# Statistics Seminar

Department of Mathematics and Statistics

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| **DATE:** | Thursday, November 6, 2025 |
| **TIME:** | 1:30pm – 2:30pm |
| **LOCATION:** | WH 100E (Zoom talk) |
| **SPEAKER:** | Harrison Quick, University of Minnesota |
| **TITLE:** | Reliable rates in disease mapping |


**Abstract**

When I worked at the CDC, my role was to produce county-level estimates of death rates due to heart disease and stroke stratified by demographic factors like age, race/ethnicity, and sex across the United States. At one of my first meetings, my team lead asked a seemingly simple question: Which of these estimates were “reliable” and fit to be published in our reports and which – due to limited data – should be deemed “unreliable” and be suppressed in our reports? Unbeknownst to me, that question would become a driving factor in my research for the next 10+ years. On one hand, many health organizations have criteria for reliability based on the size of the numerators (deaths) and/or denominators (population size) – while we could have simply leaned on their guidance, doing so would lead to wide swaths of the US having “unreliable” estimates. On the other hand, my training as a Bayesian spatial statistician suggested that we could use prior information (e.g., similarities between neighboring counties) to improve the precision and predictive performance of our estimates – while this would increase the reliability of the estimates, it might also run the risk of making the estimates too reliable. This talk aims to describe my strategy for striking a balance between these two mindsets. In particular, I will begin by introducing my criteria for declaring estimates of event rates as “reliable” based on the posterior distribution of the estimates. I will then demonstrate how these criteria can be incorporated into the specification of spatial Bayesian models to avoid oversmoothing when analyzing small counts for the purpose of producing age-standardized estimates of county-level death rates due to acute myocardial infarction in Pennsylvania and tract-level heart disease death rates in Philadelphia.