THE AUTHORS REPLY

We read the letter by Dr. Kaufman (1) with great interest, and we thank him for raising a point that is important for the motivation of one of the two measures (the interval odds ratio) that is advocated in our article (2).

Kaufman argues that the cluster-level fixed effects may be given a counterfactual interpretation. As a matter of fact, Kaufman goes further and writes as follows: “It is the causal interpretation that motivates the use of regression modeling in public health research, since this provides evidence on which to base policy decisions” (1, p. 602). While this may be true, it should be noted that the regression model does not itself ensure that the effects may be given causal interpretations. In this specific model, we find that the counterfactual interpretation of a cluster-level covariate is dubious, because it builds on assumptions that cannot be investigated and that are unlikely to hold. These two points are demonstrated in the example below. From an epidemiologic point of view, information conveyed by measures of variation provides evidence on which to base policy decisions (3).

Kaufman provides an example, with community as the clustering factor and presence of a hospital in the community as a cluster-level covariate. Kaufman concludes: “If the factual condition from some community \( j \) is that there is no hospital present, then this estimated causal effect is interpretable as the effect of the hypothetical action of putting one there” (1, p. 602). This is indeed a tempting interpretation, because it is causal rather than associational. However, it relies entirely on the assumption that the random effects would remain the same under the hypothetical experiment of manipulating the cluster-level covariate. Not only can this assumption not be investigated, it constitutes an extrapolation of the data that is generally unwarranted in epidemiologic cross-sectional studies.

To illustrate our point, we extend the example given by Kaufman to a situation where the outcome \( Y \) is an indicator of individuals having asthma. In most Western European countries, asthma is more prevalent in urban areas than in rural areas. At the same time, people living in cities are more likely to have a hospital in their community than are people in the countryside. A causal interpretation of the effect of having a hospital in the community would infer that building a hospital in a rural area increases the prevalence of asthma in the area, a conclusion that is hardly trustworthy.

A causal interpretation of a cluster-level covariate may only be inferred, if the assumption of the random effects’ remaining the same under the hypothetical experiment of manipulating the cluster-level covariate can be justified. This is usually not the case in epidemiologic studies because of confounding.

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REFERENCES


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