



# Addressing an Extreme Positivity Violation to Distinguish the Causal Effects of Surgery and Anesthesia via Separable Effects

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(Columbia University)

29/04/2026, 4:15 pm

Department of Statistics, Ludwigstr. 33, Seminar Room 144  
and online via Zoom ([Link](#))  
(Meeting-ID: 631 1190 7291; Password: StatsCol)

The U.S. Food and Drug Administration has cautioned that prenatal exposure to anesthetic drugs during the third trimester may have neurotoxic effects; however, there is limited clinical evidence available to substantiate this recommendation. One major scientific question of interest is whether such neurotoxic effects might be due to surgery, anesthesia, or both. Isolating the effects of these two exposures is challenging because they are observationally equivalent, thereby inducing an extreme positivity violation. To address this, we adopt the separable effects framework of Robins and Richardson (2010) to identify the effect of anesthesia (alone) by blocking effects through variables that are assumed to completely mediate the causal pathway from surgery to the outcome. We apply this approach to data from the nationwide Medicaid Analytic eXtract (MAX) from 1999 through 2013, which linked 16,778,281 deliveries to mothers enrolled in Medicaid during pregnancy. Furthermore, we assess the sensitivity of our results to violations of our key identification assumptions.

## About the Speaker:

Caleb Miles is an assistant professor in the Department of Biostatistics at the Columbia University Mailman School of Public Health. He works on developing semiparametric methods for causal inference and applying them to problems in medicine and public health. His applied work is largely in HIV/AIDS, mental health, anesthesiology, and urology, and his current methodological research interests include causal inference, its intersection with machine learning, mediation analysis, interference, and measurement error. He holds a PhD in Biostatistics from Harvard University.

## References:

Pitts, A. J., Guo, L., & Miles, C. H. (2025). Addressing an extreme positivity violation to distinguish the causal effects of surgery and anesthesia via separable effects. *arXiv preprint arXiv:2504.01171*.

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