

Directed Graphs
More on Full Conditionals

Lecture 13
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Copying WinBUGS graphs into Microsoft Word for printing

- Left click on plot you wish to copy. A box will appear around the plot indicating that it has been selected.
- Choose “Edit/Copy” from the WinBUGS pull-down menu
- Click in the destination Word document where you want graph to be placed
- Choose “Edit/Paste” from the pull-down menu in Word

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Directed graphs

- *directed graphical model* represents all quantities in a statistical model as nodes in a directed graph
- arrows run into nodes from the nodes that directly influence them (i.e. from their *parents*)
- developers of BUGS and WinBUGS recommend drawing directed graphs as part of model development process
- WinBUGS includes DoodleBUGS, which lets you specify models as directed graphs instead of using WinBUGS language
 - limited in what kinds of models can be specified in DoodleBUGS

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Types of nodes in directed graphs

- constants
 - fixed by design of study
 - always are *founder nodes* (i.e. do not have parents)
 - denoted as single- or sometimes double-edged rectangles
- stochastic nodes
 - variables that are given a distribution
 - may be parents or children or both
 - may be observed data or unobservable parameters
 - generally denoted as circles
 - * although data often denoted as single-edge rectangles
- deterministic nodes
 - logical functions of other nodes

Types of directed links in a directed graph

- stochastic dependence
 - indicated by solid arrow
- logical function
 - indicated by dashed or hollow arrow

Example: directed graph for Pumps problem

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Assumptions behind directed graphical model

- conditional independence assumption: given its parent nodes, each node in the graph is independent of all other nodes except its own “children”
 - given the nodes it is connected to by arrows, any node (say v) is conditionally independent of all the other nodes in the graph
 - collapse over dashed arrows in evaluating connections
- simplifies determination of full conditional distributions

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Full conditionals for Pumps problem