Unbiased treatment effects are estimable from observational studies if the selection mechanism into treatment conditions is strongly ignorable (Rosenbaum & Rubin, 1983). The strong ignorability assumption implies that all constructs that are simultaneously related to both treatment selection and the outcome are observed and measured without error, given that treatment selection and the outcome are determined by the latent constructs rather than the observed covariates. In case of a single confounder, it is well known that measurement error diminishes the covariate’s potential for removing selection bias. If the confounder’s reliability coefficient decreases by .1 units, 10% less selection bias is removed. With multiple confounding covariates, or a corresponding propensity score, the effect of measurement error on bias reduction is less clear because (i) a set of correlated covariates can partially compensate for each other’s unreliable measurement and (ii) remaining bias due to measurement error can be amplified by confounders that are highly predictive of treatment selection.

Using directed acyclic graphs (DAGs) and results from a simulations study, we discuss the implications of measurement error in covariates on identifying and estimating causal treatment effects via propensity score methods. First, we show that measurement error attenuates a covariate’s potential to remove selection bias but only if both treatment selection and the outcome are causally determined by the underlying latent construct. Second, we demonstrate that a set of interrelated covariates can partially compensate for each other’s measurement error. Third, remaining bias due to measurement error can be amplified by covariates that are highly predictive of treatment selection but weakly predictive of the outcome. Thus, measurement error has direct implications on covariate selection strategies for computing the unknown propensity score. The talk then concludes with an outlook on practical strategies for dealing with measurement error in covariates.