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DAGitty (Version 1.1)

A graphical Tool for Analyzing Causal Diagram

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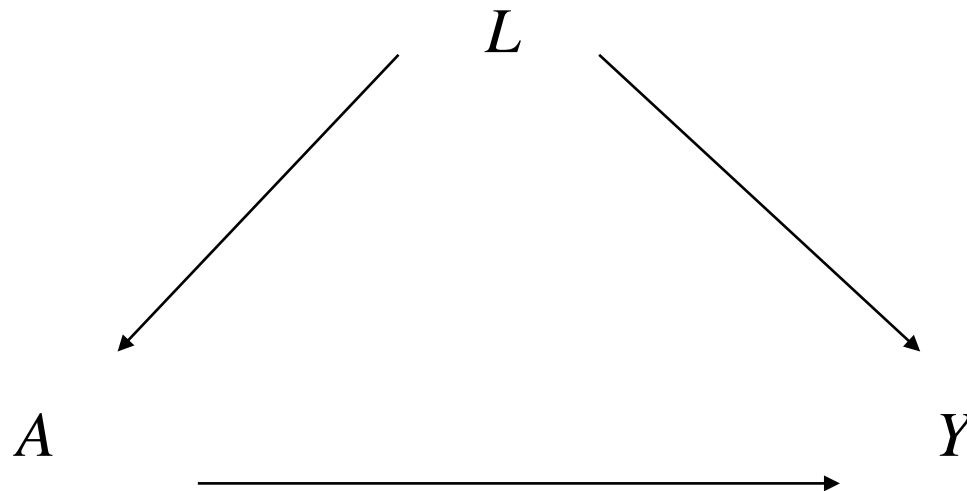
Basic Info

- Produced by Johanness Textor (University of Lubeck, Germany)
- <http://www.dagitty.net>
- <http://www.dagitty.net/dagitty.zip>
- Open source license, free access

Other Softwares

- DAGs provide a graphical approach to minimize bias in epidemiological studies
- In practice can be cumbersome
- DAG program (Knuppel and Stang)
- dagR (Breitling)

Working Example



DAGitty's textual syntax for causal diagrams

- A list of the variables in the diagram
 - ✓ One variable per line
 - ✓ First Exposure, second Outcome
 - ✓ Variable names must not contain spaces or colons
 - ✓ After each variable name follows a character that indicates the status of the variable, which can be either 1 (normal), A (adjusted for), U (unobserved)
- A list of connections between the variables
 - ✓ several lines each starting with a start variable name, followed by one or more other target variables that the start variable is connected to

DAGitty's textual syntax for causal diagrams (cont)

- A 1 @0.000,0.000
- Y 1 @1.000,0.000
- L 1 @0.500,-0.400

- A Y
- L A Y

Loading a textually defined diagram into DAGitty

- copy&paste the variable list,
- followed by a blank line, followed by the list of connections into the Model text data" text box.
- then click on Update DAG".
- DAGitty will now generate a preliminary graphical layout for your diagram on the canvas, which may not yet look the way you intended it to look, but can be freely modified.
- edit and save

Adding new variables

- To add a new variable to the model, double-click on a free space in the canvas (i.e., not on an existing variable) or press the “n” key

Setting the status of a variable

- Exposure, Outcome, Unobserved (latent), Adjusted,
- The number of variables that can be exposure or outcome variables is limited to one each
- At present, each variable can only have one status at a time, e.g., variables can not be both unobserved and adjusted or both exposure and unobserved

- **Adding new connections**
- **Deleting variables**
- **Deleting connections**

Displaying the moral graph

- To identify minimal sufficient adjustment sets, DAGitty uses the so-called moral graph, which results from a transformation of the model to an undirected, typically smaller, graph.
- This procedure is also highly recommended if you wish to verify the calculation by hand
- In DAGitty, you can switch between display of the model and its moral graph by pressing the “m” key.

Analyzing diagrams

- Paths
(causal, biasing), (open, closed)
- Adjustment sets

A sufficient adjustment set is a set S of covariates such that adjustment, stratification, or selection (e.g. by restriction or matching) will minimize bias when estimating the causal effect of the exposure on the outcome; this is only true if the causal assumptions encoded in the diagram are correct.

Example: Reducing Bias through DAGS

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- S1: the covariates chosen to reduce bias should not be descendants of exposure X
- S2: delete all variables that satisfy the following: 1) non ancestors of X 2) non ancestors of outcome 3) non ancestors of covariates that one is including to reduce bias
- S3: Delete all lines from X
- S4: Connect any two parents sharing a common child
- S5: Strip all arrowheads from lines
- S6: Delete all lines between the covariates in the models and any other covariates

Interpretation

- If X is dissociated from the outcome after S_6 then the statistical model chosen minimizes the bias of the estimate of X on the chosen outcome

Total versus direct effect

- Adjustment sets for the total effect are sets that block all biasing paths and leave all causal paths (i.e., paths of the form $e \rightarrow o$) unblocked
- Adjustment sets for the direct effect are sets that block all biasing paths and all causal paths, and leave only the direct arrow from exposure to outcome (i.e., the path $e \rightarrow o$, if it exists) unblocked.
- In a diagram where the only causal path between exposure and outcome is the path $e \rightarrow o$,