Response to Invited Commentary

Messer et al. Respond to “Positivity in Practice”

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Westreich and Cole’s commentary (1) on positivity and on the 2 accompanying articles by us (2) and Cheng et al. (3) is clear, thoughtful, and helpful. We appreciate their ability to define positivity, explain its role in causal inference, and highlight procedures for diagnosis and methodological advancement. It is their distinction between deterministic and random violations of positivity that we wish to say more about.

From our perspective, violations of positivity pose a very serious threat to credible causal inference in, and advancement of, social epidemiology. Use of regression models to overcome confounding can mean that key comparisons are based on very sparse or even fully interpolated (i.e., model-dependent) data. This is especially true in multilevel “neighborhood effects” research, where social stratification so clearly clusters individuals and exposures. As Westreich and Cole explain (1), the problem boils down to a tradeoff between confounder control and empirical support for inferences: Efforts to overcome confounding undermine empirical support for comparisons. It is worth noting that while results from such sparse-cell analyses may not be wrong, heroic modeling assumptions are required to support them.

It is obvious that not having a uterus or using a 2-headed coin in randomization can yield deterministic violations of positivity. It is also obvious that any given sample from a target population can suffer a larger or smaller violation, especially given model specifications. The key difference between deterministic and random violations is the sense that random violations could be overcome by collecting more data. With a sufficient sample size, one can imagine overcoming the problem of random violations entirely. It follows that random violations of positivity are not always clear. Deterministic violations not only are linked to 2-headed coins or anatomical differences but often are the result of policy decisions, social stratification, and other social forces. For example, because children in wealthy households are not eligible for Head Start educational programs, any outcomes evaluation of Head Start must compare those children who are eligible and exposed with those who are eligible and unexposed. Data on wealthy children may not be helpful, since such data violate the positivity assumption. Further, social stratification requires that the poor do not live in wealthy neighborhoods and the wealthy do not live in poor ones. In short, social forces can be as deterministic as a 2-headed coin.

Do exceptions to socially determined exposure assignment “rules” mean that any nonpositivity is random, and thus a function of sampling? Not necessarily. Our current view is that the exceptions are qualitatively different from the overwhelming majority of subjects; in other words, the exceptions are not good counterfactual substitutes. Concretely, rich people who prefer to live in poor areas are different from most rich people. If only to make the point, exceptions to social rules are akin to the exceptions of Mother Nature when she occasionally provides a male with a uterus. Most would agree that the “exceptional” data point is interesting but not particularly helpful for effect identification, population-level inference, or policy recommendations.

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REFERENCES

