Oral Comments from Rashid Shaikh to CASAC
December 4, 2019

Good Morning. My Name is Rashid Shaikh and on behalf of the Health Effects Institute, I am pleased to make these comments on the new and comprehensive draft Integrated Science Assessment for ozone. HEI has funded and published a many studies on ozone and its health effects, and we were pleased to see that several of these have provided useful information for the latest draft ozone ISA.

We have reviewed the health effects parts of the draft ISA, which in general is comprehensive and carefully prepared. We have submitted more detailed comments for the record, but this morning let me share some perspectives on certain key health determinations summarized in the ISA. We broadly agree with their conclusions but would like to make these remarks.

1. ***Evidence for short term respiratory effects from chamber studies***: The ISA summarizes the literature on effects of short-term ozone exposure on pulmonary function, which have played a central role in establishment of the ozone standard. The HEI-supported MOSES study has provided useful information in this area.

   In the *Multicenter Ozone Study in oldEr Subjects* 87 healthy subjects, average age 60, were exposed in chambers to three levels of ozone, namely clean air control, and 70 and 120 ppb of ozone. Ozone exposure caused concentration-related reductions in lung function and also produced airway inflammation and injury. The MOSES study stands out as having exposed the largest number of subjects under well-characterized conditions, and to some of the lowest ozone concentrations. And, these observations are all the more noteworthy because healthy older individuals are less responsive to ozone-induced lung function effects than are young individuals.

2. ***Lack of Evidence for Cardiovascular Effects after Short-term Ozone Exposure.*** On this important question, the ISA lowers the determination to "suggestive of a causal relationship" from the previous "Likely to be a causal relationship." Again, we are pleased to see that the MOSES study has proved useful for this endpoint as well.

   The primary motivation for the MOSES study was to evaluate whether short-term exposure among older, healthy individuals to low levels of ozone induces acute cardiovascular responses. Using a randomized, double blind, cross-over design, this study collected information on a comprehensive array of cardiovascular endpoints and probed a variety of potential pathophysiological pathways. It found that a 3-hour ozone exposure at 70 or 120 ppb did <u>not</u> lead to statistically significant changes in cardiovascular endpoints in this healthy group of 87 older participants engaged in moderate exercise.

   <u>Please note that detailed data from the MOSES study are available from the Harvard Data-verse website to anyone who wishes to obtain them.</u>

3. ***Exposure to Ozone and Mortality***: The results of epidemiologic studies of exposure to ozone and all-cause mortality have not all been consistent and the ISA concludes that the overall evidence is "suggestive of, but not sufficient to infer, a causal relationship."

   One of the considerations in this context is whether there is evidence for robust associations at levels of exposure below the current NAAQS. The HEI program Health Effects at Low Levels of Air Pollution is sponsoring studies that are looking at the effects of low ambient levels of ozone, in addition to those of particulate matter which was discussed yesterday.

   Last week, after a rigorous peer-review of the results of the first two years of

research, HEI published the its report, including a commentary which was prepared by a specially appointed review panel (Research Report 200).

Briefly, Francesca Dominici and her colleagues have analyzed data from 61 million Medicare enrollees, between the years 2000 and 2012, using exposure estimates based on hybrid models with a resolution of 1 km^2 which included populations living in less well monitored areas. The initial results of their two pollutant analyses – for both long- and short-term exposures – suggest an association between ozone exposure and all-cause mortality – including at levels below the current ozone NAAQS.

We believe that the evidence for an association between ozone exposure and an increase in mortality is getting stronger. The additional work HEI is supporting would help shed light on the remaining uncertainties as well as clarify the nature of such relationship.

Thank you again for the opportunity to provide these comments. We would be pleased to provide any additional assistance to EPA and CASAC.