How good are the air quality standards?

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Abstract:
Air quality standards are set to protect public health and their values are typically based on health effect studies, without any statistical considerations. In order to judge if a standard is met measurements of ambient air quality are collected at monitoring stations, and these values are then used to decide whether or not the standard has been violated. This approach has some difficulties; people do not live at, or sometimes even close, to the monitoring sites, the measured values are not the actual values due to measurement error and the ambient field is only part of the exposure of any individual. In this work we address the first two of these points and try to illuminate the effect of taking the variability of the ambient field away from the monitoring sites into account. To do that we compute the distribution of the maximum of the ambient field conditional on a measured monitoring value at the value prescribed by the standard, where the maximum is taken over a region for which the measured value in some sense is representative. The distribution of the maximum is computed using Rice's method and relies on a generalization of upcrossings of a level in one dimension to two dimensions.

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