Comments of the American Lung Association on EPA's on 2nd Draft Integrated Science Assessment (ISA) for Ozone

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Integrated Science Assessment for Ozone and Related Photochemical Oxidants
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Background

The American Lung Association offers these comments on EPA's second draft Integrated Science Assessment (ISA) for ozone.

This draft ISA presents a summary of new information on the health effects of ozone that has been published from 2005 to mid-2011. As outlined in the Integrated Review Plan, the ISA aims to integrate the recent findings with earlier studies to provide a comprehensive assessment of knowledge to date.

In the case of ozone, a comprehensive assessment is critical because many key studies were published over the last several decades. New findings cannot be evaluated in the absence of historical context. By the same token, scientific research published in the last six years has greatly increased our understanding of the adverse health effects of ozone air pollution, particularly at low concentrations.

In 2008, EPA issued a final rule on the National Ambient Air Quality Standards (NAAQS) for ozone, setting the 8-hour average standard at a level of 75 ppb, well above the range of 60 to 70 ppb recommended by the Clean Air Scientific Advisory Committee (CASAC).

In 2009, confronted with an administrative petition for reconsideration and a legal challenge, EPA embarked on a reconsideration of the 2008 ozone rule. In the course of the reconsideration, CASAC reiterated its unanimous view that the evidence supported a standard in the range of 60 to 70 ppb.

Since the completion of the 2008 review of the ozone standards, considerable new information is available on the adverse health effects of ozone. This new evidence strengthens our understanding of ozone health effects and provides evidence of health effects at lower concentrations of 60 ppb and below.

New Evidence Reinforces the Case for Strengthening the Ozone Standards

The last six years has produced a number of breakthroughs in the science of ozone air pollution. The new science substantially reinforces the case for strengthening the ozone standards.

In particular, there are several new chamber studies or analyses of data from controlled human exposure studies that point to ozone impacts in healthy young adults down to 60 ppb or below: Brown et al. (2008); McDonnell et al. (2007); and Schelegle et al. (2009). A fourth study --Kim et al. (2011) – was specifically designed to measure effects of exposures at 60 ppb, and reported adverse effects well below the current standard. The study reported that exposure of

healthy young adults to 0.06 ppm ozone for 6.6 hours causes a significant decrement of FEV(1) and an increase in neutrophilic inflammation in the airways.

Evidence supporting the association between short-term ozone exposures and premature mortality has also grown stronger over the last six years, with the multi-city U.S. studies by Bell and Dominici (2008) and Zanobetti and Schwartz (2008) and Medina-Ramon and Schwartz (2008) to be most influential. These studies have considered the role of confounding pollutants and found the effects of ozone to be robust.

In addition, two notable epidemiological studies provided new evidence of the adverse effects of chronic- exposure to ozone.

In this draft ISA, EPA has strengthened its causal findings for a number of key health endpoints relative to the 2005 ISA. Most notably, EPA now finds that the short-term ozone mortality relationship is likely causal, and concludes that the long-term effects of ozone on short-term respiratory effects are causal. The American Lung Association supports a finding of causality for both endpoints based on the total weight of evidence.

In 2008, the National Research Council reviewed evidence as it stood then [including Medina- Ramon and Schwartz (2008)] and concluded that that short-term exposure to ozone was likely to cause premature death. Since then, additional U.S. and international studies have provided consistent, positive evidence of causality on death from respiratory harm: Kastouyanni et al. (2009), Samoli et al, (2009), Stafoggia et al., (2010) and Wong et al, (2010). Furthermore, the evidence examined in this analysis finds a strong association with cardiovascular mortality.

The evidence is consistent across multiple investigators working around the world and for seasonal differences. In addition, the analysis described biological mechanisms that could explain the plausibility of ozone exposure leading to premature death. The conclusion of all these studies supports a determination of a causal relationship.

Also, with respect to cardiovascular effects, we find a large new body of research looking at the full range of health endpoints from physiological markers, to increased risk of hospital admissions and premature death. For instance, Zanobetti and Schwartz (2008) reported a positive association between ozone and cardiovascular disease mortality, respiratory mortality, and stroke mortality in their study of 48 cities in the U.S. Krewski et al., (2009) utilized data from the American Cancer Society cohort and observed a positive association between ozone exposure and all- cause and cardiopulmonary disease mortality. This association was robust to control for ecologic variables.

We encourage EPA to reexamine its finding of “suggestive of a causal relationship” for cardiovascular effects in light of the studies summarized in the

ISA as well as more recent publications included in the attachment. The American Lung Association supports a finding of "likely causal" for this endpoint,

Chapter 1: General Comments

With the publication of this draft document, EPA has moved closer to the goal of providing an assessment that integrates evidence across disciplines. We support the comprehensive scope of the document to include information from past reviews as well and more recent scientific evidence. In the case of ozone, this "long-view" is essential to provide a balanced presentation and interpretation of the evidence.

However, we find that in some areas, such as Chapter 8, the discussion of susceptibility of asthmatics lacks integration of past studies with current literature.

We applaud EPA for the creation and maintenance of the HERO database. This resource has the potential to streamline the literature review process for deveiopment of ISAs. However, at present, the public is not allowed access to full articles in the database, thereby limiting its utility. We encourage EPA to explore with publishers the possible public availability of full articles (not just abstracts) as is now available for many articles on the National Library of Medicine's website PubMed.

Chapter 1 states that the scope of the ISA covers the period of 2006 to July 2011 in depth. We ask that EPA specify the cutoff date will be for articles to be included in the final ISA.

We are pleased to see that EPA has incorporated some "in press" literature in its assessment. Many journals now make content available online prior to publication. Inclusion of these articles helps ensure that the final ISA will be as up to date as possible. We have provided in Attachment 1 a number of "in press" articles that have been published on the internet over the last six months. We encourage EPA to evaluate these and other recent publications to the extent practicable in developing the final ISA.

We also note with concern that EPA has not included studies that address the health effects of traffic related air pollution (unless those studies report measurements of ozone or other pollutants). There have been a plethora of traffic studies published over the last decade, reporting on health effects ranging from asthma exacerbations to preterm births. Since EPA also declined to assess these studies as part of the reviews of the particulate matter, nitrogen dioxide, or carbon monoxide reviews, we believe the Agency is failing to provide a comprehensive assessment of scientific "criteria" for review of the NAAQS. We understand that EPA may consider these studies as part of a multi-pollutant assessment now underway, but the regulatory significance of that review is

unknown. The NAAQS are the vehicle provided by the Clean Air Act for the regulation of adverse health effects of air pollution. Traffic related air pollution is a large part of the mix, and these studies should be explicitly reviewed in the ISA.

Chapter 2 – Executive Summary

We recommend that EPA summarize the key findings in Chapter 2 in nontechnical language. No reader of the document will be an expert in all of the disciplines covered in the summary, and the summary should be accessible to EPA decision makers and other informed readers. Health effects should be described in layman's terms to the extent possible.

Chapter 2 provides an executive summary of the ISA. We find figure 2-3, the "snapshot of evidence" to be very useful, and recommend that a similar, but "plain language" version be included in the final for use in helping the public understand the evidence for harm. For instance, "decreased host defenses" might be expressed as enhanced susceptibility to colds and flu.

Because the averaging time is one of the key attributes of any NAAQS, it would be very helpful if EPA could clarify its definitions of short-and long-term studies and effects. "Short-term" could apply to exposures of five minutes, one hour, eight hours, 24 hours, a week, or a month. "Long-term" could include seasonal, yearly, or multi-year exposures. These distinctions are important to the standard-setting process and should be addressed.

It would be helpful to clarify what is intended by the columns in Table 2-1, which summarizes the key conclusions of the ISA. Specifically, does column 3, "Conclusions from 2011 2nd Draft ISA" reflect conclusions from the 2005-2011 data only, or is it intended to integrate prior findings with recent research? If the former is the case, then a fourth column is needed to synthesize the conclusions from the 2006 and 2011 ISAs. We find it helpful that column 3 includes concentration levels from key studies.

Some of the health endpoints in column 3 deserve some additional explanation. For instance, where EPA has changed the causal finding from the 2006 ISA, a rationale should be provided. We recognize that more detail is included in the text of the chapter; but Table 2-1 is a key summary table, so if short-term mortality is now considered to be "likely causal" a few key studies should be cited. The same is true for health endpoints that are now identified as suggestive of a causal relationship.

We are in agreement with the most important causal findings summarized in this table except as noted earlier.

Chapter 3: Atmospheric Chemistry and Ambient Concentrations

Over the last decade, there has been a vast increase in oil and gas exploitation in the Intermountain West. This has led to concern over ozone concentrations in the winter months and in sparsely populated areas. A critical issue for this review of the ozone standard will be seasonality. A few states have been monitoring high ozone levels in the winter months in the oil and gas drilling regions, but there is not federal requirement that they do so. Interestingly, concentrations in excess of the current air quality standards have been observed in the winter months. In addition to seasonality, EPA must reconsider its monitor siting requirements in light of the expansion of petroleum industry activity outside urban areas. In past NAAQS reviews (such as for nitrogen dioxide) EPA has conducted a review of monitoring requirements and we believe this is necessary in the case of ozone. Beyond monitoring, EPA needs to consider whether the limited seasonal enforcement of the standard needs to be extended year-round.

In addition, we note that the discussion of "policy relevant background" concentrations seems to have taken on a life of its own. We understand is use in the policy process, but the ISA is a scientific document. Ozone causes the same adverse health effects regardless of the source of the ozone: natural or manmade; domestic or international. As the National Research Council noted in their 2008 report, this "policy relevant background," or PRB is not necessary for understanding the health effects of ozone:

> "Defining a PRB is unnecessary for establishing a level above which ozone is harmful to human health or for estimating changes due to a specific regulatory action, nor is it needed for quantifying human health responses to short-term ozone levels or monetizing risk changes in response to ozone changes." (National Research Council, 2008, p. 27).

The ISA needs to identify natural background levels and concentrations due to manmade air pollution. The "policy relevant" discussion can take place in the integrated policy assessment document.

Chapter 6 and 7: Integrated Health effects of Short- and Long-Term Ozone Exposure

We find the figures in these chapters that group studies topically and graphically present the results to be very useful (for example, Table 6-6, Figure 6-6, and Table 6-7, on lung function). The accompanying tables which provide key information about each study including the averaging time, concentration level, and number of subjects, etc. are also very accessible and informative.

Chapter 8: Populations Potentially at Increased Risk for Ozone-Related Health Effects

We find the discussions in this chapter to be much weaker and less well integrated than in the prior chapters of the ISA. For instance, in the discussion of asthma, the conclusions of a number of recent epidemiological studies are reeled off, but no information is provided on the ozone concentration levels in these studies or other pertinent details. The studies are not critically reviewed, and they are barely placed in context with the studies in the 2006 ISA which led EPA to make a strong finding of asthmatics as a population at increased risk for ozone related health effects.

For estimates of the number of people with lung disease, we refer you to the recent statistical reports of the American Lung Association on Trends in Asthma, COPD, and other diseases available at: http://www.lungusa.org/finding-cures/our-research/epidemiology-and-statistics-rpts.html

Chapter 8 needs greater discussion of health impacts of children. As has been discussed in past ISAs, numerous factors place children at increased risk from air pollution. These include a higher breathing rate, a greater activity level, increased time spent outdoors, an immature immune system, and a developing respiratory tract, for example, as described in the statements issued in 2004 and upheld in 2010 by the American Academy of Pediatrics. (American Academy of Pediatrics, 2004).

Newborns are another population at elevated risk from ozone exposure. Triche et al. (2006) examined respiratory effects of ozone in infants of asthmatic mothers. The authors found for every interquartile range (IQR) increase in 24-h average ozone (mean concentration 35.2 ppb), infants of asthmatic mothers had a greater likelihood of wheeze and difficulty breathing compared to infants whose mother did not have asthma. Dales et al. (2006) tested the association between daily neonatal respiratory hospitalizations and ambient ozone concentrations in 11 large Canadian cities (mean daily concentration ranged by city from 16.4 to 23.1 ppb). The authors concluded current ozone levels are responsible for a significant proportion of respiratory hospitalizations in neonates.

The findings of Chapter 8 have important Implications for Risk and Exposure Assessment (REA). The ISA identifies the elderly as a population at increased risk of hospital admissions from ozone exposure. A number of studies contribute to this finding, especially community health studies. In the United States, where public health records are most accessible for people on Medicare, the majority of these studies consider populations of age 65 and above.

EPA's draft methodology for the risk and exposure assessment indicated that it would assess the health risks to senior citizens aged 70 years old and above. This seems to be an arbitrary cutoff. For consistency with the epidemiological

studies from which the risk functions are derived, we recommend that senior citizens be defined as those aged 65 or above.

We also recommend that the REA consider ways to include young children in its assessment, whether qualitatively or quantitatively.

Chapter 10: The Role of Tropospheric Ozone in Climate Change and UV-B Effects

This chapter should discuss the impact of climate change and temperature increases on ozone concentrations. See for example Ostro et al (2011) included in the attachment.

Attachment
Comments of the American Lung Association

Selected Recent 2011 References (Including *In Press*) Not Included in EPA's 2nd Draft ISA for Ozone

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