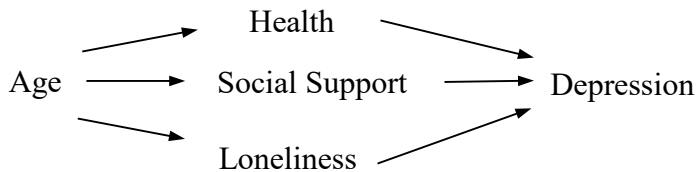


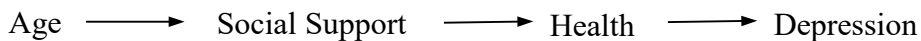
### More Complex Mediational Models

#### Multiple (Parallel) Mediators

Below the link between age and depression is explained by several pathways



#### Multiple Mediation Steps



#### Moderated Mediation

The mediation process differs across groups or across values of another independent variable

Men

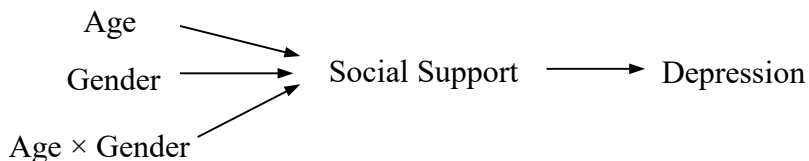


Women



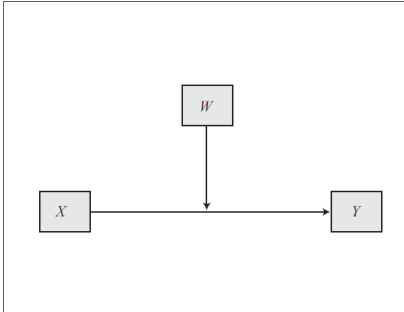
#### Mediated Moderation

Process by which an interaction impacts an outcome

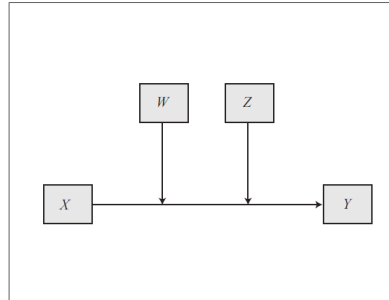


The following are a few of the most common models out of fifty or so possible model options from the PROCESS macro. The documentation for the macro can be found in the second edition of Hayes book (2020, Appendix A). These figures and model numbers are based on Version 3 of the macro.

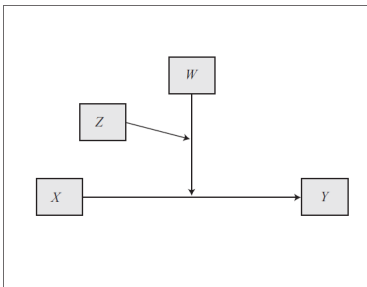
Model 1



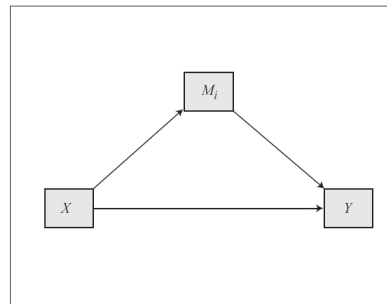
Model 2



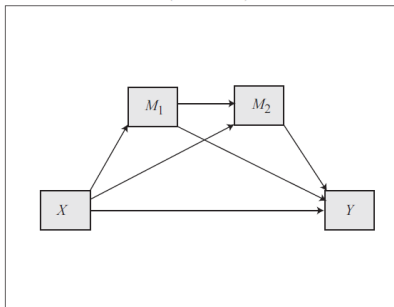
Model 3



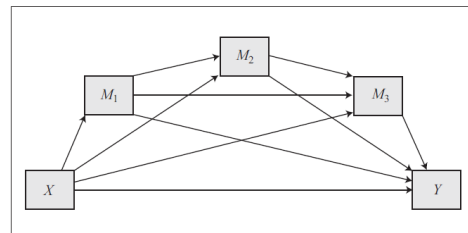
Model 4



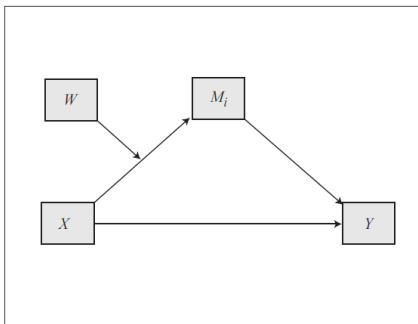
Model 6  
(2 mediators)



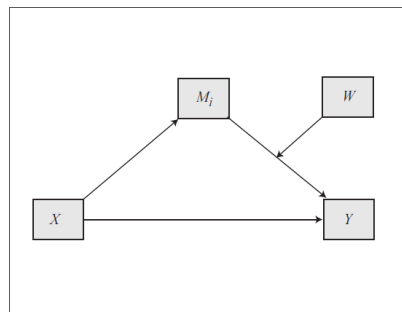
Model 6  
(3 mediators)



Model 7

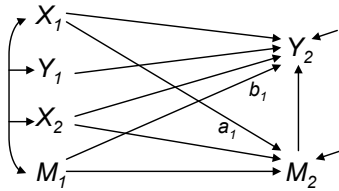


Model 14



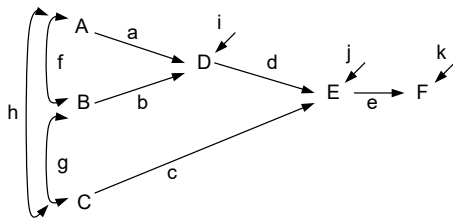
### Longitudinal Mediation

See Cole and Maxwell (2003) and MacKinnon (2008)

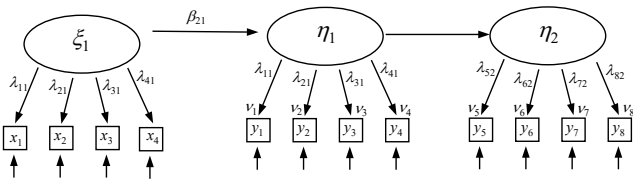


### Path Analysis and Structural Equation Modeling

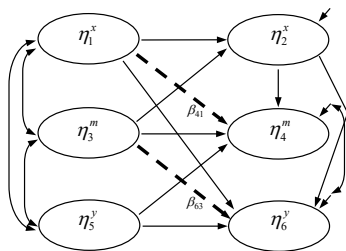
All of the above models also can be tested using structural equation modeling (SEM) software. In addition to path analyses of any level of complexity, SEM analysis also can incorporate latent variables to account for measurement error.



Measurement error can bias mediation estimates (circles represent latent variables)



Longitudinal mediation with two waves with latent variables



### Further Reading

Alwin, D. F., & Hauser, R. M. (1975). The decomposition of effects in path analysis. *American Sociological Review*, 40, 37-47.

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: questions and tips in the use of structural equation modeling. *Journal of abnormal psychology*, 112, 558-577

Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. *Psychological Methods*, 12, 1-22.

Hayes, A. F. (2020). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach, second edition*. Guilford Press.

James, L.R., Brett, J.M. (1984). Mediators, moderators, and tests for mediation. *Journal of Applied Psychology*, 69, 307-321.

JuddCM, Kenny DA, McClellandGH.2001. Estimating and testing mediation and moderation in within-subject designs. *Psychological Methods*, 6, 115-134.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology*, 58, 593-614.

- Newsom, J.T. (2015). *Longitudinal Structural Equation Modeling: A Comprehensive Introduction*. New York: Routledge.
- Frazier, P. A., Tix, A. P. & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology, 51*, 115-134.
- Loehlin, J. C., & Beaujean, A. A. (2016). *Latent variable models: An introduction to factor, path, and structural equation analysis*. New York: Taylor & Francis. (Good introduction to path analysis).
- MacKinnon, D. P. (2008). *Introduction to statistical mediation analysis*. New York: Routledge.