

### Ozone: Unrealistic Scenarios

Knowlton et al. (2004) argued that increasing temperatures associated with climate change will increase urban ozone and related health risks. They have disregarded important factors in reaching this conclusion.

During the last 20 years, nationwide exceedances of the federal 1-hr ozone standard declined 90%, and the June–August average of daily 1-hr peak ozone levels declined 10% (Schwartz et al., in press), presumably with ensuing declines in ozone-related mortality. Ozone declined despite a roughly 1°C increase in urban temperatures during the last few decades (Karl et al. 1988). Knowlton et al. (2004) did not explain why we should expect the future to be the opposite of the past.

Knowlton et al. (2004) used ozone-precursor [nitrogen oxides (NO<sub>x</sub>) and volatile organic compound (VOC)] emissions estimates for 1996 to predict ozone levels in the 2050s. However, even current emissions are substantially lower than 1996 levels, while, as shown below, already-adopted U.S. Environmental Protection Agency (EPA) requirements will eliminate most remaining ozone-precursor emissions, even after accounting for growth.

The U.S. EPA (2003) estimated that between 1996 and 2001, total emissions of NO<sub>x</sub> and VOC declined, 10 and 14%, respectively. [The U.S. EPA updated its trend estimates in November 2004 (U.S. EPA 2004a) and now believes the decline was even steeper, although these new estimates were obviously not available to Knowlton et al.] During 2003 and 2004, the U.S. EPA capped total NO<sub>x</sub> from coal-fired power plants and industrial boilers at 60% below 2000 levels (U.S. EPA 1998a, 2004b). A range of emissions data show the average automobile's NO<sub>x</sub> emissions rate declined 4–9% per year between 1995 and 2001, with greater improvements for vehicles up to 4 years old (Pokharel et al. 2003; Schwartz 2003). Total driving is increasing < 2% per year, resulting in large net NO<sub>x</sub> declines (Texas Transportation Institute 2004).

Data on heavy-duty diesel vehicles are sparse, but there is every reason to believe that diesel NO<sub>x</sub> has also declined. The U.S. EPA has tightened NO<sub>x</sub> standards for new on- and off-road diesels several times over the last 15 years, and also recently required additional NO<sub>x</sub> reductions from in-use 1993–1998 model year trucks (U.S. EPA 2002a, 2004c, 2004d).

VOCs have declined far more than NO<sub>x</sub> and far more than U.S. EPA estimates. The U.S. EPA's official VOC inventory understates significantly the gasoline-vehicle contribution to total VOCs (Watson et al.

2001). Real-world data show the average automobile's VOC emission rate is declining 11–15% per year, again much more rapidly than driving is increasing, and with a more rapid decline for recent models (Pokharel et al. 2003; Schwartz 2003). The U.S. EPA also recently implemented VOC reductions for other sources (U.S. EPA 1998b, 2002b, 2004e).

Overall, between 1996 and 2004, anthropogenic NO<sub>x</sub> and VOC emissions likely declined, respectively, at least 25 and 50%—declines overlooked by Knowlton et al. (2004).

Emission declines will continue. For example, a vehicle fleet meeting the U.S. EPA's "Tier 2" automobile standards, implemented in 2004, on-road diesel standards set for 2007, and off-road diesel standards set for 2010, will emit 90% less NO<sub>x</sub> and VOCs per mile over their lifetime than the current average vehicle, resulting in huge emissions declines, even with predicted increases in driving (Schwartz 2003; U.S. EPA 2000a, 2000b, 2004c).

Knowlton et al. (2004) assume ozone-precursor emissions several times greater than any plausible future scenario. Their projections of future ozone and related health impacts are therefore unrealistically high.

Heat-related mortality has also declined, by 70% nationwide since the 1960s, despite warming urban climates, with the hottest and most humid cities achieving the greatest risk reductions (Davis et al. 2003). These health improvements resulted from a range of adaptive technologies and processes, including increased air conditioning, changes in building design, physiologic adaptations, and improved emergency medicine.

Nevertheless, because of a single major blackout on a warm day in 2003, Knowlton et al. (2004) maintain that "air conditioning may not really be an appropriate 'fix' for adapting to climate change." Air conditioning is clearly a vital adaptive technology that has saved countless lives. One study reported a relative risk of death on hot days of 1.7 for people with no air conditioning compared to those with central air (Rogot et al. 1992).

The nondiscriminating reader might be impressed by the downscaling of a general circulation model using a regional mesoscale model to predict localized differences in future air-pollution related mortality, but the complexity of the models is irrelevant in the face of Knowlton et al.'s failure to temper their theoretical exercise with real-world data. Had Knowlton et al. (2004) accounted for observed historical health and pollution trends and future emission-reduction requirements, they would have arrived at a markedly different story.

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## Ozone: Kinney et al. Respond

We appreciate the interest taken by Schwartz et al. in our recent article (Knowlton et al. 2004) and welcome the opportunity to respond to their comments. Although they raised several important issues regarding ozone trends, we do not believe these issues are as relevant to our article as they suggest. Further, we wish to highlight several points on which their letter is misleading.

The overall aim of our article was to illustrate the use of a new modeling system that could be of value to policy makers engaged in projecting future ozone levels and corresponding health impacts. Our contention is that, because ozone levels are so sensitive to climate, analyses of future ozone impacts ought to take climate change into account. The overall thrust of the article was summarized in the concluding sentence of the abstract:

This modeling framework provides a potentially useful new tool for assessing the health risks of climate change.

Schwartz et al. suggest incorrectly that our model runs were intended to project what is likely to actually happen with ozone and mortality in the 2050s under a changing climate. Had we wished to do that, we would have needed to include realistic estimates of ozone precursor changes over the period of interest. However, because there are no reliable estimates of precursor emissions extending to the mid 21st century, such an exercise would have been extremely speculative. To avoid this bind, for our main analysis of climate impacts on ozone we chose to simply keep anthropogenic ozone precursor emission levels constant. We used 1996 U.S. Environmental Protection Agency (EPA) emissions estimates (U.S. EPA 2002) because those fell within our reference period. We do not dispute Schwartz et al.'s point that precursor emissions have likely decreased since 1996. We do note, however, that as a result of the complex chemistry of ozone formation, ambient ozone concentrations do not necessarily change in direct proportion to precursor changes (Seinfeld and Pandis 1998). These

relationships become even more complex when both precursor changes and changing climate are taken into consideration (Hogrefe et al. 2004). To illustrate this complexity, when we allowed regional ozone precursor emissions to rise in a manner consistent with the Intergovernmental Panel on Climate Change (IPCC) A2 scenario (Nakicenovic and Swart 2000) in a sensitivity analysis, the ambient ozone levels projected for several urban counties around New York City, New York, in the 2050s actually decreased from 1990s levels (Knowlton et al. 2004, Table 1). As a result, Schwartz et al.'s statement that we assume ozone precursor emissions several times greater than any plausible future scenario, and as a result our projections of future ozone and related health impacts are unrealistically high, is misleading and probably incorrect.

We also wish to point out that, in spite of the recent reductions in precursor emissions that Schwartz et al. highlight, the U.S. EPA has reported that nationwide ozone levels have decreased only slightly since 1990 [U.S. EPA (2004), Figure 9]. This likely reflects the complex interplay between precursors and climate in the formation and dispersion of ozone. Therefore, it is not at all clear what impact the introduction of more realistic ozone precursor emission estimates would have on future ozone levels in the New York City region. However, addressing such questions is exactly what we hope our modeling system will be used for in the future.

Schwartz et al. highlight one sentence from the end of a discussion paragraph to imply that we downplayed the significance of air conditioning as an adaptive strategy to a warming climate. In fact, the main thrust of the paragraph was to acknowledge air conditioning as a potential tool for reducing the health impacts of both heat and ozone. The excerpted sentence was merely a cautionary reminder that our adaptive mechanisms have in the past been vulnerable to disruption at times, that is, during extreme heat waves, when they are most needed.

In conclusion, we hope that even discriminating readers will be impressed by the utility of this new modeling system to provide down-scaled estimates of general circulation models and associated air quality, and will be motivated to use this system to evaluate alternative inputs and their potential impacts on future climate and air quality at fine spatial scales in the United States.

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## Inappropriate Influence by Industry on EHP News Article

We are disturbed by the recent revelation that, before its publication, an *EHP* Science Selection article on the toxic rocket fuel additive perchlorate (Renner 2002) was substantially revised by a paid consultant to the perchlorate industry to downplay adverse health effects (Danelski 2004). *EHP* contracted freelance journalist Rebecca Renner to write the Science Selection piece to accompany publication of a research article by Greer et al. (2002). The Greer study was partially funded by the Perchlorate Study Group (PSG), a self-described alliance of perchlorate users and manufacturers, including the military contractors Boeing, Lockheed Martin, Aerojet, and Kerr-McGee. It seems apparent that the PSG had a significant financial interest in continued perchlorate use. The study included two authors affiliated with Intertox, Inc., a consulting firm contracted by the PSG. Greer et al. (2002) reported on the effects of perchlorate ingestion by 37 healthy adults over a 2-week period, concluding that

Assuming that the drinking water supply is the only significant source of exposure ..., a perchlorate concentration of 180–220 ppb (and possibly much higher) should be of no health concern in iodine-sufficient populations.

The original article by Renner reported that the Greer study results disagreed with a draft toxicologic review released by the U.S. Environmental Protection Agency (EPA) just a few months earlier, recommending no more than 1 ppb perchlorate in drinking water, on the basis of reduced thyroid hormone levels, abnormal brain morphology, and thyroid cancers in young rat pups exposed *in utero* and perinatally to perchlorate (U.S. EPA 2002).

Prior to publication, the *EHP* editors sent Renner's article to one of the authors of the Greer study, Gay Goodman, of Intertox, Inc., to check the characterization of her study for accuracy. According to an invoice from Intertox to PSG (Pleus 2002), Goodman was paid by the industry for her time spent "editing the *EHP* news article (Renner 2002)." Intertox explained in the invoice that Renner's article, as originally written, "was potentially very damaging to PSG" (Pleus 2002). The invoice described Intertox's work: "Dr. Goodman gained the trust of the editor and, through a cooperative process entailing five or more drafts, provided substantial and critical improvements to the article" (Pleus 2002). Renner was never provided an opportunity to review the revised version, yet practically every sentence of her article had been altered (Danelski 2004). In particular, all references to the inconsistency between the drinking water "safe" level recommended by the Greer study and that of the U.S. EPA were scrubbed from the published version, as was the disclosure of the major funding source of the Greer study.

Although the Intertox rewrite of Renner's news story was titled "Relief for Perchlorate: Effects Not a Significant Concern" and the revised story was written to imply that the Greer study proved perchlorate to be less toxic than previously believed, these conclusions are unfounded and misleading. More recent reviews of the Greer study by state agencies, the U.S. EPA, and independent scientists have noted that the low-dose group in the study was too small to have the statistical power to detect a relevant effect (Massachusetts Department of Environmental Protection 2004). Furthermore, the results could not be extrapolated to longer-term exposures, iodine-deficient populations (including 15% of women in the United States), or to the fetus and infant (Hollowell et al. 1998).

The Department of Defense and its military contractors have waged a coordinated

assault on the U.S. EPA regulatory recommendation of no more than 1 ppb perchlorate in drinking water (Beeman and Danelski 2004; Sass 2004). It now appears that *EHP* unwittingly became part of that campaign to manipulate the public perception of perchlorate and avoid strict regulatory standards. In other efforts, the Department of Defense and PSG pushed for the National Academies to provide a review of the U.S. EPA recommendations (Renner 2003), with the report expected in late January 2005. A paid consultant to Lockheed Martin was initially appointed to the Academies' scientific committee, but was later asked to resign when previously undisclosed evidence of financial conflicts emerged (Waldman 2004).

We applaud *EHP*'s excellent reputation for scientific quality and integrity. However, in this case we believe the evidence shows that *EHP* was unwittingly used as part of a deliberate campaign to undermine a health policy position taken by a sister agency. We request that the *EHP* editors implement policies to ensure that any alterations made to a manuscript be clearly marked and reviewed by the author before going to press. *EHP* has indicated that it may add another layer of editing by outside scientists to the Science Selection editing process in response to this situation (Beeman and Danelski 2004). We strongly discourage the use of outside reviewers for news stories and suggest instead that *EHP* rely on the expertise of its editorial staff and news reporters, with limited use of outside reviewers for accuracy checks only. We applaud the recent *EHP* policy to ban from publishing for 3 years any author who fails to disclose financial conflicts (EHP 2004). If *EHP* applied such a requirement to news articles, it would bring needed transparency to efforts like those of Intertox consultant Gay Goodman, who effectively ghost authored the Renner article (with permission of *EHP* editors) without disclosure to the *EHP* readership.

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*Editor's note: Science Selections articles are summaries of peer-reviewed research articles published in the concurrent issue of EHP. They are not investigative pieces, and thus differ from other EHP news articles in several substantive ways. They are not meant to analyze, critique, or comment upon the research methodology, findings, or integrity. Contextual information in the news article is generally confined to context provided by the authors of the research paper in the paper's introduction and conclusion. For this reason, corresponding authors of the research papers have been involved in the review process of Science Selections to ensure accurate presentation of their research.*

*We now recognize that this process is vulnerable to at least the appearance of conflicts of interest and regret this incident. To avoid this, Science Selections articles will now be reviewed by outside experts the same as all other EHP news articles. EHP is also contemplating convening an international meeting to address complex questions associated with ethics in publishing in the fields of environmental and public health.*

## ERRATA

Siemiatycki et al. have detected some errors in their review of occupational carcinogens published in the November 2004 issue of *EHP* [Environ Health Perspect 112:1447–1459 (2004)]. Specifically, they inadvertently included in their list of Group 2B (possible) carcinogens some substances that had been downgraded to Group 3 (not classifiable) in a subsequent *IARC* (International Agency for Research on Cancer) *Monograph*. Their corrections are as follows:

- On page 1449, 3rd column, “113 possible human occupational carcinogens (IARC Group 2B; Table 5)” should be replaced by “110 possible human occupational carcinogens (IARC Group 2B; Table 5).”
- On page 1454, Table 5 (under “Respirable dusts and fibers”), glass wool, rock wool, and slag wool fireproofing should not have appeared in the listing of Group 2B human carcinogens because they were downgraded to Group 3 in the latest monograph to address these substances (IARC 2002a); special purpose glass fibers such as E-glass and “475” glass fibers are not used in the “Reinforced plastic industry” but rather in “High-efficiency air filtration media and

battery separator media” (IARC 2002a). A corrected version of this section of Table 5 is presented below.

- On page 1459, Table 8, as a result of the previous corrections, the last section of Table 8 (Current rating 2B) should be modified as follows: the total number of substances with this rating should read 110 instead of 113; the number of substances unrated by IARC in 1987 should read 36 instead of 39; and the number of substances unrated by the World Health Organization (WHO) in 1964 should read 104 instead of 107. A corrected version of Table 8 is presented below.

Siemiatycki et al.’s review of the *IARC Monographs* was intended to cover volumes 1–83. With these corrections, the tables and text are complete.

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**Table 8.** Evolution in knowledge regarding current (2003) IARC occupational carcinogens (corrected version).

Current rating	Earlier evaluation		
	Past rating	IARC 1987	WHO 1964
1 (n = 28)	1	19	13
	2A	4	4
	2B	1	
	3	0	NA
	Unrated	4	11
2A (n = 27)	Total	28	28
	1	0	0
	2A	16	0
	2B	6	
	3	2	NA
Unrated	3	27	
2B (n = 110)	Total	27	27
	1	0	1
	2A	2	5
	2B	63	
	3	9	NA
Unrated	36	104	
	Total	110	110

NA, not applicable.

**Table 5.** Substances and mixtures that have been evaluated by IARC as possible (Group 2B) human carcinogens and that are occupational exposures [corrected section only].

Substance or mixture	Occupation or industry in which the substance is found <sup>a</sup>	IARC Monograph volume (year) <sup>b</sup>	Human evidence <sup>c</sup>	Animal evidence <sup>c</sup>
Respirable dusts and fibers				
Palygorskite (long fibers > 5 μm)	Miners and millers; production of waste absorbents, fertilizers, and pesticides	Vol. 68 (1997b)	Inadequate	Sufficient
Refractory ceramic fibers	Production; furnace insulators; ship builders; heat-resistant fabric manufacture	Vol. 81 (2002a)	Inadequate	Sufficient
Special-purpose glass fibers such as E-glass and “475” glass fibers	High-efficiency air filtration media; battery separator media	Vol. 81 (2002a)	Not available	Sufficient