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ATS Comments to CASAC on Ozone NAAQS Reconsideration (May 31, 2022)

As chair and vice chair of the ATS Environmental Health Policy Committee, we appreciate the opportunity to submit comments to the EPA Clean Air Scientific Advisory Committee regarding the reconsideration of the ozone NAAQS. We hope our comments will provide useful information for the experts on CASAC to consider as they develop their recommendation to the Administrator regarding the ozone NAAQS.

We appreciate the CASAC chair's decision to pause in reviewing the EPA staff ozone policy assessment and instead focus the current discussion on key decisions made during the previous consideration of the ozone NAAQS. The ATS believes there were several process concerns and ill-considered decisions reached by the previous CASAC panel that warrant discussion.

Process Concerns

As we commented at the time, the ATS had significant concerns with the process and pace of the previous ozone NAAQS consideration. The combination of accelerated review and changes to review process resulted in a CASAC outcome that lacked the expertise, careful consideration and competence provided by previous CASAC review efforts. We will not reiterate all of our concerns but do want to note a particular concern that bares on the current CASAC reconsideration, and -the CASAC Advisory - and Consultant Process.

CASAC Advisory Process

As we noted in the ATS 2019 comments to CASAC, the ATS was very critical of the Trump Administration's decision to dismiss the CASAC advisory committees. Review of the evidence for any single pollutant involves a wide range of scientific expertise that is challenging to find in a seven-person panel. By its own admission, the current CASAC has recognized this limitation and has sought additional outside expertise. The ATS remains concerned that the EPA's previous decision to eliminate the CASAC advisory committee undermined the quality of the previous CASAC ozone review.

Flawed Consultant Process

To address the expertise gap, EPA created an expert consultant process to attempt to replace the expertise lost from

the dismissed CASAC advisory committee. The EPA's convened consultant panel did not play a useful role in providing expert input to the statutory CASAC panel. For example, in written questions to the consultant experts one CASAC member asked the following question:

"Please comment on the strengths and weaknesses of the epidemiology literature with regard to CV effects of short-term ozone exposure. Are there key studies that are missing? Are the remaining weaknesses, along with the other new evidence, sufficient to justify the change in causality determination?"

The written responses from consultant experts to this question were concerning. Of the eight consultant experts, four explicitly stated they did not have expertise to respond to the question and one consultant expert did not acknowledge or respond to the question at all. Of the three who did respond, one consultant supported the downgrade of the ozone mortality causality assessment by citing four of her own statistical methodology papers - none of which were primary research papers of O_3 exposure and mortality. One consultant supported the downgrade based on issues of confounding, even though the ISA did not cite confounding as the reason to downgrade the association, and another consultant had the comment of, "I see mortality causality as binary, ozone can be deadly or not." These responses, we believe, are insufficient.

Changing the causality determination for the mortality effects of ozone, as was done in the previous ISA, is not an inconsequential matter. It is one of the most important, and likely controversial, findings made in the ozone ISA document. That half of the consultant experts admitted insufficient expertise to respond to the question and remaining consultants together provided insufficient answers to such a central question is a prime example of deficiency of the current CASAC process.

Regarding the ISA document developed during the Trump Administration, the ATS makes the following recommendations:

(1) Revise the causality determination for the association between O_3 and all-cause mortality to "likely causal," consistent with the latest scientific evidence and the conclusion of the 2013 ISA.

The ATS disagrees with the Trump Administration ISA's determination on all-cause mortality. Since the last ISA, even more evidence has accumulated that strengthens that causality determination, even at exposure levels below the current standard of 70 ppb. Notably, a large time series analyses from a national study of U.S. Medicare recipients (4), as well as two new international studies (5,6) found significant and positive associations between short-term ozone levels and all-cause mortality, down to very low levels of exposure within the current standard of 70 ppb. Multiple other well-designed studies, published since the last ISA, have similarly found associations between short-term exposure to O3 and mortality (7–11). Evidence on long-term exposure to O_3 and mortality has also accumulated since the last ISA, even after controlling for possible confounding from co-pollutants (12,13). The EPA's decision to downgrade the causality determination for O_3 and mortality is not justified in the document, nor supported by the available scientific evidence.

(2) Revise the causality determination for the association between O_3 and cardiovascular effects to "likely causal," consistent with the latest scientific evidence and the conclusion of the 2013 ISA.

We do not agree with the Trump Administration ISA conclusion that short-term or long-term exposure to ozone should be deemed "suggestive of, but not sufficient to infer, a causal relationship" for cardiovascular effects. Part of the cited rationale for this downgrade was the MOSES controlled exposure study, which exposed older adults to O_3 for three hours and found no effects on autonomic function, repolarization, ST segment change, arrhythmia, or vascular function (14). However, as noted by the authors, three hours is a short time period of exposure and all study participants were free of cardiovascular disease. Therefore, this study does not 1) mimic real-world exposures to O_3 in patients with cardiovascular risk factors and 2) the duration studied was insufficient to affect the cardiovascular endpoints examined.

There is compelling new evidence that has accumulated since the 2013 ISA that strengthens the conclusion that higher daily exposures to O_3 are associated with cardiovascular effects. In particular, a number of well-designed studies have linked short-term O_3 with higher risk of hospitalization for cardiovascular disease (15,16), myocardial infarction (17,18), and stroke (19–22).

(3) Acknowledge the serious and often irreversible effects of O_3 among children (especially children who follow U.S. health guidelines to exercise outdoors), including worse lung function, risk of asthma exacerbation and higher risk of asthma development, as noted in this ISA.

We agree with the assessment in this ISA that O_3 is a serious health hazard to children: "Overall, recent evidence expands upon evidence available in the 2013 Ozone ISA and is adequate to conclude that children are at greater risk of ozone-related health effects based on the substantial and consistent evidence within epidemiologic studies and the coherence with animal toxicological studies." (IS.4.4.4.1, page IS-62).

For children, ozone is a critical issue because adverse health effects may have long-term impacts given their growing respiratory systems and relative longevity compared to adults. Children are exposed to outdoor air during transportation to and from school, and during outdoor play. The National Kids Survey suggests that U.S. children spend about two hours outdoors on weekdays and four hours on weekends, totaling 18 hours per week minimum. Multiple public health organizations in the U.S., including the American Academy of Pediatrics, are vigorously promoting increased outdoor time for children and adolescents through public campaigns as well as formally in school and daycare guidelines and programming[33–35]. The guidelines promoted by the U.S. through the Department of Health and Human Services[36] and the American Academy of Pediatrics[33,34] advocate for at least one hour per day of vigorous outdoor activity (minimum seven hours per week plus less vigorous play time) as a part of combating the obesity epidemic. Children who follow these guidelines and are exercising vigorously outdoors will be exposed to an increased effective dose of O_3[37].

The ISA notes that "recent studies provide consistent evidence of an association between O_3 and hospital admissions for asthma" (ISA p 3-40). In particular, the ISA notes that multiple recent studies have shown that **ozone-asthma**

admissions associations were strongest among children (age <18) (p 3-40)[38–42]. Asthma is the most common chronic disease in children, causing significant morbidity as well as driving social and societal costs through health care, missed school and parental work. The CDC 2017 data reported that the prevalence of asthma in US children <18 years in 2017 was 7.9 percent, with 51.6 percent reporting at least one exacerbation in 2017[43]. Short-term increases in ambient ozone are linked to increased pediatric emergency department visits and hospitalizations for asthma, with a 3-8 percent increase in risk per 13 ppb of ozone, mainly for 1-3 days after higher ozone levels[41].

In addition, studies have linked long-term ozone exposure to increased incidence and prevalence of asthma. In the Children's Health Study from southern California, researchers reported children playing three or more sports in high-ozone communities have a 3.3-fold increased relative risk of developing asthma compared to children playing no sports but found no effect of sports in areas of low ozone concentrations. A recent analysis of the Children's Health Study published in 2019 examined the improvement in O_3 levels over time and found that decreases in O_3 levels were associated with decreases in asthma incidence.[44] We agree with the conclusion in the ISA that "**recent studies provide support for an association between long-term ozone exposure and the development of asthma in children**." (ISA p 3-91).

The scientific literature on O_3 exposure and lung function among children with and without asthma is also consistent with the toxicologic evidence of harmful inflammatory effects of O_3 on the airways. Higher long-term O_3 exposure has been linked to worse lung function among children with asthma[45] and among healthy children without asthma[46]. It has been shown that lower lung function in childhood predicts worse lung function, including irreversible obstructive lung disease, in adulthood[47,48].

Pediatric lung health translates into lifelong lung health, and therefore the American Thoracic Society places special emphasis on optimizing the respiratory health of children. Our children must be protected by controlling ozone pollution so that they can exercise freely outdoors and grow up to be healthy, active adults who are free of respiratory and cardiovascular disease.

(4) Address concerns around the Biden Administration Ozone Policy Assessment Form. The ATS has strong concerns with the Biden Administration Ozone Policy Assessment that recommends retaining the current NAAQS standard of 70 ppb using the form of the fourth highest day averaged over three years. The current form of the ozone standard was developed in order to minimize the number of days with high ozone concentrations while also providing stability in making attainment determinations so that attainment was not based on a single unusual ozone episode. While the 8-hour max concentration is still the best representation of adverse health effects (as compared to the 1-hour max or 24-hour average) the use of the fourth highest day needs more careful consideration.

Use of the fourth highest day averaged over three years falls short in a number of important ways. The most important being the failure to account for the adverse health effects of ozone exposure that occur most consistently across multiple days. An improved form based on the best available scientific evidence that accounts for these consistently demonstrated adverse

effects would look more like the four-day average of ozone concentrations or alternatively a form that is based on not allowing multiple consecutive days to be above a defined limit value.

The current form of the ozone standard also fails to address in any meaningful way the unique exposure profiles that occur in communities that experience elevated wintertime ozone which is characterized by sporadic ozone episodes that do not occur on an annual basis. It is not uncommon to have the three-year average for areas in non-attainment due to wintertime ozone to have a three-year average above 70 ppb that results from one year's fourth highest value above 110 ppb with the other two years having a fourth highest value near 50 ppb. While implementation issues have not been a part of the decision-making process surrounding the NAAQS review in the past, it is relevant to note that in the scenario described, lowering the wintertime ozone concentrations during the lower two years could bring a community into attainment even though it would completely miss the days on which real health risks are occurring. A different form of the standard (likely based on a level that is associated with adverse effects even in healthy individuals) that is not averaged over multiple years and based on a small number of days is needed to address the distinct, yet commonly occurring, exposure profile and associated health risks that occur in communities that experience sporadic elevated wintertime ozone concentrations.

ATS is most directly concerned with decision-making regarding the primary standard, but the secondary standard also faces similar challenges with the current form not representing the best way to measure and account for adverse welfare effects ozone, particularly for adverse ecological and agricultural effects which would be better served through use of a seasonal average form of the standard. This is mentioned here to further shine a light on the need to more carefully consider more than just the level of the standard. But we would also note that consideration of a seasonal standard would potentially be better equipped to address the adverse health considerations of long-term ozone exposures that may be very different in two communities that share the same design value based on the fourth highest day.

(5) Reduce the heavy reliance on controlled human studies over epidemiological or toxicological studies.

We are also concerned that the Policy Assessment relies too heavily on results of controlled human exposure studies while not making full use of information that has been derived over many years through other methodological approaches including multiple different study design types in both epidemiology and toxicology studies.

For example, information regarding the adverse health risks of short-term exposures to ambient ozone in the epidemiological literature indicate that the adverse effects are less pronounced on the same day of exposure, which is more typical for PM, and instead demonstrate the clearest and strongest associations that occur over multiple days. Accounting for exposures across multiple days, also known as looking at the lag effect of pollutant exposures, regularly demonstrates that lag structures of exposure around one to three days before the adverse event (or in some cases from lag days zero to four) are most predictive of adverse health risks.

This can be interpreted in two different ways: today's ozone exposures will impact health risks over the next several days; or alternatively, today's health risk is impacted by exposures that have occurred over the last several days. Either way, it is important to account not only for elevated exposures on individual days but also to take into account the unique, ozone-specific lag effects when reviewing the adequacy of the current ozone standard, particularly in the risk and exposure analysis in the Policy Assessment. For example, a 4-day average of 8-hour max

ozone concentrations above 60 ppb, but each day's concentration remaining below the current standard of 70 ppb, is expected to result in greater health risks as compared to a stretch of days with a lower4-day average, even if there are one or more days during that time window above 70 ppb.

(6) Acknowledge that the current ozone NAAQS does not provide an adequate margin of safety for vulnerable populations

As CASAC itself noted in 2014, the current standard of 70 ppb is likely insufficient to offer an adequate margin of safety for vulnerable populations stating, "*Although a level of 70 ppb is more protective of public health than the current standard, it may not meet the statutory requirement to protect public health with an adequate margin of safety. In this regard, the CASAC deliberated at length regarding advice on other levels that might be considered to be protective of public health with an adequate margin of safety. For example, the recommended lower bound of 60 ppb would certainly offer more public health protection than levels of 70 ppb or 65 ppb and would provide an adequate margin of safety. Thus, our policy advice is to set the level of* ***the standard lower than 70 ppb*** *within a range down to 60 ppb, taking into account your judgment regarding the desired margin of safety to protect public health*."

Link:
https://casac.epa.gov/ords/sab/f?p=113:0:15420734743523:APPLICATION_PROCESS=REPORT_DOC:::REPORT_ID:1014

Given CASAC prior recognition of the inadequate margin of safety provided to vulnerable populations by the current standard and given the growing body of evidence showing adverse health effects for children exposed to ozone at level below the current standard, we strongly urge CASAC to state the current standards is not protective of public health and recommend a more protective standard of 60 ppb.

In conclusion, The ATS strongly recommend CASAC endorse a more protective ozone NAAQS of 60 ppb.

As demonstrated amply by the available literature contained in the 2019 Trump ozone ISA, the current standard of 70 ppb is not sufficiently protective of the public health and fails to meet the legislative requirements of providing an adequate margin of safety for vulnerable populations. It has long been the position of ATS that the focus of the ozone standard should be to avoid as many days as possible above 60 ppb rather than the current focus in the Policy Assessment to target reducing days under 70 ppb, with 60 ppb and 80 ppb levels largely considered in a secondary manner in the risk and exposure assessment. This is particularly critical for the aforementioned subpopulations that experience clear adverse effects above 60 ppb.

In 2006, the ATS adopted a policy position of supporting a more protective ozone NAAQS of 60 ppb. Since 2006, the evidence showing measurable adverse health effects at levels below the current standard has grown. Also since 2006, the ATS has published a string of perspective articles that explain our rationale for supporting a more protective standard of 60 ppb, including:

- Clearing the Air (John Balmes MD, Kent Pinkerton PhD 2006)

- A Second Chance: Setting a Protective Ozone Standard (Richard Dey, et al, 2010)
- EPA's New Ozone Air Quality Standard: Why We Should Care (John Balmes MD, 2017)
- Long-Term Exposure to Ozone and Cardiopulmonary Mortality: Epidemiology Strikes Again (John Balmes MD, 2019)

For the convenience of CASAC, we have attached copies of these perspective articles with our written comments.

The ATS appreciate the opportunity to share our views with the Clean Air Scientific Advisory Committee and look forward to the panels continued deliberations.

Sincerely

Jack Harkema, PhD – Chair, ATS Environmental Health Policy Committee
Alison G. Lee, MD, MS – Vice Chair, ATS Environmental Health Policy Committee

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