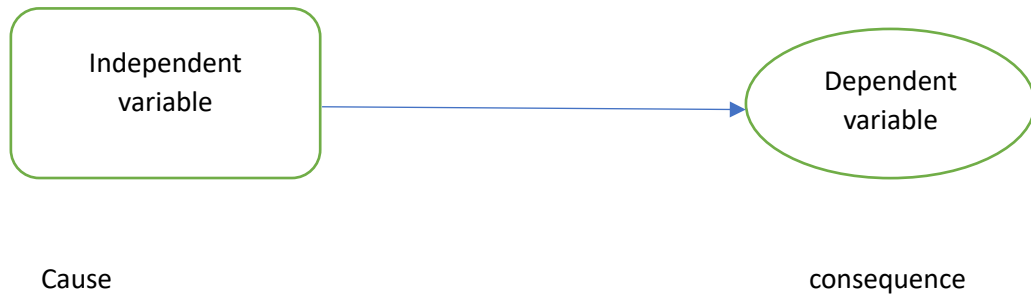# Chapter 9 bivariate statistics

1) What is bivariate statistics?

It includes at two aspects 1) the significance of the relationship (chi-square, two-sample t, F ratio, and student t) and 2) the strength of bivariate associations (lambda and gamma).
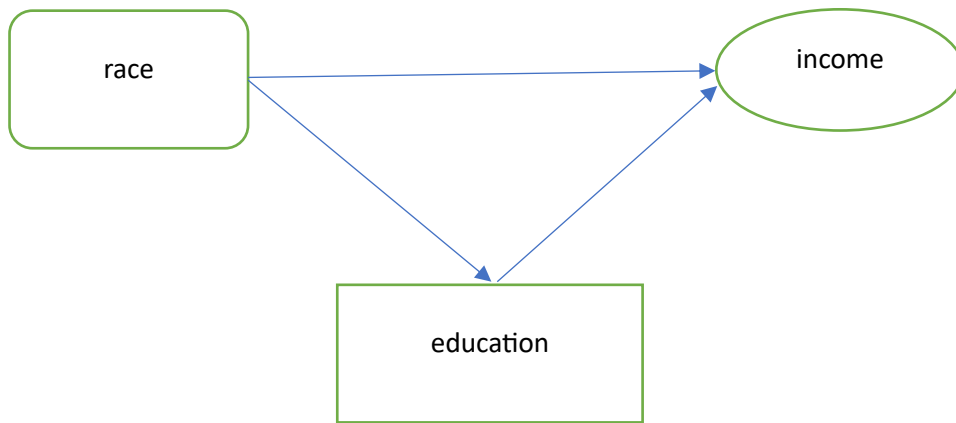
2) Bivariate examples (two variables)

Independent variable	→	Dependent variable
Cause		consequence

A) LSAT -> Law School admission
B) Education -> income
C) Gender/race -> income
D) Study hours -> grades
E) Attendance -> grades
F) Exercise -> weight controls

3) Causality establishment: when all three conditions are satisfied, the causality is established.

    A)   Independent variable must predate the dependent variable
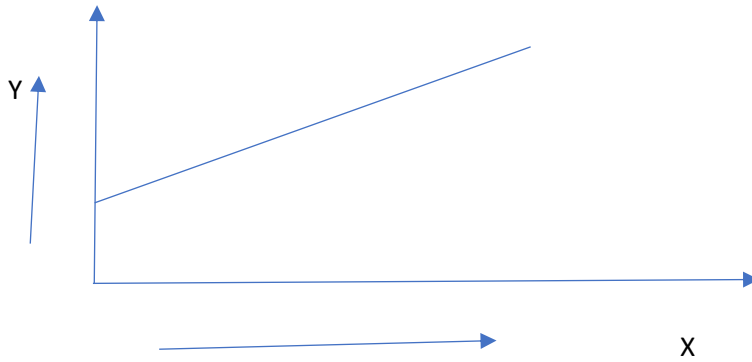   B)   The relationship must be non-spurious

```
  ┌─────────────┐                              ╭───────────╮
  │    race     │──────────────────────────▶  │  income   │
  └─────────────┘                              ╰───────────╯
         │                               ▲
         ▼                               │
       ┌─────────────────────┐
       │      education      │
       └─────────────────────┘
```

c) the relationship must be statistically significant (P < .05)

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  ╭───────────────────────╮        sampling        ╭───────────────────╮
  │      population        │───────────────────▶   │      sample        │
  ╰───────────────────────╯                        ╰───────────────────╯
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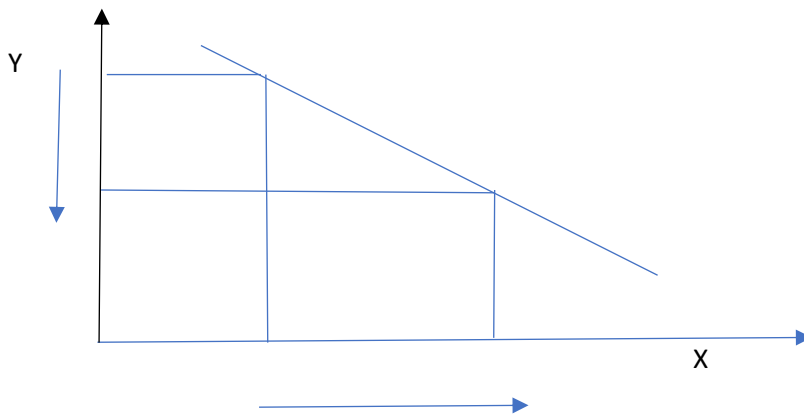
4) The direction of the bivariate relationship

A) Positive bivariate relationship

B) Negative bivariate relationship

C) Curvilinear relationship