Questions for Non-Member Consultants on the Ozone PA from Dr. Sabine Lange

Air Quality

1) Multiple ozone chemistry analyses (e.g. Downey et al., 2015; Simon et al., 2012) have demonstrated that in an area where peak daily ozone concentrations have decreased over time, over the same period of time the lowest daily ozone concentrations have also decreased (due to the NOx disbenefit aspect of ozone chemistry). An example is provided in Figure 1. What are your thoughts about the change of annual average ozone concentrations (which tend to be the focus of epidemiology studies) with decreases in annual peak ozone concentrations?

Epidemiology

2) Is an epidemiology study with higher statistical power (sample size) innately more protected against problems of confounding, error, and bias, than an epidemiology study with lower statistical power (sample size)?

3) In section 3.3.3 (Exposure Concentrations Associated with Effects) and section 3.3.4 (Uncertainties in the Health Effects Evidence), the EPA notes that the epidemiology studies are generally assessing the associations between ambient ozone and specific health outcomes and are not investigating the details of the exposure circumstances eliciting these effects (e.g. pg 3-40[1] and pg 3-43[2]). Do you think that this statement is correct? If so, is this statement generally true of air pollution epidemiology studies, or is it peculiarly specific to ozone? If it is not specific to ozone, then should this caveat always be considered when evaluating exposure concentrations associated with these types of epidemiology studies?

Exposure-Response Modeling

4) In section 3.4.4 (Key Uncertainties) of this PA, the EPA notes that "In recognition of the lack of data for some at risk groups and the potential for such groups, such as children with asthma, to experience lung function decrements at lower exposures than healthy adults, both models generate nonzero predictions for 7-hour concentrations below the 6.6-hour concentrations investigated in the controlled human exposure studies." Is assuming a lack of threshold in an exposure-response relationship a standard method for considering potential at-risk populations that may not have been characterized in an exposure-response assessment?

5) The EPA also notes in this section that there is a lack of information about the factors that make people more susceptible to ozone-related effects, and that the risk assessment could therefore be underestimating the risk. However, the exposure-response model used to estimate the risk of

[1] "We have also considered what may be indicated by the epidemiologic studies regarding exposure concentrations associated with health effects, and particularly by such concentrations that might occur in locations when the current standard is met. In so doing, however, we recognize that these studies are generally focused on investigating the existence of a relationship between O3 occurring in ambient air and specific health outcomes, and not on detailing the specific exposure circumstances eliciting such effects."

[2] "As associations reported in the epidemiologic analyses are associated with air quality concentration metrics as surrogates for the actual pattern of exposures experienced by study population individuals over the period of a particular study, the studies are limited in what they can convey regarding the specific patterns of exposure circumstances (e.g., magnitude of concentrations over specific duration and frequency) that might be eliciting reported health outcomes."

lung function decrements uses those people in the health population with a greater response to ozone than the mean response (i.e. that fraction of the people in controlled human exposure studies who had FEV1 responses >10%, 15%, or 20%). Does this method already include consideration for more susceptible people in the population?

References

Downey, N., Emery, C., Jung, J., Sakulyanontvittaya, T., Hebert, L., Blewitt, D., Yarwood, G., 2015. Emission reductions and urban ozone responses under more stringent US standards. Atmos. Environ. 101, 209–216. https://doi.org/10.1016/j.atmosenv.2014.11.018

Simon, H., Baker, K., Phillips, S., 2012. Compilation and interpretation of photochemical model performance statistics published between 2006 and 2012. Atmos. Environ. 61, 124–139.

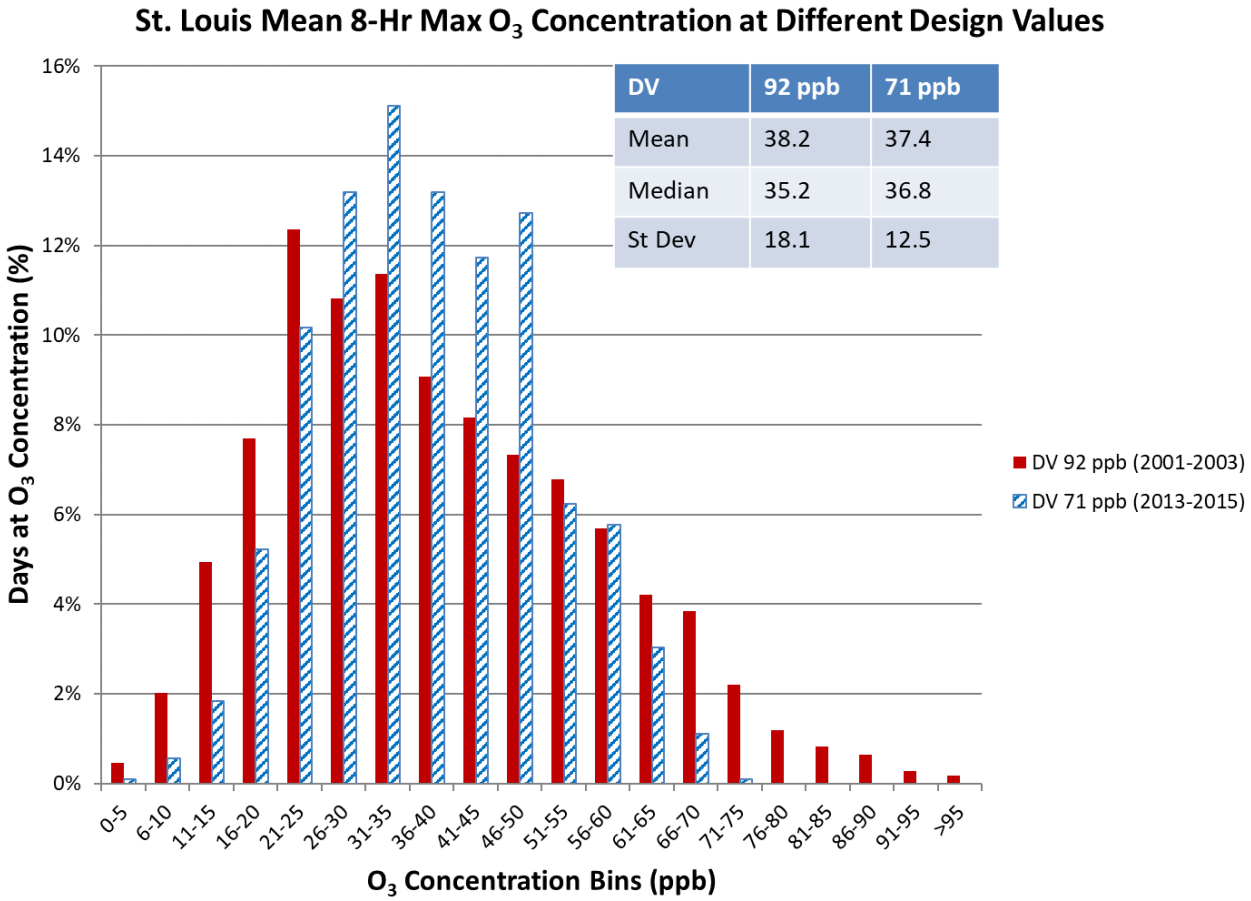

Figure 1. Distribution of Daily 8-Hr maximum ozone concentrations in St. Louis (averaged over all monitors in the city) for the 3-year period of 2001-2003 (red bars) or 2013-2015 (hatched blue bars); DV – design value.