We thank Hernán et al. (1) for their thoughtful comments about the causal relationships among exposure, birth, and perinatal death; how selection bias can distort those relationships; and the role of composite outcomes. In our article (2), we do not claim composite outcomes to be a solution (“escape”) from the selection bias caused by conditioning on birth when analyzing the effect of pregnancy exposures on perinatal death (1). Rather, we discuss composites as an approach to analysis of competing risks. Composites and competing risks relate to the numerator events in risk expressions. As we explain in our article, the selection bias causing the crossover paradox is a problem of denominators, not numerators.

Our 3 major points are these:

1. Gestational age is not just an alternative formulation of the birth weight paradox. It is also a measure of time at risk since or during exposure. Moreover, the age of a fetus affects its size, but its size cannot affect its age.

2. Preterm birth is indeed an intermediate on the causal pathway between exposure and early neonatal death, because livebirth must precede early neonatal death, and very preterm fetuses are physiologically disadvantaged for survival outside the uterus. Preterm birth is not an intermediate for stillbirth, however, because in most cases the fetal death (stillbirth) causes the birth, not the reverse. For that reason, we disagree with the directed acyclic graph of Hernán et al., which combines livebirth and stillbirth as a single event (birth) and shows no causal arrows in either direction between birth and death, even in early gestation.

3. We make no claim that our directed acyclic graph represents a complete causal diagram—only the relationships among exposure, birth, and perinatal death. We include no unknown causes in our causal diagram, because none is required to cause selection bias, as previously claimed by Hernández-Díaz et al. (3) and by Basso and Wilcox (4). Conditioning on livebirth for analysis of early neonatal death, or on any birth for analysis of perinatal death, is sufficient to cause the selection bias and the resulting crossover paradox. According to Hernán et al. (1), their causal diagram is “simplified” because it combines stillbirth and livebirth. They say that, “Conditional on birth, these 2 are the same variable with reversed coding.” (1, p. 000) But conditioning on birth is the crux of the problem. In fact, the fetus can have 1 of 3 events occur during a given day or week. It can be stillborn or liveborn, but throughout most of gestation, most fetuses remain unborn. Those fetuses have also been exposed, and conditioning on birth (stillbirth or livebirth) removes the unborn fetuses from the denominator of all risk calculations. The crossover paradox can be explained as an analysis of the case fatality of early birth, rather than the occurrence of fatal early birth, because it is observed only when conditioned on birth, including early birth. As illustrated by our smoking–lung cancer analogy, the selection bias arises from using the wrong denominator: all livebirths or total births, rather than all exposed fetuses.