

Response to Invited Commentary

Bakian et al. Respond to “Assessing Air Pollution and Suicide Risk”

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We appreciate Guo and Barnett’s thoughtful and informative commentary (1) on our article (2). Their commentary raises several considerations for the future design of air pollution–suicide studies that merit exploration.

In our study (2), we followed an approach that was closely modeled after Kim et al.’s work in South Korea (3) in order to allow for direct comparisons of findings between locations with distinct cultural and geographical characteristics. This included the intentional omission of precipitation in our models in order to replicate Kim et al.’s (3) selection of meteorological variables. The consistency between these 2 studies’ results now supports further investigation of this phenomenon with subsequent adjustments in study design, including the suggestions proposed by Guo and Barnett (1). Specifically, the use of improved methods for modeling urban air pollution concentrations in our future analyses will continue to advance our understanding of the relationship between air pollutant exposures and suicide. Land-use regression models, line-dispersion models, and proximity-based assessments are currently under development through support from the University of Utah’s Program for Air Quality, Health, and Society. We are also fortunate to have a long-standing collaboration with the Utah Department of Health’s Office of the Medical Examiner and the Utah Population Database (4). Collectively these sources provide statewide data on all suicides, detailed individual-level information (e.g., co-occurring medical conditions, familial risk of suicide, and exact suicide location), and access to DNA samples from over 3,500 Utah suicide decedents, allowing future exploration of specific genetic susceptibilities to air pollution exposure.

Guo and Barnett stress the importance of exploring the association between air pollution and suicide attempts in addition to suicide completion (1). As a group, persons who complete suicide differ from those who attempt suicide with regard to sex, age, and psychosocial risk factors (5–7), suggesting that these 2 groups may have distinct etiologies. We agree that our study’s results cannot be generalized to persons who attempt suicide; separate studies focusing on suicide

attempts are needed to understand the relationship between air pollution and risk of attempting suicide.

The simulation analysis conducted by Guo and Barnett, in which they explored risk-estimate bias induced by the selection of stratum length and case-control matching criteria (1), is a valuable contribution to the literature on case-crossover study designs. We agree that a sensitivity analysis varying stratum length would be informative; however, our use of a 28-day stratum length and a case-control matching interval of 6 days was justified for both biological and statistical reasons. Previous studies suggested a lag between air pollution exposure and suicide, potentially due to variation in the timing of the onset of adverse biological effects following air pollutant exposure (8). Figure 1 in our paper (2) shows a positive trend in percent increases in the odds of suicide per interquartile-range increases in air pollutant levels, suggesting that the lag period should be extended to include more days in order to identify the exposure window conferring the greatest risk. Inclusion of additional lag days would prevent us from changing the interval size for matching cases with controls. Statistically, although minimizing bias is an important consideration, it should not be done at the expense of efficiency, which is a greater concern in case-crossover studies given small effect sizes (9, 10). Reducing stratum length from 28 days to 21 or 14 days would limit the number of control days available to match to cases, thereby decreasing statistical efficiency and the ability to detect associations.

In conclusion, given the unique resources outlined above, we look forward to pursuing further studies on suicide risk. Guo and Barnett’s commentary provides several important considerations to incorporate into the design of these future studies.

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