

# Chapter 5. Correlation and causation

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# Contents

- The Third-Variable Problem
  - Why Goldberger's Evidence Was Better
- The Directionality Problem
- Selection Bias

# Goldberger and Pellagra



# The third-variable problem: Goldberger and Pellagra

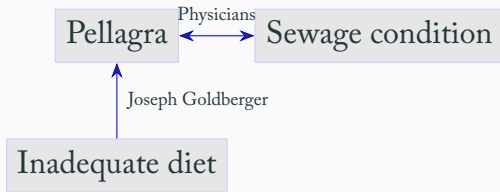
Pellagra

Sewage condition

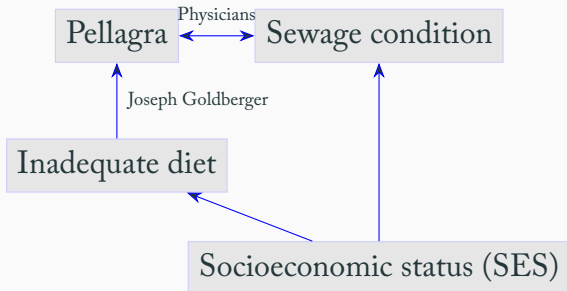
# The third-variable problem: Goldberger and Pellagra



# The third-variable problem: Goldberger and Pellagra



# The third-variable problem: Goldberger and Pellagra



# Birth Control by the Toaster

Contraceptive use

Electrical appliances



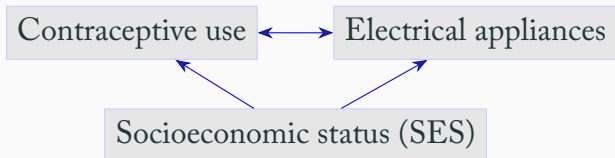
# Birth Control by the Toaster

Contraceptive use



Electrical appliances

# Birth Control by the Toaster



# Spurious correlations and the third-variable problem

## Spurious correlations and the third-variable problem

- **Spurious correlations** (虚假相关) are correlations that arise not because a causal link exists between the two variables that are measured, but because both variables are related to **a third variable**.

# Temperature and crime

# Temperature and crime

- **Heat hypothesis:** uncomfortably warm temperatures produce increases in aggressive motives and (sometimes) aggressive behavior.

# The directionality problem

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- Eye movement patterns and reading ability.



# The directionality problem

- Eye movement patterns and reading ability.
- Self-esteem and Problem behaviors.

# The directionality problem

- Eye movement patterns and reading ability.
- Self-esteem and Problem behaviors.
- Altruism and happiness.

# Selection Bias

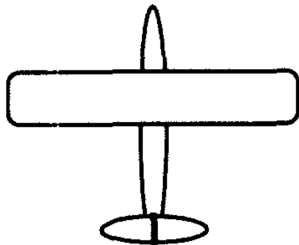
# Selection Bias

- **Selection bias** refers to the relationships between certain subject and environmental variables that may arise when people with different biological, behavioral, and psychological characteristics select different types of environments.

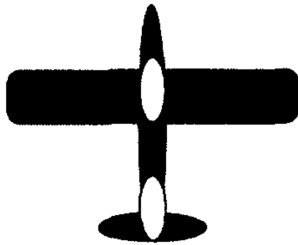
## Selection Bias

- **Selection bias** refers to the relationships between certain subject and environmental variables that may arise when people with different biological, behavioral, and psychological characteristics select different types of environments.
- Selection bias creates a spurious correlation between environmental characteristics and behavioral—biological characteristics.

## Selection Bias



An outline of a plane



A depiction of a plane with shading indicating where returning planes had been shot.

# Selection Bias

## Selection Bias

- Arizona has an above-average incidence of deaths due to respiratory illness.



## Selection Bias

- Arizona has an above-average incidence of deaths due to respiratory illness.
- Republicans enjoy sex more than Democrats.

## Selection Bias

- Arizona has an above-average incidence of deaths due to respiratory illness.
- Republicans enjoy sex more than Democrats.
- Moderate drinkers have better health outcomes than not only frequent drinkers but also abstainers as well.

Questions?