

result of programs implemented to attain an 8-hour O₃ NAAQS. These commenters further suggest that EPA, in concluding that such estimates can not now be developed with sufficient credibility to serve as a basis for setting a less stringent 8-hour O₃ NAAQS, is treating scientific uncertainty differently than it did when regulating substances that deplete O₃ in the stratosphere. The EPA believes that these commenters are ignoring fundamental differences, discussed above, in the nature and relative magnitude of the temporal and spatial variability of O₃ levels in the stratosphere and at ground-level in the troposphere. The EPA remains convinced that it is entirely reasonable to use available information to make estimates of broad-scale public health impacts in the context of the stratospheric O₃ program, while concluding that such broad-scale analytic approaches necessarily obscure and assume away the localized and highly variable factors that are central to credibly estimating public health impacts in the context of programs designed to attain the O₃ NAAQS.

More specifically, EPA notes that quantitative estimates of public health impacts associated with projected changes in stratospheric O₃ are based primarily on epidemiological studies designed to evaluate impacts of long-term UV-B radiation exposures over broad geographic regions (defined in terms of latitude bands) within which stratospheric O₃ levels exhibit relatively little variability. These types of epidemiological studies are not designed to discern impacts associated with much smaller, and much more highly variable, localized changes in ground-level O₃ that will likely result from programs implemented to attain an 8-hour O₃ NAAQS—such local variations are simply averaged out in these studies that compare average UV-B radiation penetration over broad geographic regions with regional average incidence rates of UV-B radiation-related effects. The EPA believes that in choosing not to apply the same type of approach used to assess stratospheric O₃ impacts to its assessment of NAAQS-related changes in ground-level O₃, that it is treating scientific uncertainty in an appropriate and consistent manner. To do otherwise, as some commenters urge, would be to disregard the uncertainties associated with localized and highly variable changes in UV-B radiation exposure patterns that are central to an assessment of NAAQS-related changes, but that are not relevant to the long-term, regional assessment of

stratospheric O₃ impacts. Therefore, EPA rejects the notion advanced by these commenters that the simple application of a stratospheric O₃-type assessment would produce credible quantitative estimates of NAAQS-related impacts for the purpose of weighing against the adverse respiratory-related impacts of ground-level O₃, for which EPA has applied state-of-the-art assessments that appropriately take into account the relevant, highly variable patterns of changes in exposures of concern to ground-level O₃ (as discussed more fully in the following section).

b. Factors Related to Area-Specific Assessment

An enumeration of factors that would be important in assessing the potential UV-B radiation-related consequences of a more stringent O₃ NAAQS in any geographical area serves to illustrate the complexities discussed above. Such UV-B radiation-related factors are analogous, but not equivalent to the factors that were important in the respiratory effects exposure and risk assessments discussed above in section II.A.2. These UV-B radiation-related factors include: the temporal and spatial patterns of ground-level O₃ concentrations throughout a geographic area where reductions are likely to occur, and the variations in O₃ concentrations within a comprehensive set of “microenvironments” relevant to UV-B radiation exposures (which are generally different from the microenvironments relevant to O₃ inhalation exposures); the associated temporal and spatial patterns of UV-B radiation flux in such microenvironments; the temporal and spatial patterns of movement of people throughout the UV-B radiation-related microenvironments within the geographic area; and the effects of variable behaviors (e.g., the use of sunscreen, hats, sunglasses) within the range of activities that people regularly engage in, on the effective dose of UV-B radiation that reaches target organs such as the skin.

While analogous to the respiratory-related factors, there are a number of important differences between these sets of factors that arise, for example, due to: (1) The indirect nature of the relationship between changes in ground-level O₃ and UV-B radiation-related health effects (in contrast to the direct relationship between ground-level O₃ and inhalation-related health effects); (2) the long-term nature of the relevant exposures that are associated with UV-B radiation’s chronic health effects (in contrast to the short-term

exposures associated with acute inhalation effects); (3) the different types of parameters that are relevant to assessing dermal exposures (in contrast to those that are important in assessing inhalation exposures); and (4) the importance of skin type in characterizing the sensitive populations (in contrast to characterizing sensitive populations in terms of activity levels and respiratory health status). Further, as was done in EPA’s assessment of respiratory effects, it is important to characterize the exposure-related factors specifically to address the relevant at-risk sensitive population groups. As noted in section II.B.1, the sensitivity to UV-B radiation effects varies among U.S. demographic groups, such that it would be important to incorporate census data on relevant characteristics (e.g., age at time of exposure, skin pigmentation) that affect an individual’s susceptibility.

Aspects of each of these factors (including areas where current information or modeling tools are insufficient to address these factors at this time), significant comments received on these factors, and EPA’s general responses are discussed briefly below.

(i) *Estimation of area-specific and microenvironment changes in ground-level O₃*. Implementation of a more stringent O₃ standard would, over time, further reduce O₃ concentrations across many areas within the U.S., but would affect various areas in different ways. Depending on the strategies adopted, in some locations peak concentrations would be reduced significantly during the O₃ season, while the lower concentrations that occur on far more numerous days could increase. In such areas, the long-term cumulative effect could be little net change, or even a small increase in cumulative shielding. In other areas, the entire distribution of O₃ could be reduced. The assessment of the acute respiratory health effects of O₃ appropriately focused on the higher portion of this distribution, using a simple roll-back approach discussed above (section II.A.2.a) to simulate changes in air quality patterns during the O₃ season based on available air quality monitoring data. For assessment of chronic effects such as those associated with UV-B radiation, however, where long-term cumulative exposures are of central importance, the mid to lower portion of the distribution would also be important. Also the distribution across the entire year, for which O₃ monitoring data is not generally available in many parts of the country, could potentially be important. The mid to lower portion of the