EPA/600/R-05/004aB-cB, 2006.

^{xiv} Letter from Dr. Rogene Henderson, Chair, Clean Air Scientific Advisory Committee to Stephen L. Johnson, Administrator, U.S. Environmental Protection Agency, re Clean Air Scientific Advisory Committee’s (CASAC) Review of the Agency’s Final Ozone Staff Paper, EPA-CASAC-07-002, March 26, 2007.

^{xv} Letter from Dr. Rogene Henderson, Chair, Clean Air Scientific Advisory Committee to Stephen L. Johnson, Administrator, U.S. Environmental Protection Agency, re Clean Air Scientific Advisory Committee’s (CASAC) Peer Review of the Agency’s 2nd Draft Ozone Staff Paper, EPA-CASAC-07-001, October 24, 2006.

^{xvi} Letter from Dr. Rogene Henderson, Chair, Clean Air Scientific Advisory Committee to Stephen L. Johnson, Administrator, U.S. Environmental Protection Agency, re Clean Air Scientific Advisory Committee's (CASAC) Peer Review of the Agency's 2nd Draft Ozone Staff Paper, EPA-CASAC-07-001, October 24, 2006. *See also*, U.S. EPA Proposed Rule, National Ambient Air Quality Standards for Ozone, June 21, 2002, p. 149.

^{xvii} Ostro BD, Tran H, Levy JI. The Health Benefits of Reduced Tropospheric Ozone in California. *J. Air & Waste Manage. Assoc.* 2006; 56: 1007-1021.