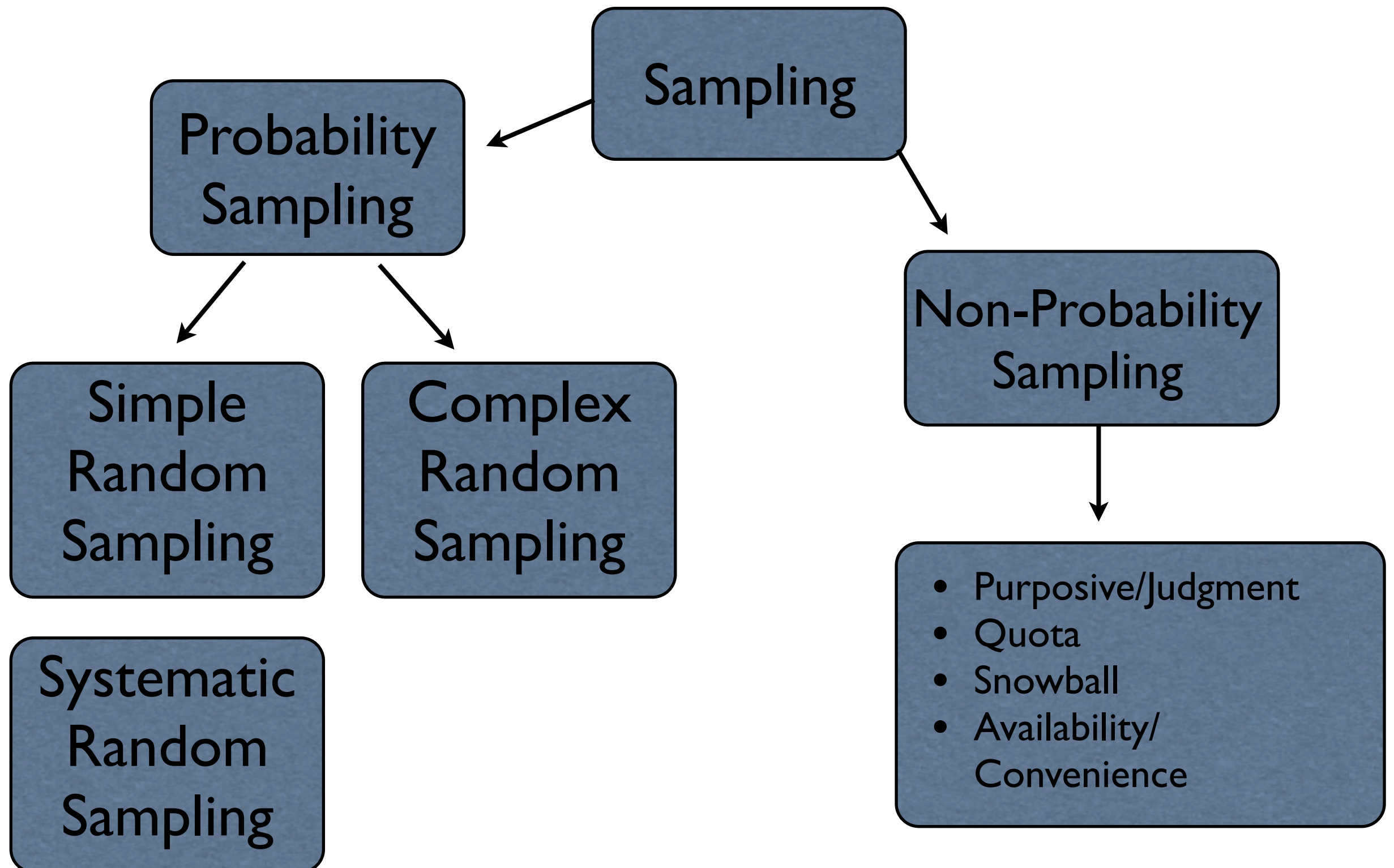


Lesson 4

Tuesday 2/6/24

Summary of Different Sampling Approaches



Varieties of Research Involving Statistics

- Descriptive Analysis: "How many" or "how often" questions; documenting patterns.
- Explanatory Studies: measuring the relationship between independent and dependent variables; testing hypotheses.
- Program and policy evaluation: analyzing the effectiveness of various policies and interventions on scientifically interesting criminal justice outcomes.

Examples

- Descriptive Analysis: Which states have the highest rates of police killings?
- Explanatory Studies: Some criminological theory hypothesizes that poor school performance is a cause of crime. A basic question we could answer with data is whether school performance is correlated with crime?
- Program and policy evaluation: do batterer intervention programs reduce future domestic violence?

Police Killings by State

- Within each state, we would need a way to count the number of times someone was killed by the police in a well-defined period of time.
- There is no nationally mandated reporting system for police killings.
- Most research in this area relies on data collected by journalists (see, the Washington Post database for example) .

School Performance and Crime

- If poor school performance is a cause of crime, then age should be correlated with crime.
- If school performance is a cause of crime, then the correlation should be measurable under a wide range of circumstances.
- If school performance is a cause of crime, then no other variable should be able to explain the correlation.

Batterer Intervention and Domestic Violence

- If a batterer intervention program is effective, it should be correlated with reduced rates of domestic violence.
- We could randomly assign abusers coming into court during some time period to 2 different groups: treatment and control. The treatment group gets the program and the control group gets whatever the business as usual condition is.
- Then, we can follow people in both groups (for the same length of time) to see whether the treatment group has better outcomes than the control group.
- This is an example of a randomized controlled experiment or trial (pp. 7-8 in your textbook).

Measurement Validity

- Validity is a synonym for accuracy. In research, we say a measure is valid if the measure accurately reflects the concept that is being measured.
- Example: we might use the word "recidivism" to mean "new offending among people who have offended in the past." This is a conceptual definition.
- For purposes of conducting an actual study, we might define recidivism among a cohort of prison releasees as "any arrest for a new crime within 3 years of release from prison." This would be an operational definition.

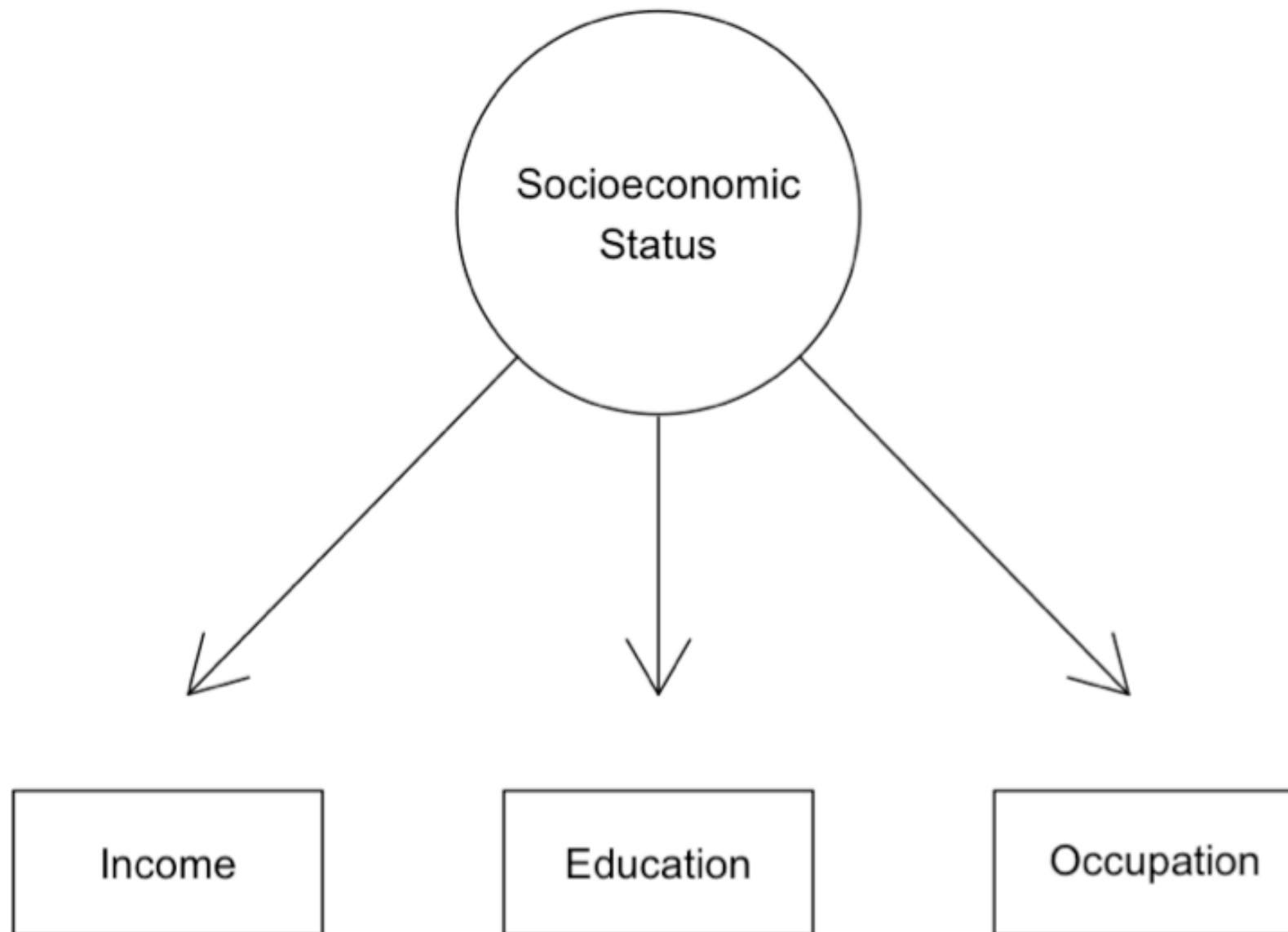
Practice Analysis Exercise 1: Household Burglary in Charlotte and Wilmington NC (2010)

```
nburg.clt=7305  
nburg.wil=1109  
nburg.clt/nburg.wil  
pop.clt=779541  
pop.wil=106476  
burgrate.clt=(nburg.clt/pop.clt)*100000  
burgrate.clt  
burgrate.wil=(nburg.wil/pop.wil)*100000  
burgrate.wil  
burgrate.clt/burgrate.wil
```

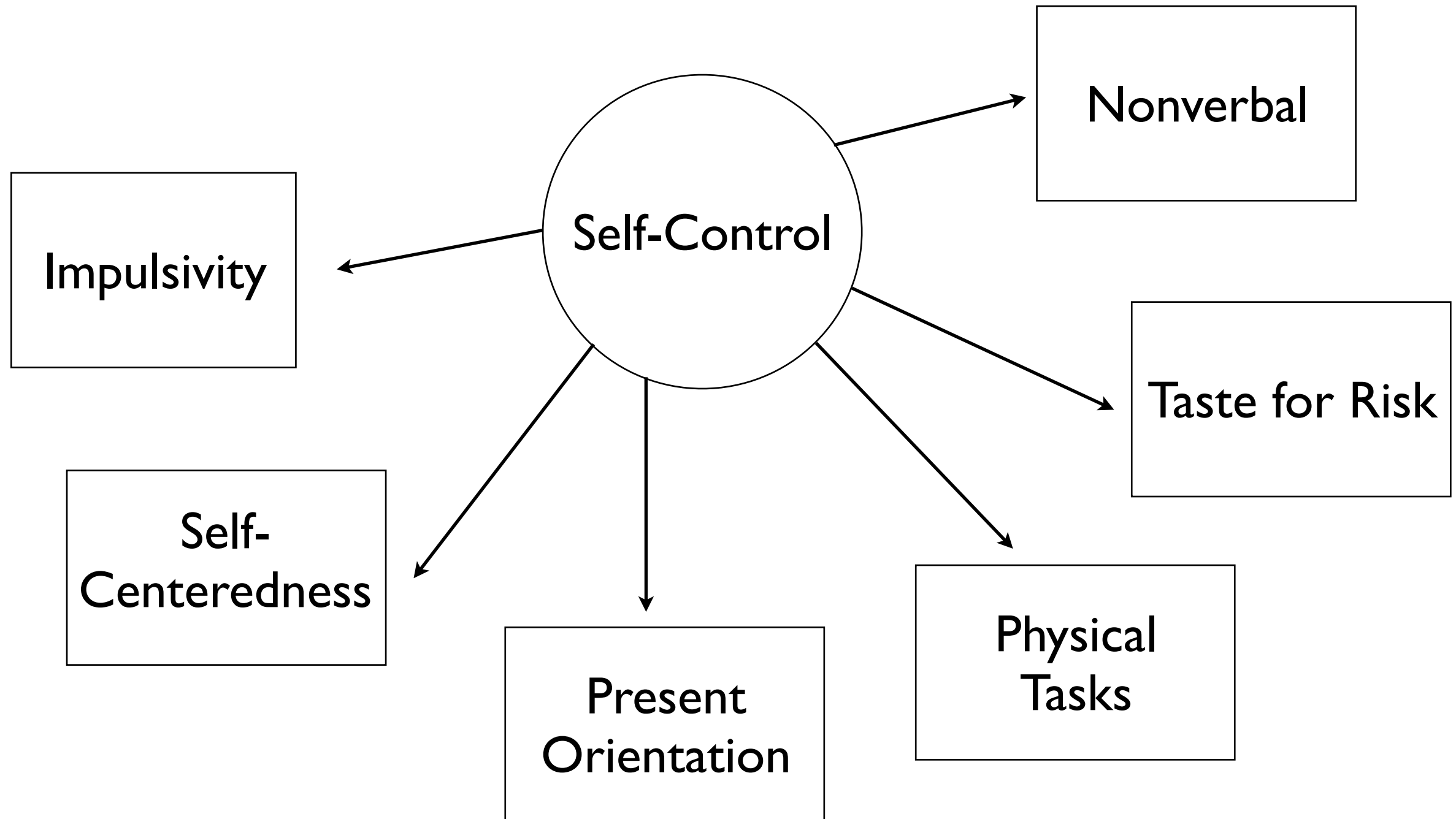
Results

```
> nburg.clt=7305
> nburg.wil=1109
> nburg.clt/nburg.wil
[1] 6.587015
> pop.clt=779541
> pop.wil=106476
> burgrate.clt=(nburg.clt/pop.clt)*100000
> burgrate.clt
[1] 937.0899
> burgrate.wil=(nburg.wil/pop.wil)*100000
> burgrate.wil
[1] 1041.549
> burgrate.clt/burgrate.wil
[1] 0.8997077
>
```

Another Example (Measurement)



Another Example (Measurement)

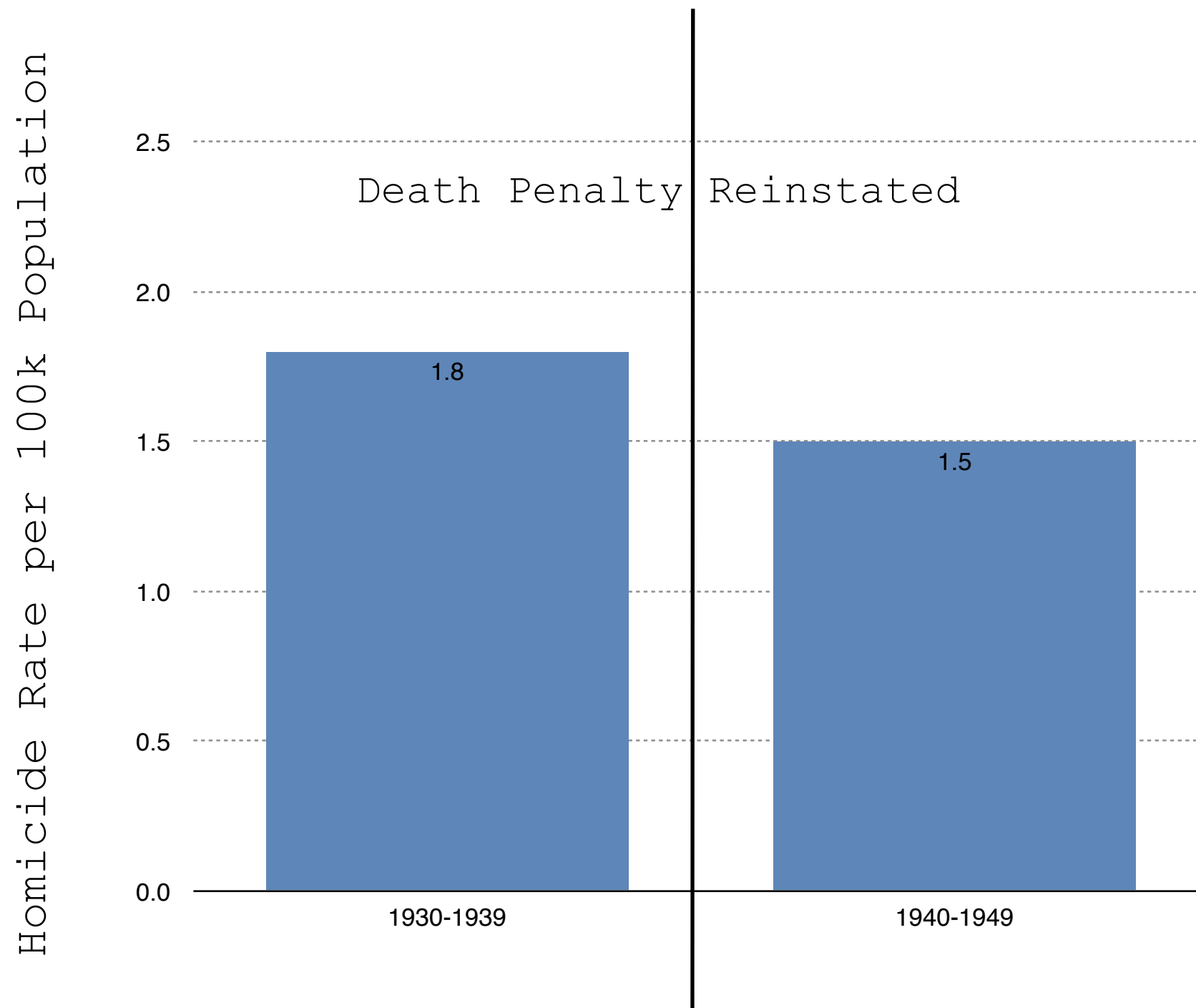


Source: Michael R. Gottfredson and Travis Hirschi (1990). A General Theory of Crime. Stanford, CA: Stanford University Press (see page 90).

Causal Validity

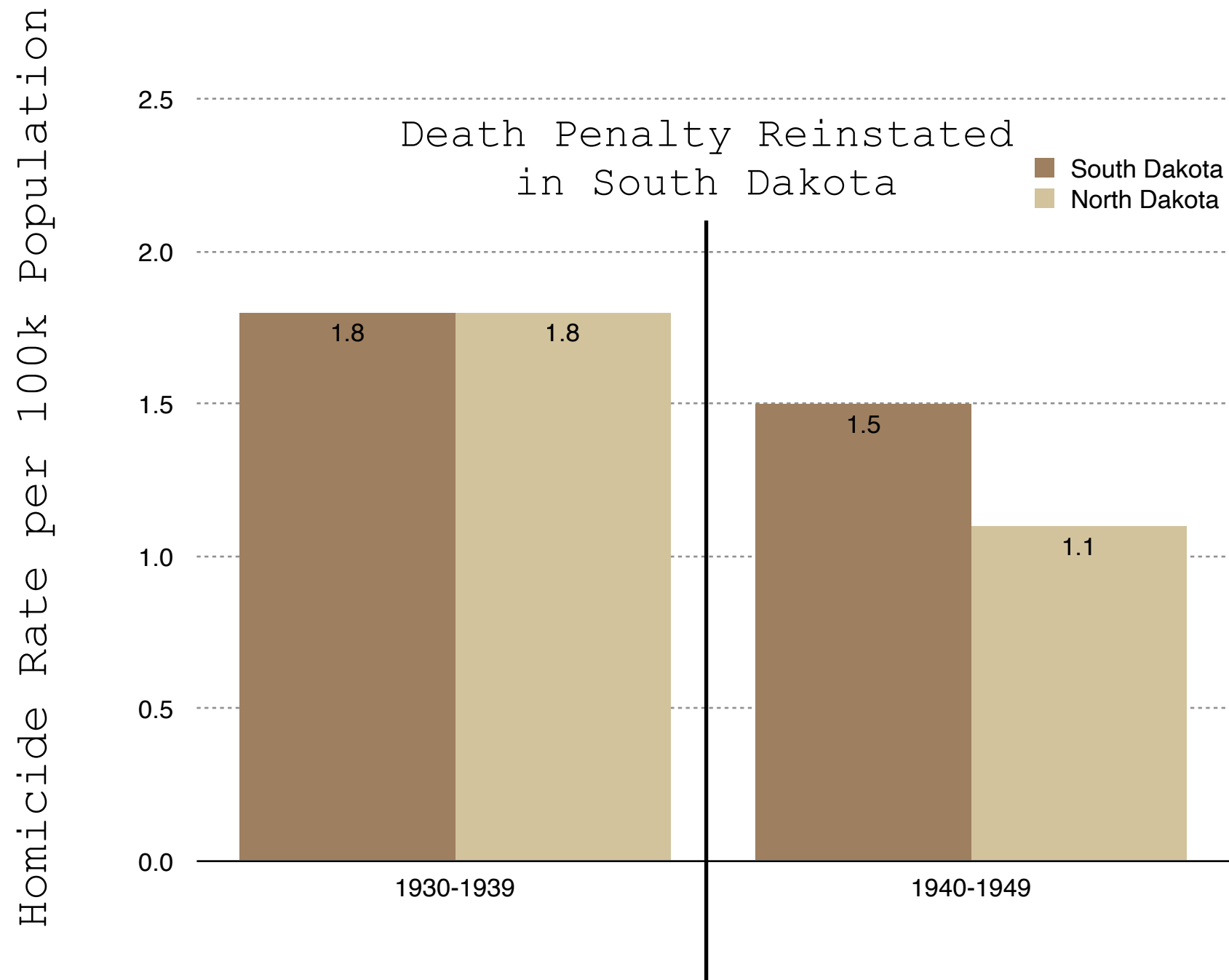
- Causal validity is a synonym for another term -- internal validity -- that is often used in research methods (note: your book has a typo on page 17 and refers to interval validity; this should say "internal" validity instead).
- The concern here (internal validity) is around whether a study provides convincing evidence of that a causal effect has been measured.
- Three conditions must be met to show that x is a cause of y: (1) x must precede y; (2) x and y must be correlated; (3) the correlation between x and y is not spurious.
- Establishing convincing evidence of cause-and-effect is very difficult as our next 3 examples will show.
- Another type of validity which we will consider later is "external validity"; has to do with the generalizability of our results to a larger population.

Homicide Rates in South Dakota



Source: Karl Schuessler (1952). The deterrent influence of the death penalty. Annals of the American Academy of Political and Social Science, 284:54-61 (at page 58).

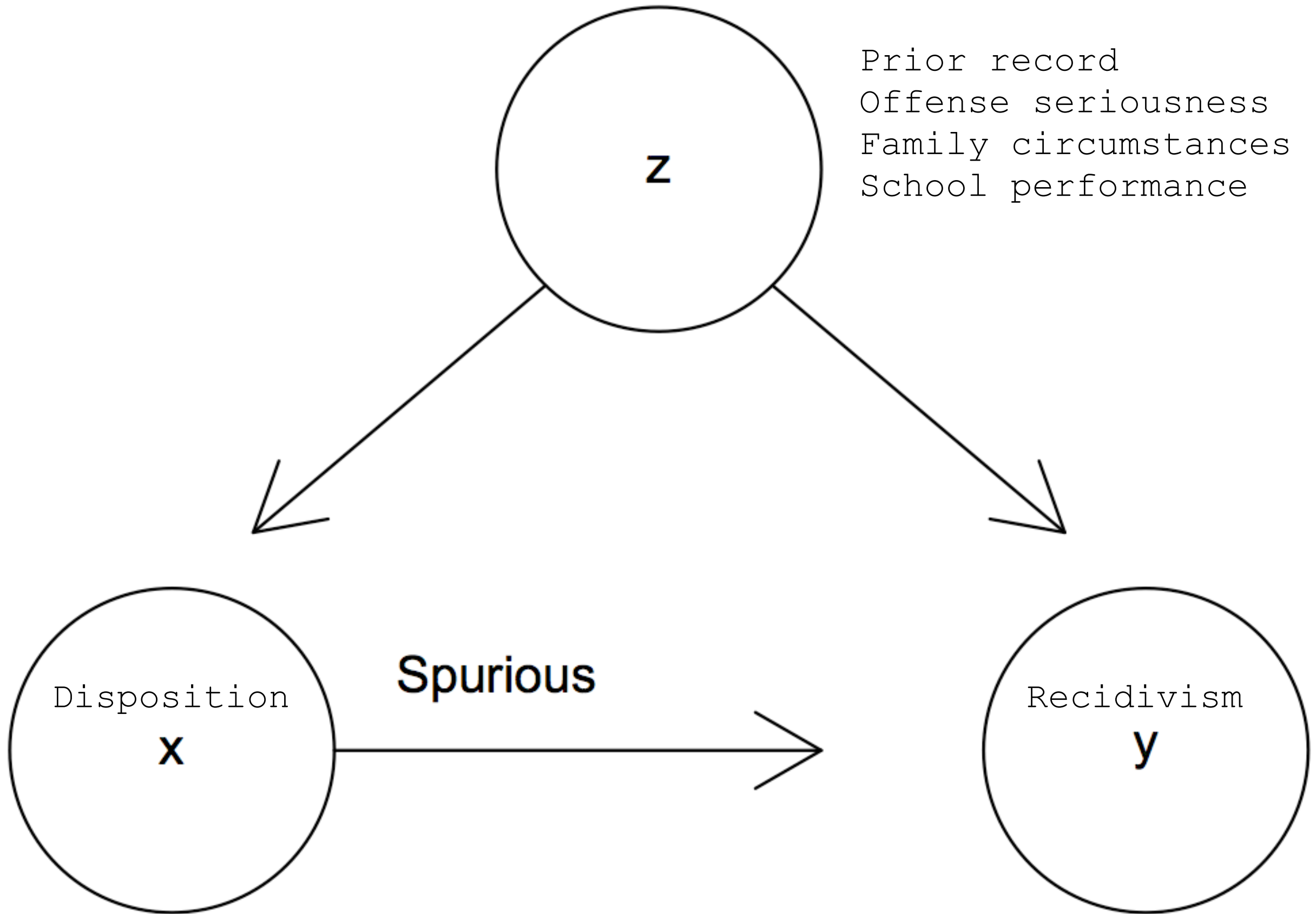
Homicide Rates in North & South Dakota

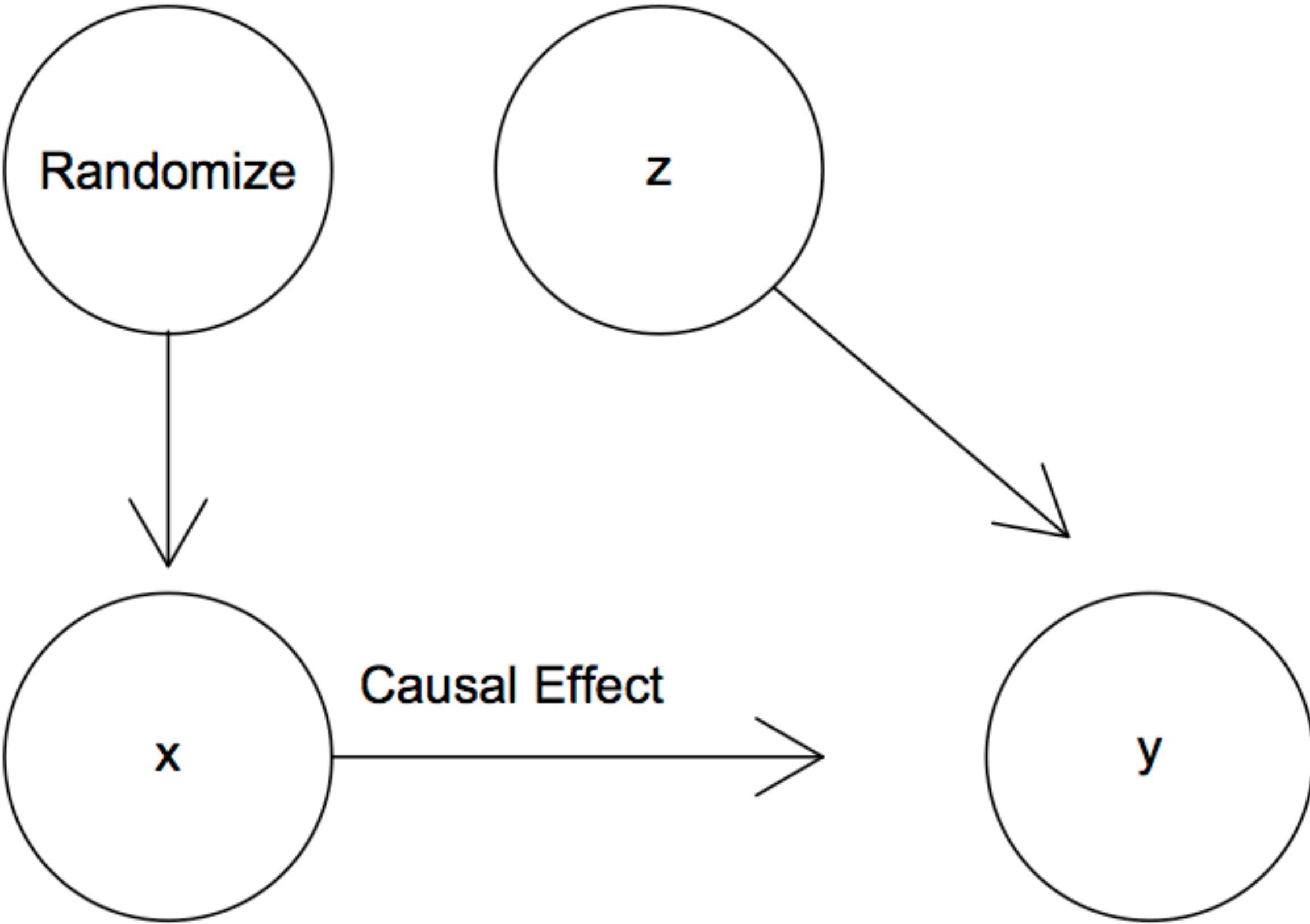


Source: Karl Schuessler (1952). The deterrent influence of the death penalty. Annals of the American Academy of Political and Social Science, 284:54-61 (at page 58).

Residential Placement and Recidivism (Manski & Nagin, 1998)

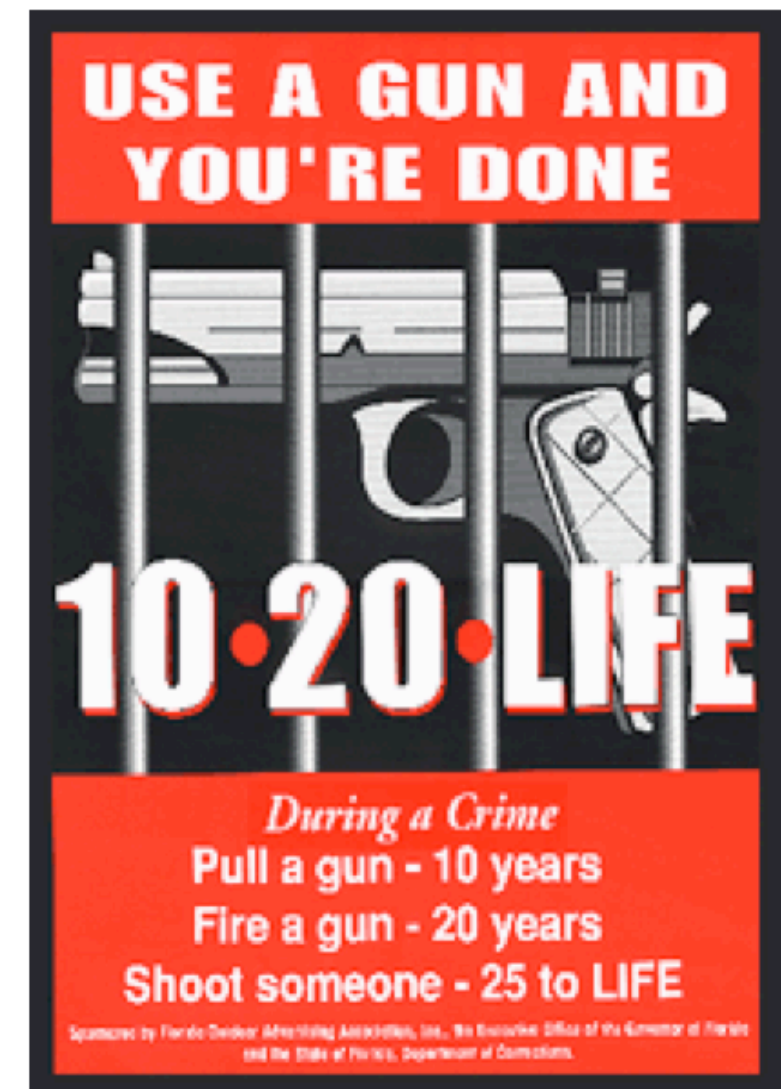
- This research study (intentionally) exposes the ambiguity that arises when we use observational data to infer causal effects.
- The study included 13,197 kids in Utah who were processed in the juvenile court for a criminal offense.
- About 11% of the kids received a "residential treatment" disposition while the other 89% of the kids remained in the community for their disposition.
- The recidivism rate (recidivism was operationally defined as a return to the juvenile court within 2 years) for residential treatment kids was 77% while the recidivism rate for the kids who remained in the community was 59%.
- What can we conclude about the causal effect of the disposition on recidivism?





Florida's 10-20-Life Law

- Mandates a minimum 10 year prison term for certain felonies, or attempted felonies in which the offender possesses a firearm or destructive device
- Mandates a minimum 20 year prison term when the firearm is discharged
- Mandates a minimum 25 years to LIFE if someone is injured or killed
- Mandates a minimum 3 year prison term for possession of a firearm by a felon
- Mandates that the minimum prison term is to be served consecutively to any other term of imprisonment imposed

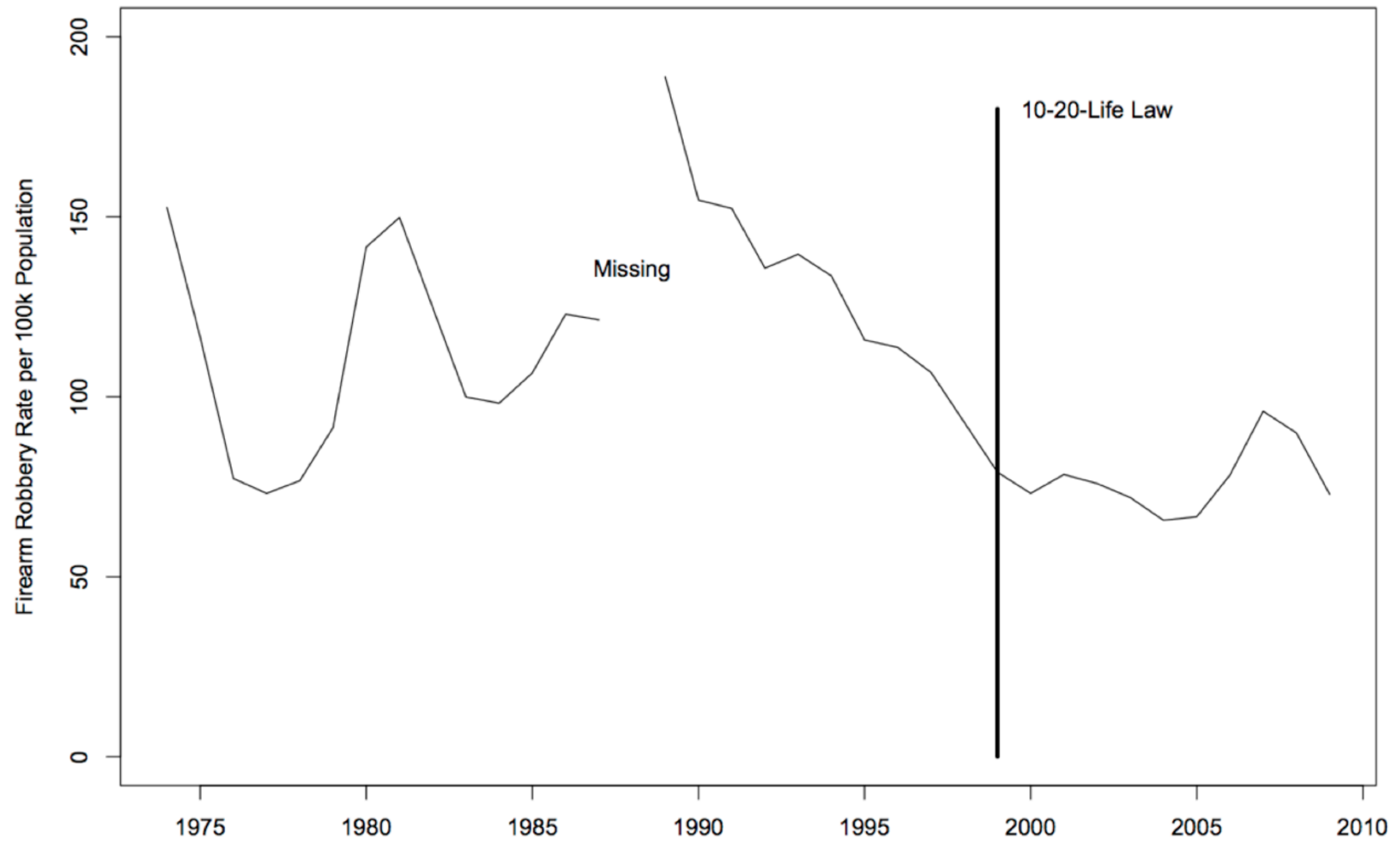


Florida's Summary of the Law's Effects (as recounted by Piquero (2005:786-787))

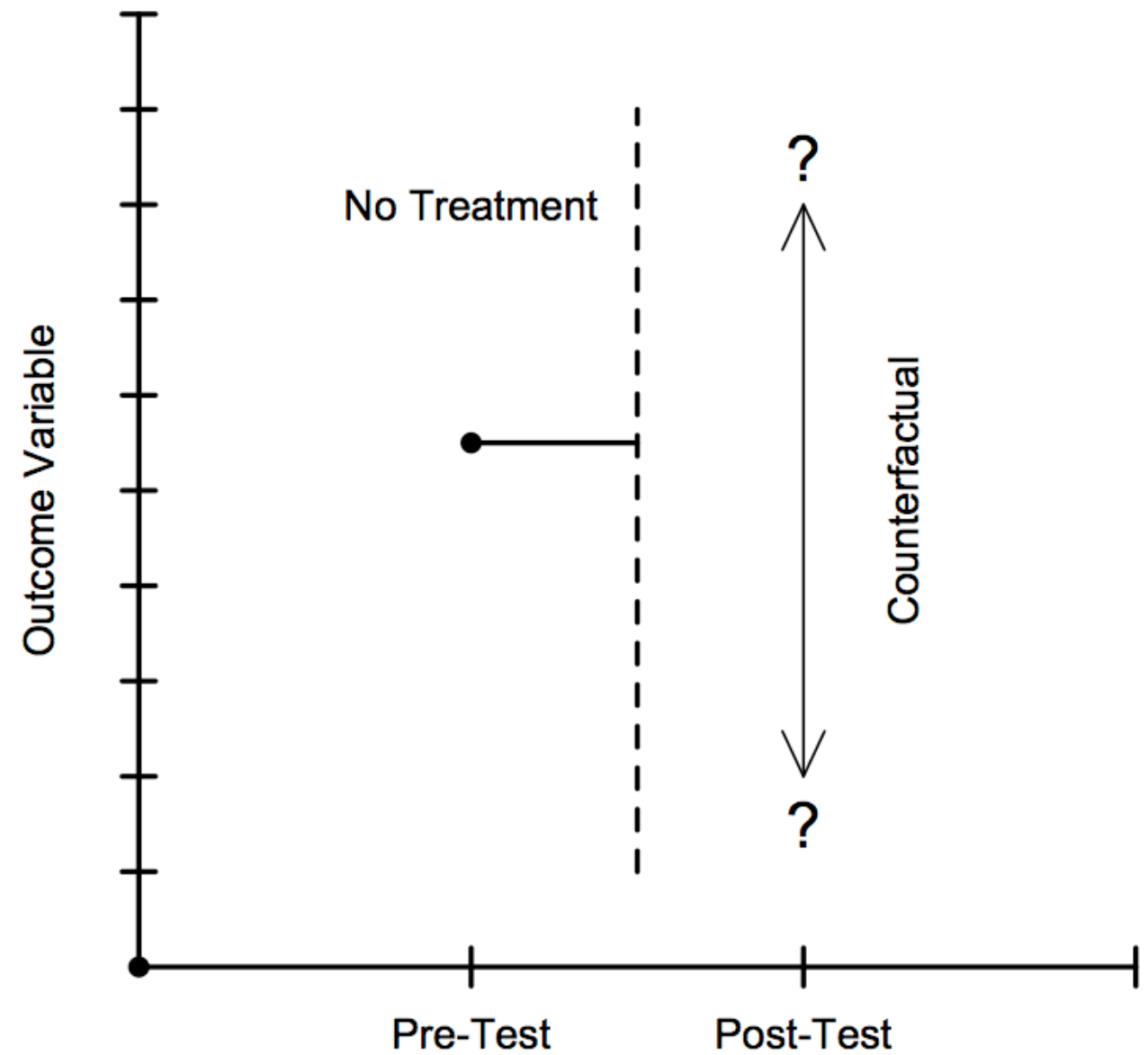
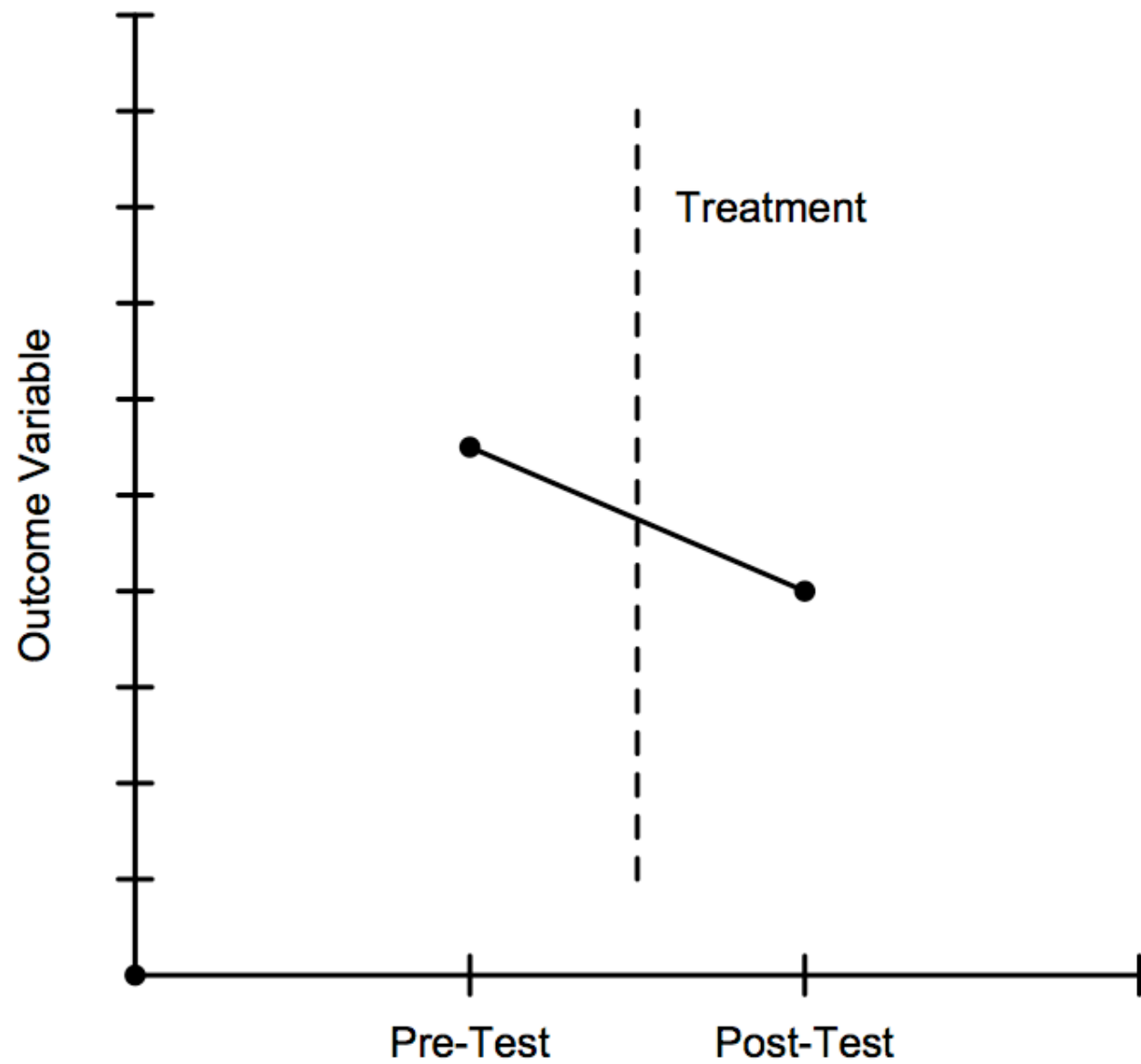
"The results under 10-20-Life are impressive. In only five years, from 1998-2003, 10-20-Life has helped drive down violent gun crime rates 28 percent statewide. During the 10-20-Life era, compared to 1998 statistics, 8,134 fewer people were robbed by armed criminals. More importantly, compared to 1998 statistics, 346 fewer people in Florida were killed by armed criminals under 10-20-Life. These crime decreases occurred even as Florida's population increased over 2 million (14 percent) between 1998 and 2003. Punishing criminals who use guns is making our state safer."

Source: Alex R. Piquero (2005). Reliable information and rational policy decisions: does gun research fit the bill? Criminology & Public Policy, 4:779-798.

Florida Gun Robberies (1971-2009)



Fundamental Problem of Causal Inference



Reliability

- Synonyms for reliability include words like "reproducibility" or "repeatability."
- Test-retest: give a test at time 1; repeat at time 2; how often do I get the same answer?
- Different raters scoring the same phenomenon; how often do the raters produce the same answer?
- Survey questions that ask about the same phenomenon but in somewhat different ways; how correlated are the answers to the different survey questions?
- Note: a measure must be reliable to be valid; the reverse is not true, however. A measure can be reliable and invalid.

Practice Analysis Exercise 2

```
year=seq(from=1994,to=2019,by=1)

murders=c(23326,21606,19645,18208,16974,15522,
          15586,16037,16229,16528,16137,16692,17034,
          16929,16272,15241,14748,14612,14827,14196,
          14249,15696,17250,17284,16214,16425)

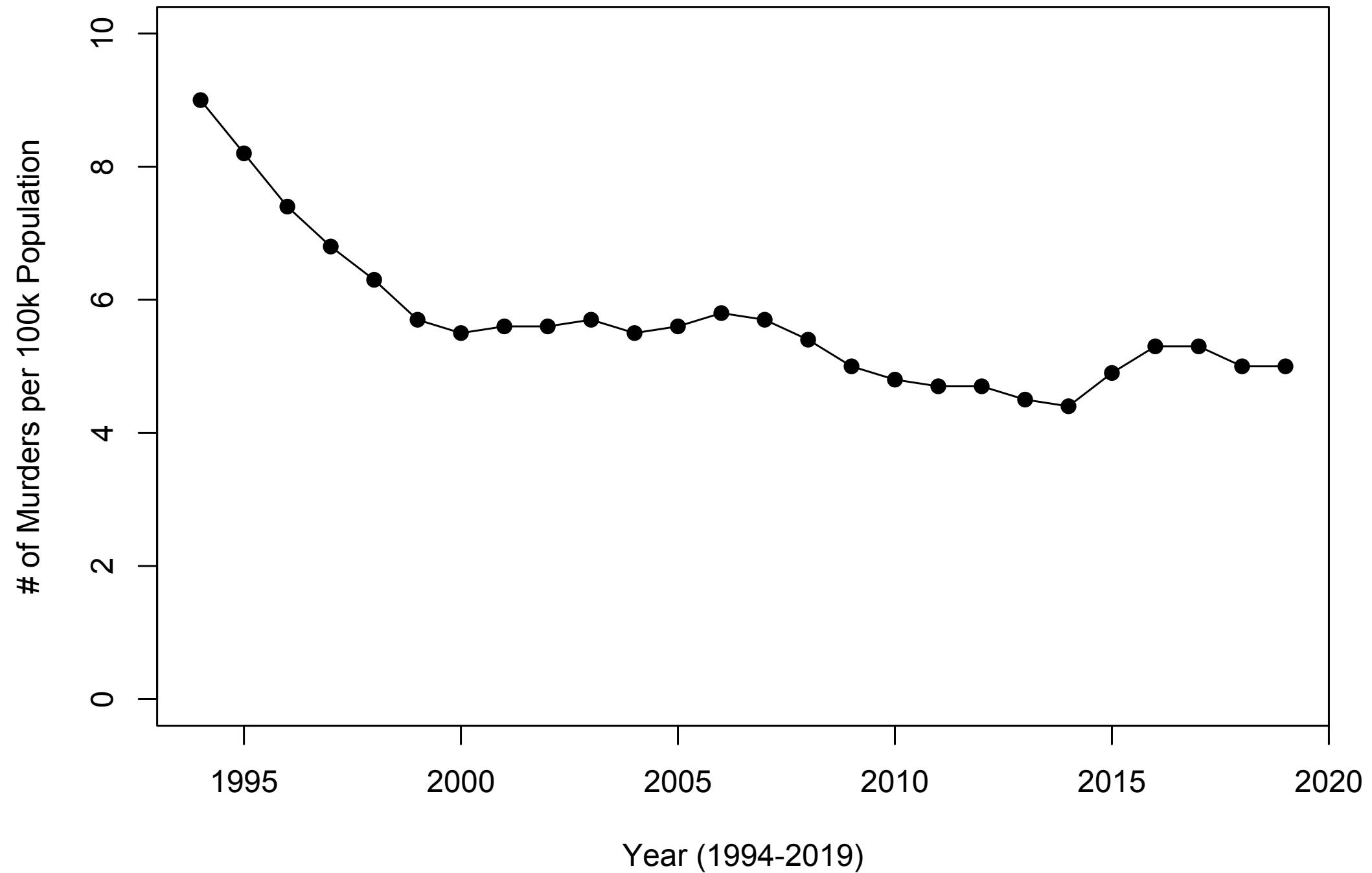
pop=c(259177778,263487805,265472973,267764706,
      269428571,272315789,283381818,286375000,
      289803571,289964912,293400000,298071429,
      293689655,297000000,301333333,304820000,
      307250000,310893617,315468085,315466667,
      323840909,320326531,325471698,326113208,
      324280000,328500000)

mrate=(murders/pop)*100000
df=data.frame(year,murders,pop,mrate)

plot(df$year,df$mrate,type="l",ylim=c(0,10),
     main="Murder Rates by Year (1994-2019)",
     xlab="Year (1994-2019)",
     ylab="# of Murders per 100k Population")
points(x=df$year,df$mrate,pch=19)
```


R Code on Last Slide Draws This Chart

Murder Rates by Year (1994-2019)



Practice Analysis Exercise 3

```
# read the dataset - NC Department of Corrections FY1978 Releases

age=c(rep(16,19),rep(17,161),rep(18,492),rep(19,480),rep(20,624),
      rep(21,599),rep(22,580),rep(23,468),rep(24,537),rep(25,443),rep(26,432),
      rep(27,338),rep(28,415),rep(29,292),rep(30,324),rep(31,254),rep(32,234),
      rep(33,179),rep(34,187),rep(35,167),rep(36,177),rep(37,132),rep(38,152),
      rep(39,117),rep(40,119),rep(41,93),rep(42,113),rep(43,102),rep(44,85),
      rep(45,75),rep(46,90),rep(47,72),rep(48,86),rep(49,62),rep(50,78),
      rep(51,61),rep(52,57),rep(53,50),rep(54,44),rep(55,49),rep(56,55),
      rep(57,34),rep(58,34),rep(59,25),rep(60,21),rep(61,18),rep(62,19),
      rep(63,11),rep(64,16),rep(65,7),rep(66,5),rep(67,13),rep(68,5),rep(69,3),
      rep(70,1),rep(71,3),rep(72,5),rep(73,3),rep(74,4),rep(75,2),rep(77,2),rep(78,2))
n=length(age)
n

# part 1: create a chart

barplot(table(age),
        xlab="Age (in years) at Time of Release",
        ylab="Number of People",
        main="Age at Release from Prison (1978 NCDoc)")

# part 2: average age at release for the population

mean(age)
```

Practice Analysis Exercise 3 (Continued)

```
# part 3: study a simple random sample
```

```
s=sample(1:n,size=100,replace=T)  
sample.age=age[s]  
mean(sample.age)
```

```
# part 4: create a chart showing the ages in the sample
```

```
barplot(table(sample.age),  
        xlab="Age (in years) at Time of Release",  
        ylab="Number of People",  
        main="Age at Release for Random Sample")
```

Results for Practice Exercise 3

