

# Social Science and Statistics

UseR Conference  
Iowa State University  
August 9, 2007

# (Applied) Causal Inference

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## Treatment Assignment

Randomized

Not Randomized

Unit Selection  
Randomized  
Not Randomized

Randomized	<b>Randomized Experiment</b> (gold standard)	<b>Survey Sampling</b> (allows population inference)
Not Randomized	<b>Controlled Experiment</b> (allows causal inference)	<b>Observational Study</b> (large potential for bias)

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- ▶ Ignore it → biased results
- ▶ Use modeling assumptions
- ▶ “Fix” the data

Fixing the data  $\equiv$  Matching!

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- ▶ Exact matching



Fixing the data  $\equiv$  Matching!

- ▶ Exact matching
- ▶ Propensity scores

## Fixing the data $\equiv$ Matching!

- ▶ Exact matching
- ▶ Propensity scores
- ▶ Optimization-based matching  
(the way forward)

## Choices for optimization-based matching

- ▶ Loss-function

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- ▶ Loss-function
- ▶ Optimization algorithm