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## Award Abstract #0961971

**Instrumental Variable Methods for Observational Studies**NSF Org: [SES](#)  
[Division of Social and Economic Sciences](#)

Initial Amendment Date: June 1, 2010

Latest Amendment Date: June 1, 2010

Award Number: 0961971

Award Instrument: Standard Grant

Program Manager: Cheryl L. Eavey  
SES Division of Social and Economic Sciences  
SBE Directorate for Social, Behavioral & Economic Sciences

Start Date: June 1, 2010

Expires: May 31, 2013 (Estimated)

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Investigator(s): dylan small dsmall@wharton.upenn.edu (Principal Investigator)

Sponsor: University of Pennsylvania  
Research Services  
Philadelphia, PA 19104 215/898-7293

NSF Program(s): METHOD, MEASURE &amp; STATS

Field Application(s):

Program Reference Code(s): OTHR, 0000

Program Element Code(s): 1333

**ABSTRACT**

The instrumental variable (IV) method is an approach to estimating a causal relationship in the presence of unmeasured confounders. A central concern in most studies using the IV method is that the IV is not perfectly valid in the sense that it is correlated with unmeasured confounders. This project will contribute to improved methodology for using the IV method. The project will develop a new, more interpretable sensitivity analysis for IV studies that is calibrated to observed covariates. A new way of designing IV studies to make the study less sensitive to the proposed IV

being invalid (i.e., correlated with unmeasured confounders) also will be developed. The approach will involve setting up a matched comparison between a group of subjects with a high level of the IV and a group of subjects with a low level of the IV in such a way that the IV is a strong predictor of the treatment that is received in the two groups. Finally, a new IV method for studies with binary outcomes will be developed that is easier to implement and more robust than existing methods.

A main goal of many empirical studies in the social sciences is to provide evidence about the effects caused by policies or treatments. For practical and/or ethical reasons, most such studies are observational rather than randomized studies. A central difficulty for observational studies is that because treatments were not randomly assigned, the subjects receiving different treatments may not be comparable so differing outcomes after treatment may not be effects caused by the treatment. The instrumental variable (IV) method is an approach for estimating a causal relationship that can overcome unmeasured confounding. The basic idea is to use an "instrumental" variable to extract variation in the treatment that is unrelated to the unmeasured confounders, and then use this variation to estimate the causal effect of the treatment on the outcome. This project will provide ways to better assess sensitivity of results from using the IV methods to concerns that the proposed IV is related to unmeasured confounders (and thus not a valid IV), and better ways to make use of an IV when the outcome of the study is a binary variable. The project also will develop and disseminate freely available software for implementing the new methods. By offering rigorous analysis in complex setting otherwise not suited for experimentation, improved methodology for observational studies has the potential to lead to improved policies and practices of both public and private institutions.

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