



Effect Modification by Covariates: Extending the Current Causal Mediation Analysis

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Introduction

- The closed-form mediation mediation analysis approach by Valeri & VanderWeele (VV2013) estimates the natural direct effect (NDE) and natural indirect effect (NIE), conditional on covariates.
- VV 2013 includes a treatment-mediator interaction term in outcome model.
- But in some cases, there are effect modification by covariates in mediator and outcome models.

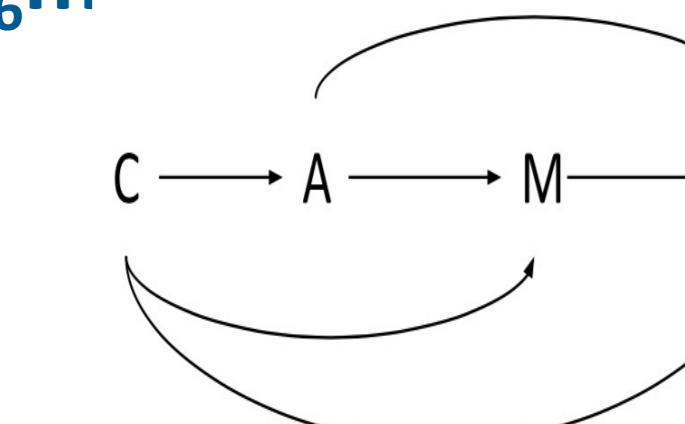
Aims

- Extend the model by VV2013, including additional interaction terms.
- Demonstrate covariate dependence under different scenarios.

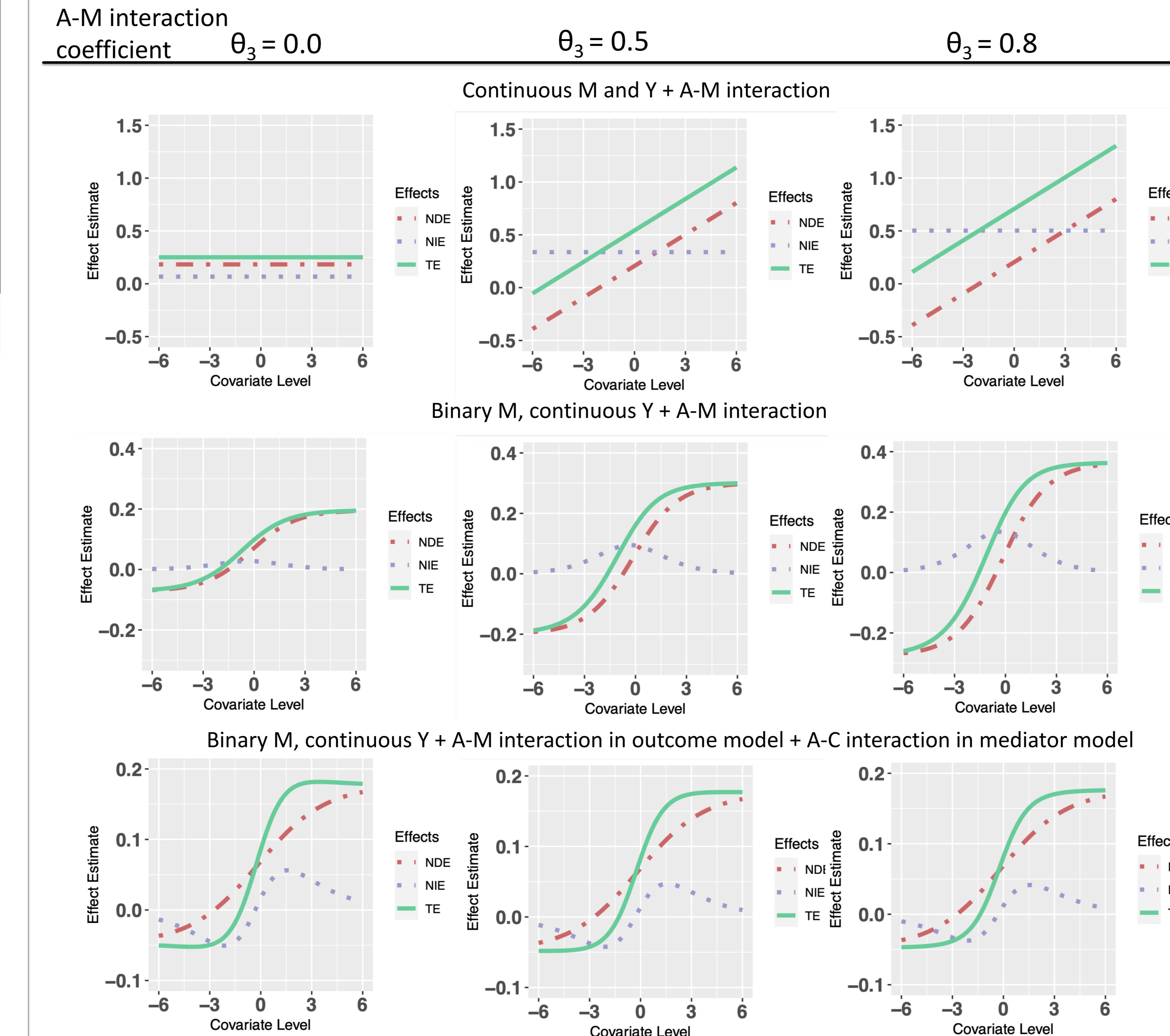
Methods

- Treatment A; Mediator M; Outcome Y; Covariates C.
- Extended mediator model:
- $g_{a,c}[E(M|A, C)] = \beta_0 + \beta_1 a + \beta_2 c + \beta_3 ac$
- Extended outcome model:
- $g_{a,m,c}[E(Y|A, M, C)] = \theta_0 + \theta_1 a + \theta_2 m + \theta_3 am + \theta_4 c + \theta_5 ac + \theta_6 m$

- **bold**: additional effect modification terms



Results



Conclusions

Covariate levels can affect the direction and the magnitude of natural effects.

Whether and how natural effects depend on covariate dependence is affected by the magnitude of A-M interaction, effect modification by C and link functions.

References & Acknowledgements

Valeri L & VanderWeele TJ. (2013). Mediation analysis allowing for exposure-mediator interactions and causal interpretation: theoretical assumptions and implementation with SAS and SPSS macros. *Psychological Methods*, 18(2), 137.

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