

**Testimony by Allen S. Lefohn, Ph.D.**  
**to**  
**The House Committee on Science, Space, and Technology**

**March 17, 2015**

My name is Allen Lefohn. I have a Ph.D. from UC Berkeley. I have performed research for environmental organizations, federal and tribal governments, the U.S. Congress, the White House, the United Nations, and industrial clients. I have published over 125 peer-reviewed publications and served as an Executive Editor of *Atmospheric Environment*.

Today, I am speaking on my own behalf.

Background ozone plays an important role in affecting the selection of the level of the human health ozone standard.

In my testimony I will discuss:

- Current levels of background ozone make up a substantial portion of the observed ozone across the U.S.
- As emissions are reduced, EPA's estimated cumulative mortality and morbidity health risks will be heavily influenced by background ozone.
- EPA's margin of safety is influenced by background ozone.

**Why is background important in the standard-setting process?**

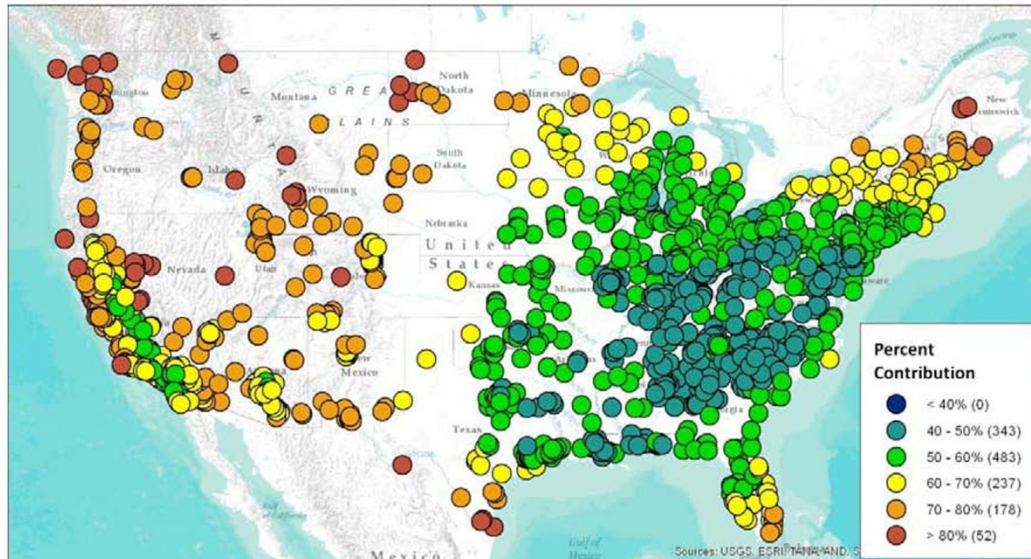
Background ozone is continually contributing to observed concentrations that influence risk estimates across the U.S. Background also contributes to exceedances of the standard and attainability.

## **What happens to ozone concentrations when emissions are reduced to attain the ozone standard?**

Efforts to control ozone will not only reduce peak ozone concentrations, but will cause the low-level concentrations to shift upward. The result is that mid range values (i.e., 25 – 55 ppb) will dominate the distribution of concentrations. EPA's mortality and morbidity risk estimates are dominated by mid-range concentrations range (EPA, 2014b, c). **Background makes up a large percentage of these mid-range values (Lefohn et al., 2014).**

## **What is EPA's conclusion about the relative importance of background ozone?**

EPA's and our findings (Lefohn et al., 2014) agree that background ozone makes up a relatively large percentage (e.g., 70 to greater than 80%) of the observed ozone within the intermountain western U.S. and along the northern and southern U.S. border. The orange and red circles in Slide 3 illustrate where the large percentages occur. For many low-elevation sites across the U.S., the contribution of background ranges from 50% to greater than 80% as illustrated by the green-, yellow-, orange- and red-colored circles (EPA, 2014a).



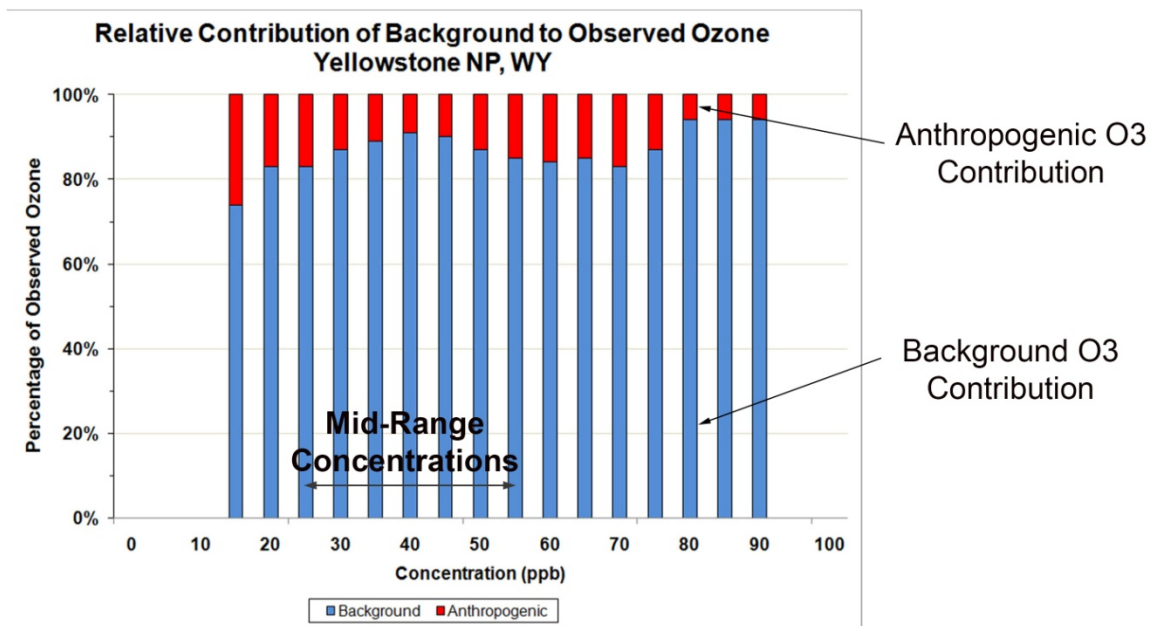
**Slide 3. Map of site-specific ratios of apportionment-based U.S. background to seasonal mean ozone (April-October) based on 2007 CAMx source apportionment modeling. (Source: page 2-22 of EPA's Policy Assessment Document (EPA, 2014a)).**

**What is EPA's opinion on the role that background plays in attaining alternative ozone standards across the U.S.?**

EPA (Federal Register, 2014 page 75383) agrees that there is no question that as the levels of potential alternative standards are lowered, background will represent increasingly larger percentages of total ozone and may subsequently complicate efforts to attain these potential standards.

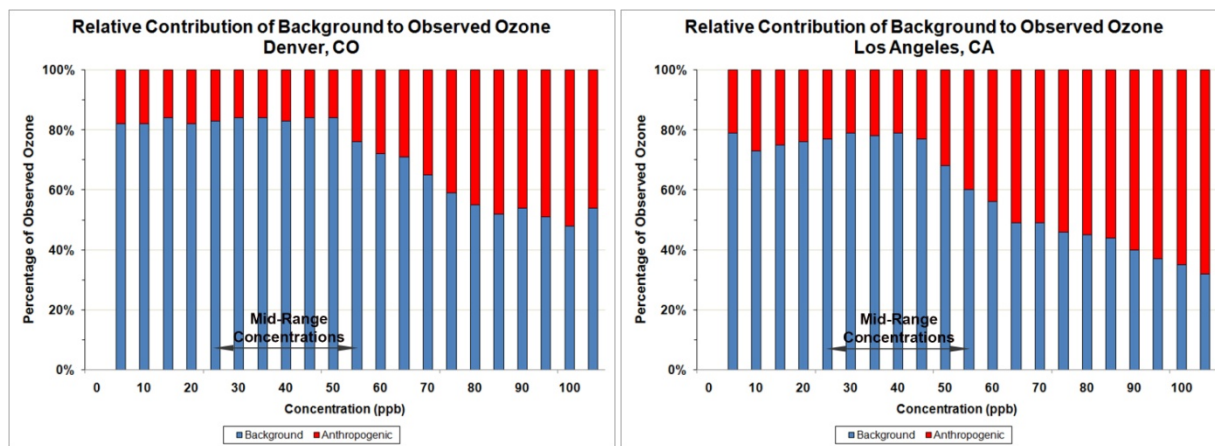
**How much does background contribute currently within specific concentration ranges?**

Yellowstone National Park in Wyoming is dominated by background ozone throughout the year with minor anthropogenic contributions (Lefohn et al., 2014). In Slide 4, the relative comparison of background (noted by blue) to anthropogenic (noted by red) within each concentration level shows that background contributes greater than 80%, including the mid-range (20-25 ppb), which is an important range that influences EPA's human health risk estimates.



**Slide 4. Average relative contributions of current hourly background (blue) and anthropogenic ozone (red) for Yellowstone NP (WY). (Source: Lefohn et al., 2014).**

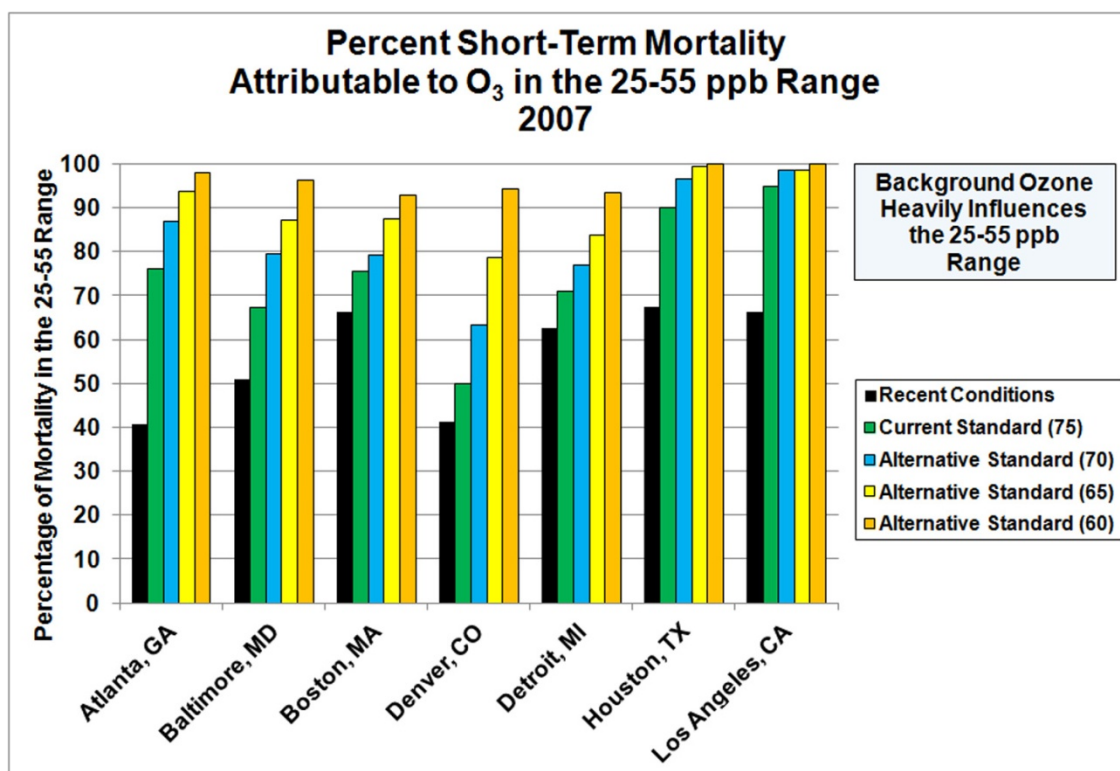
In Slide 5, for Denver, the contribution of background within the mid-range concentrations is approximately 75 to 80%. For Los Angeles, a site heavily influenced by anthropogenic emissions, background contributes 60-80% in the mid-range.



**Slide 5. Average relative contributions of current hourly background (blue) and anthropogenic ozone (red) for Denver (CO) and Los Angeles (CA). (Source: Lefohn et al., 2014).**

## How does background influence the EPA's human health risk estimates?

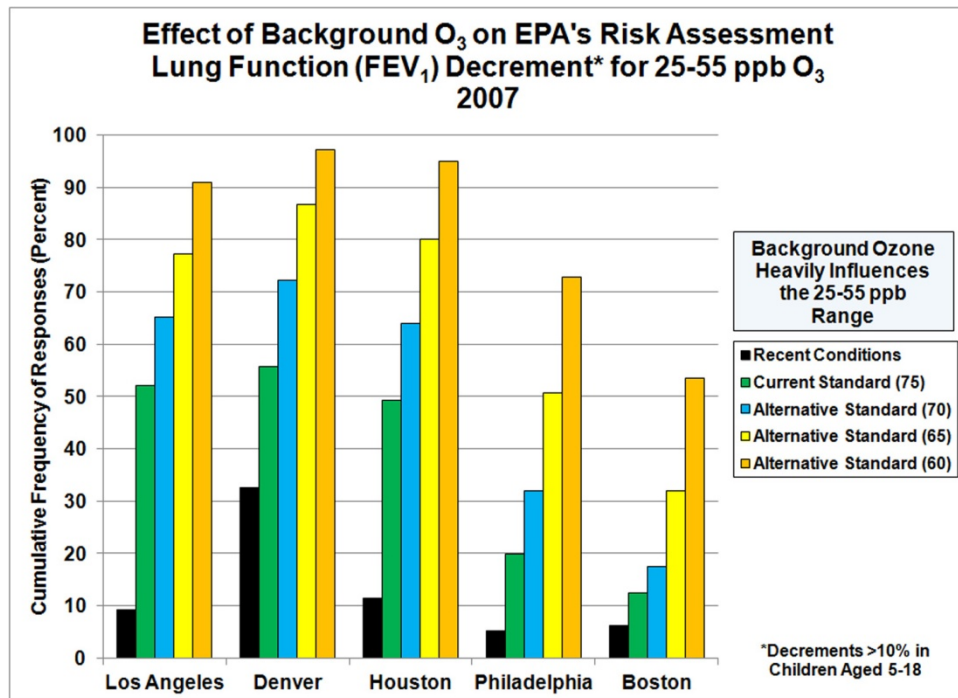
As emissions are reduced, background-influenced concentrations in the mid-range dominate the cumulative mortality health risk estimates (Slide 6). In some cases, 90% or more of the accumulated risk is associated with the mid-range for cities across the U.S. The different colors represent the different standard scenarios. Results shown here are similar for all 12 cities used in the epidemiological risk analyses.



Slide 6. Percent short-term ozone-attributable mortality in the 25-55 ppb range for various exposure conditions for 2007 for 7 of 12 cities. (Source: Data from Fig. 7-B1 on page 7-B3 of EPA, 2014c).

The Administrator has placed greater weight on controlled human exposure studies rather than on the epidemiological results (Federal Register, 2014 page 75288). As emissions are reduced, we investigated the degree to which EPA's lung function risk estimates are affected by the background-influenced concentrations in the mid-range for Los Angeles, Denver, Houston, Philadelphia, and Boston. We found that for 3 (i.e., Los Angeles, Denver, and Houston) of the 5 cities, a large percentage of

the cumulative frequency of responses is affected by background-influenced mid-range concentrations (Slide 7).



**Slide 7. The percentage of the cumulative frequency of responses in children aged 5-18 associated with the 25-55 ppb range for the Los Angeles, Denver, Houston, Philadelphia, and Boston urban study areas using EPA's APEX model.**

Background will be a regional attainment problem in the West and Intermountain West. The EPA Administrator will use the background-influenced EPA mortality/morbidity and lung-function risk estimates to provide a margin of safety when setting the ozone standard. Background cannot be ignored and plays an important role in informing the Administrator on the final selection of the level of the ozone standard.

Thank you

## References

Federal Register, 2014. U.S. Environmental Protection Agency. National Ambient Air Quality Standards for Ozone; Proposed Rule. Vol. 79, Number 242. Pages 75234-75411. December 17, 2014.

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