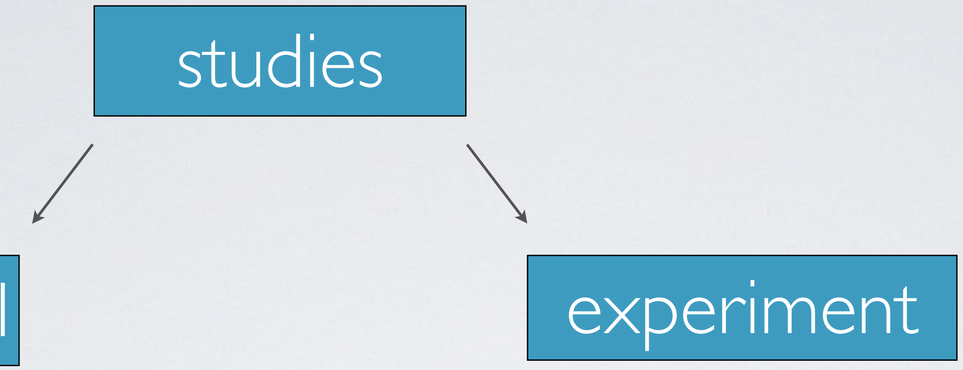
observational studies & experiments

- define observational studies and experiments
- correlation vs. causation

Duke UNIVERSITY

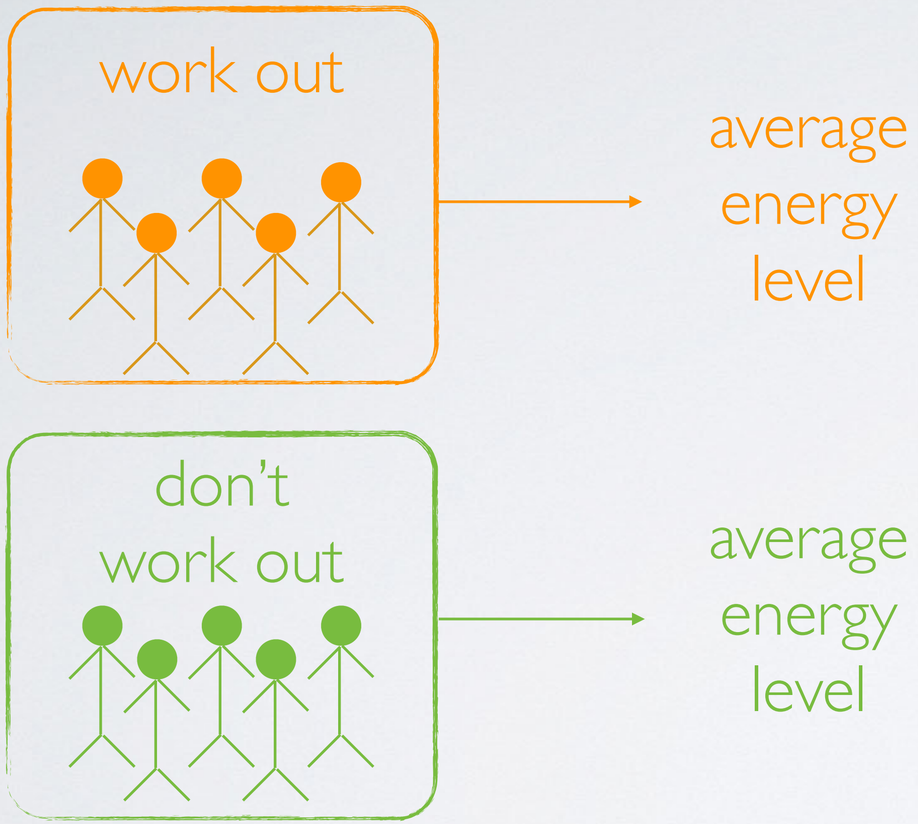
Dr. Mine Çetinkaya-Rundel
Duke University



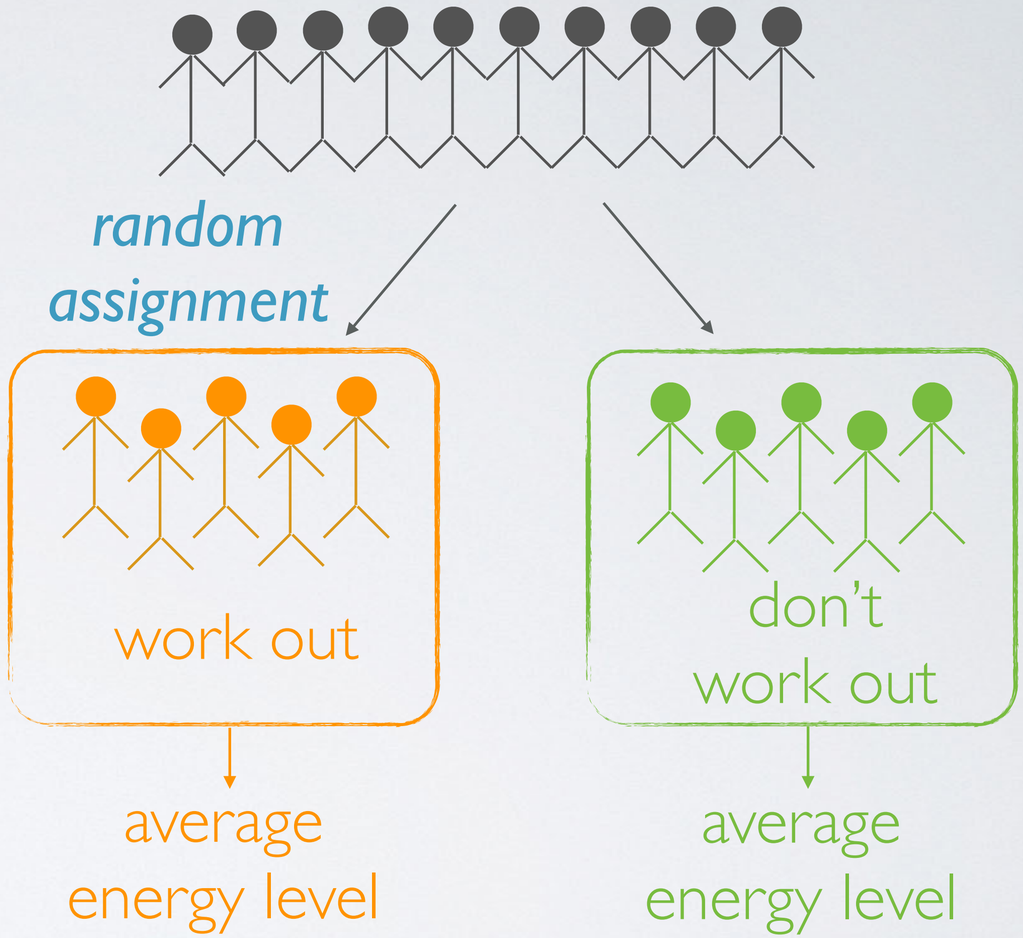
- collect data in a way that does not directly interfere with how the data arise ("observe")
- only establish an association
- retrospective: uses past data
- prospective: data are collected throughout the study

- randomly assign subjects to treatments
- establish causal connections

observational study



experiment



Study: Breakfast cereal keeps girls slim

USA TODAY
Sept 8, 2005

[…]

Girls who ate breakfast of any type had a lower average body mass index, a common obesity gauge, than those who said they didn't. The index was even lower for girls who said they ate cereal for breakfast, according to findings of the study conducted by the Maryland Medical Research Institute with funding from the National Institutes of Health (NIH) and cereal-maker General Mills.

[…]

The results were gleaned from a larger NIH survey of 2,379 girls in California, Ohio, and Maryland who were tracked between the ages of 9 and 19.

[…]

As part of the survey, the girls were asked once a year what they had eaten during the previous three days.

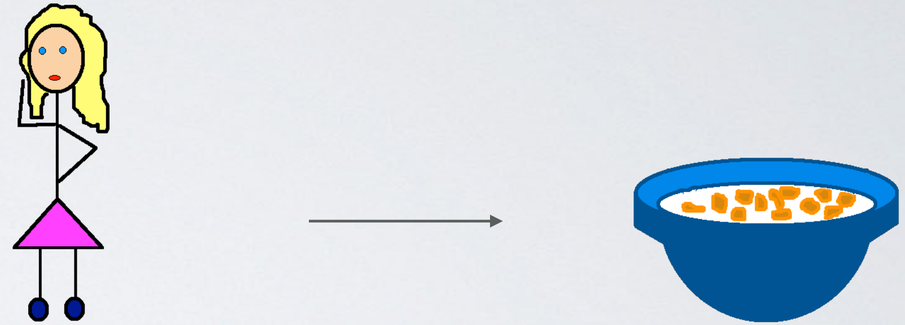
[…]

Image credit: Sonny Abesamis CC BY 2.0 http://www.flickr.com/photos/enerva/9865254103

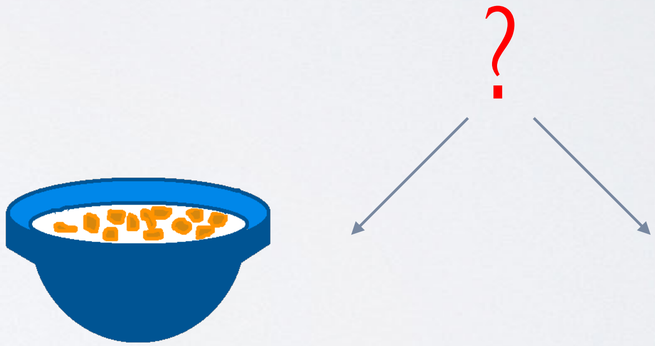
3 possible explanations

1. eating breakfast causes girls to be slimmer

2. being slim causes girls to eat breakfast

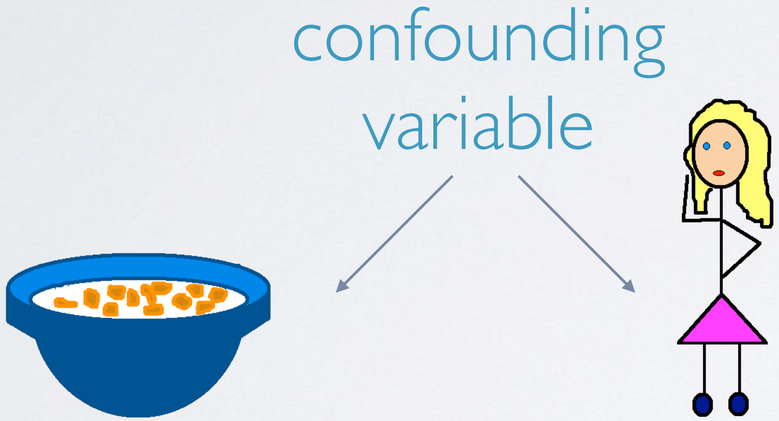


3. a third variable is responsible for both



confounding variables

extraneous variables that affect both the explanatory and the response variable, and that make it seem like there is a relationship between them



correlation does not imply causation

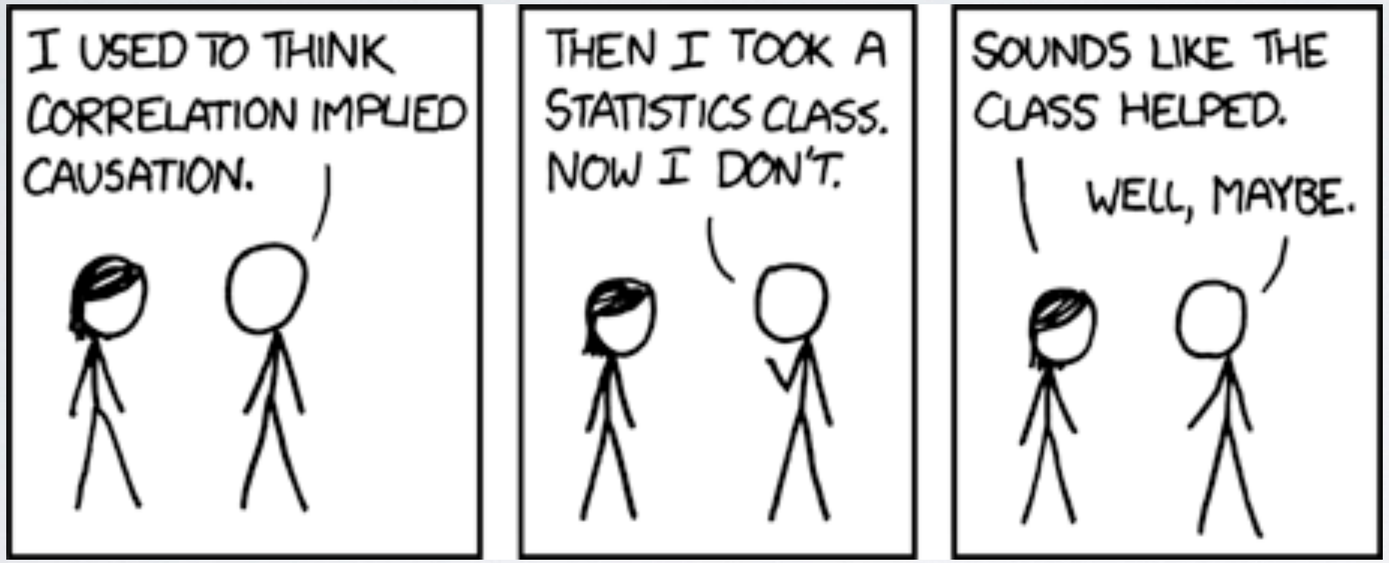


Image credit: Randall Munroe CC BY-NC 2.5 http://xkcd.com/552/