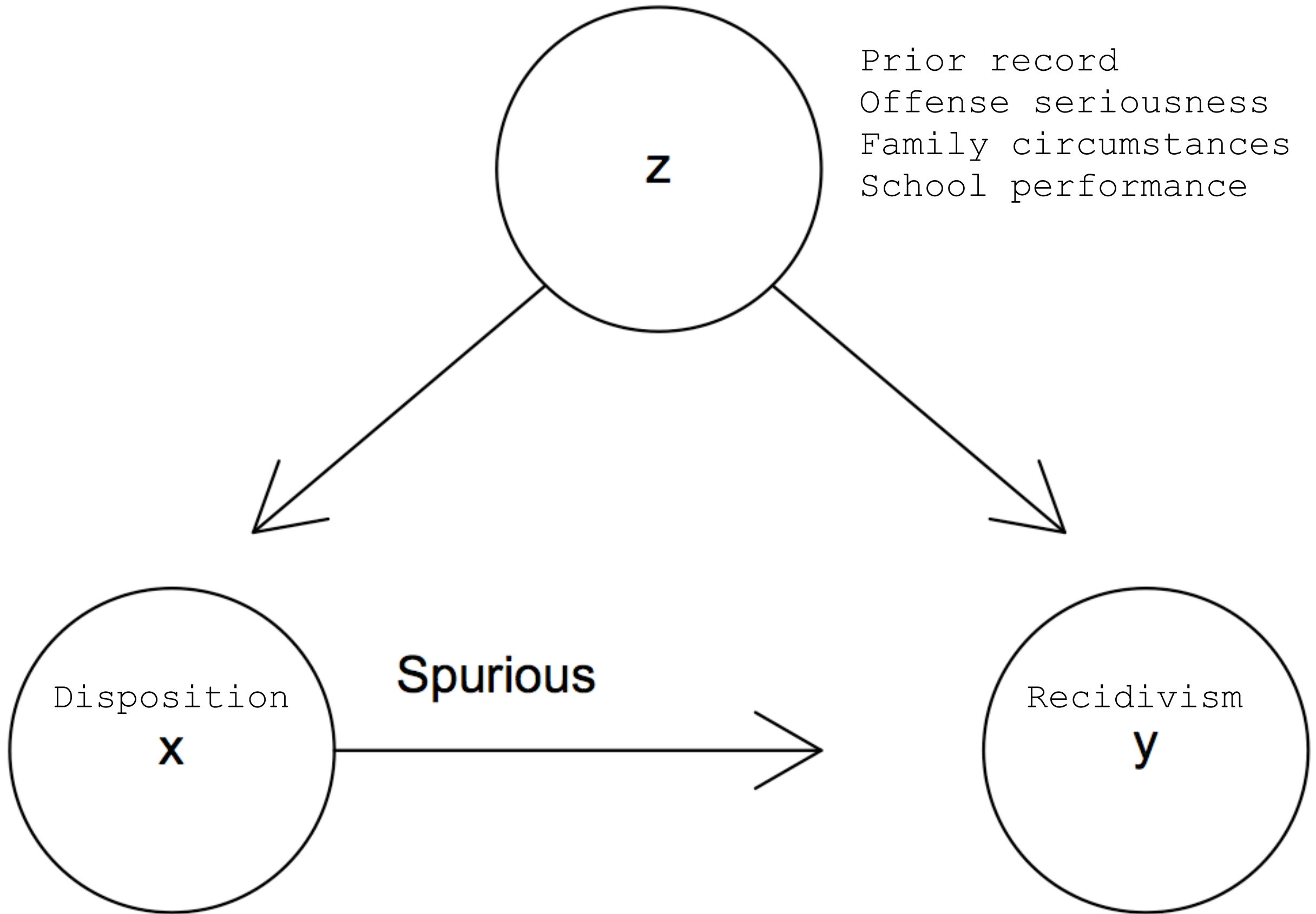# Lesson 5
Thursday 2/8/24

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 <u>interval</u> 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 <u>very difficult</u> 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.
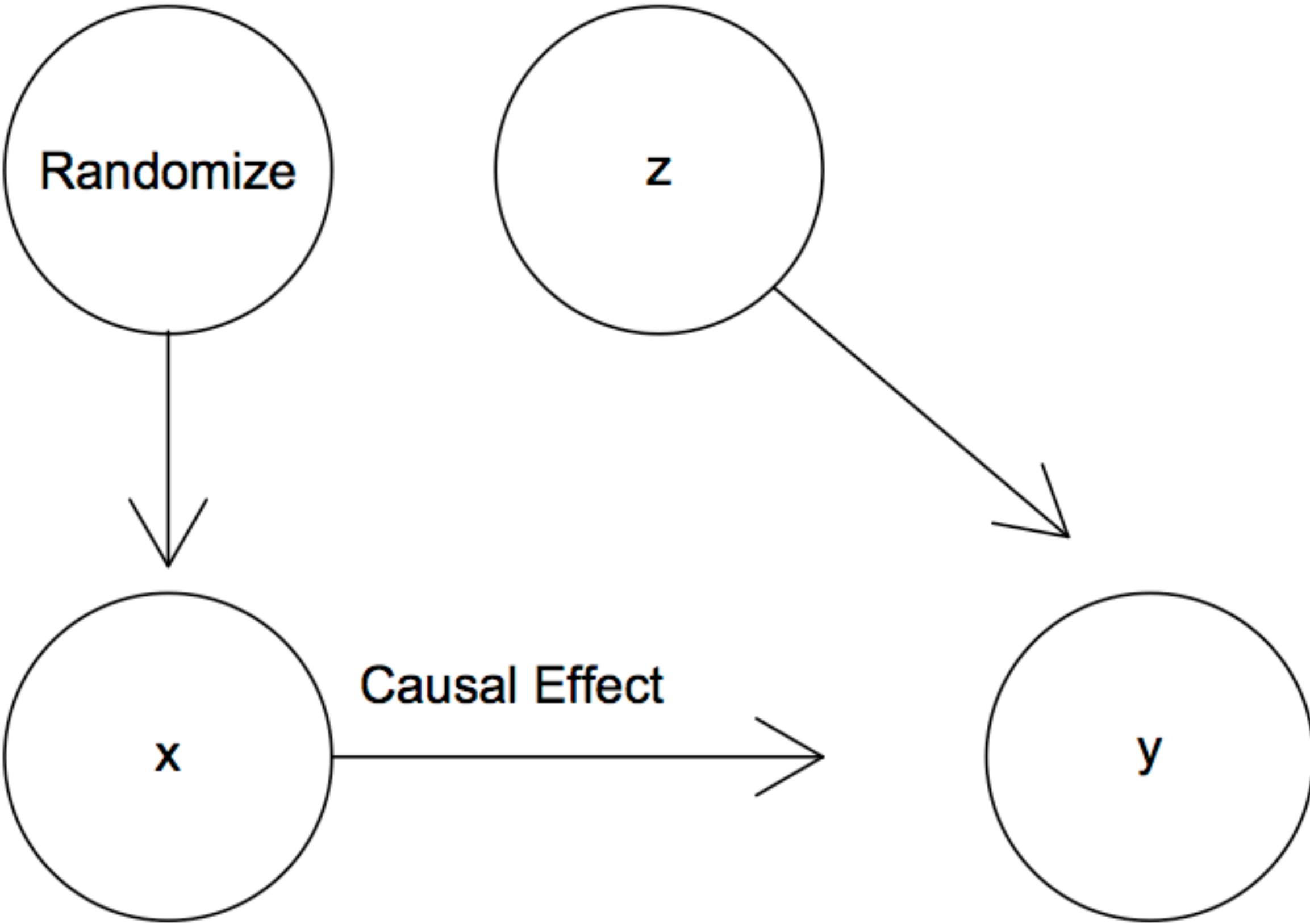
Residential Placement and Recidivism (Manski & Nagin, 1998)

Example 2

- 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?
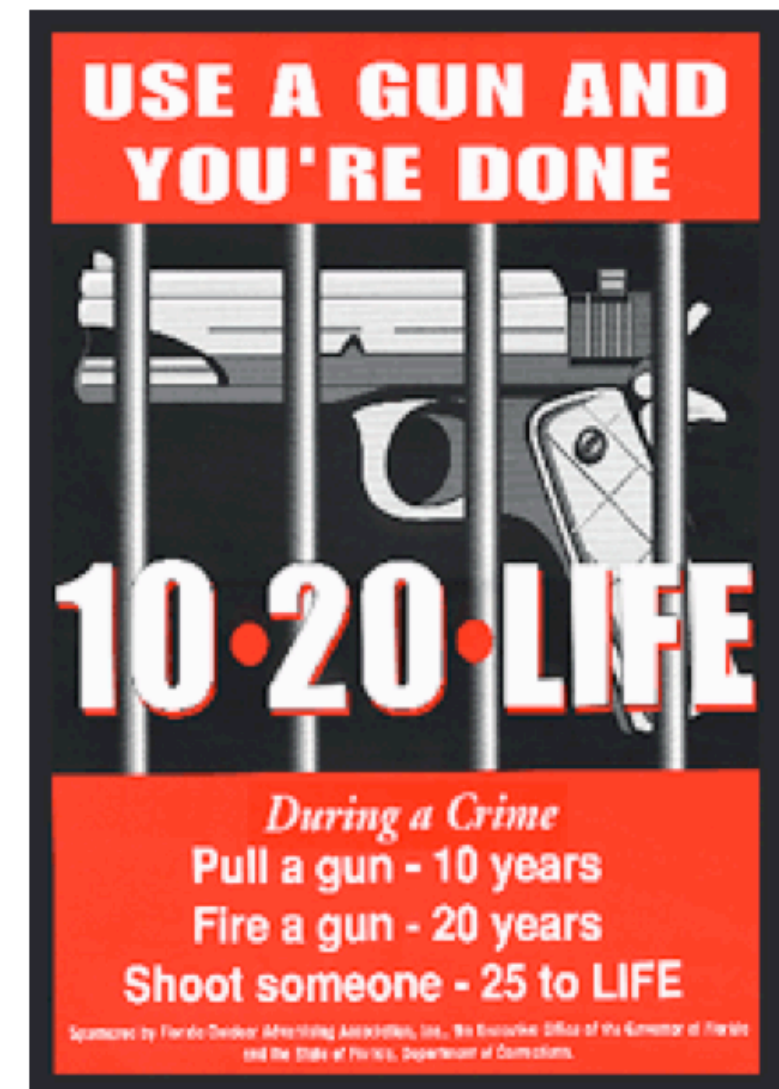
z

Prior record
Offense seriousness
Family circumstances
School performance

Disposition
x

Spurious

Recidivism
y

Example 3

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


USE A GUN AND YOU'RE DONE

10·20·LIFE

During a Crime
Pull a gun - 10 years
Fire a gun - 20 years
Shoot someone - 25 to LIFE

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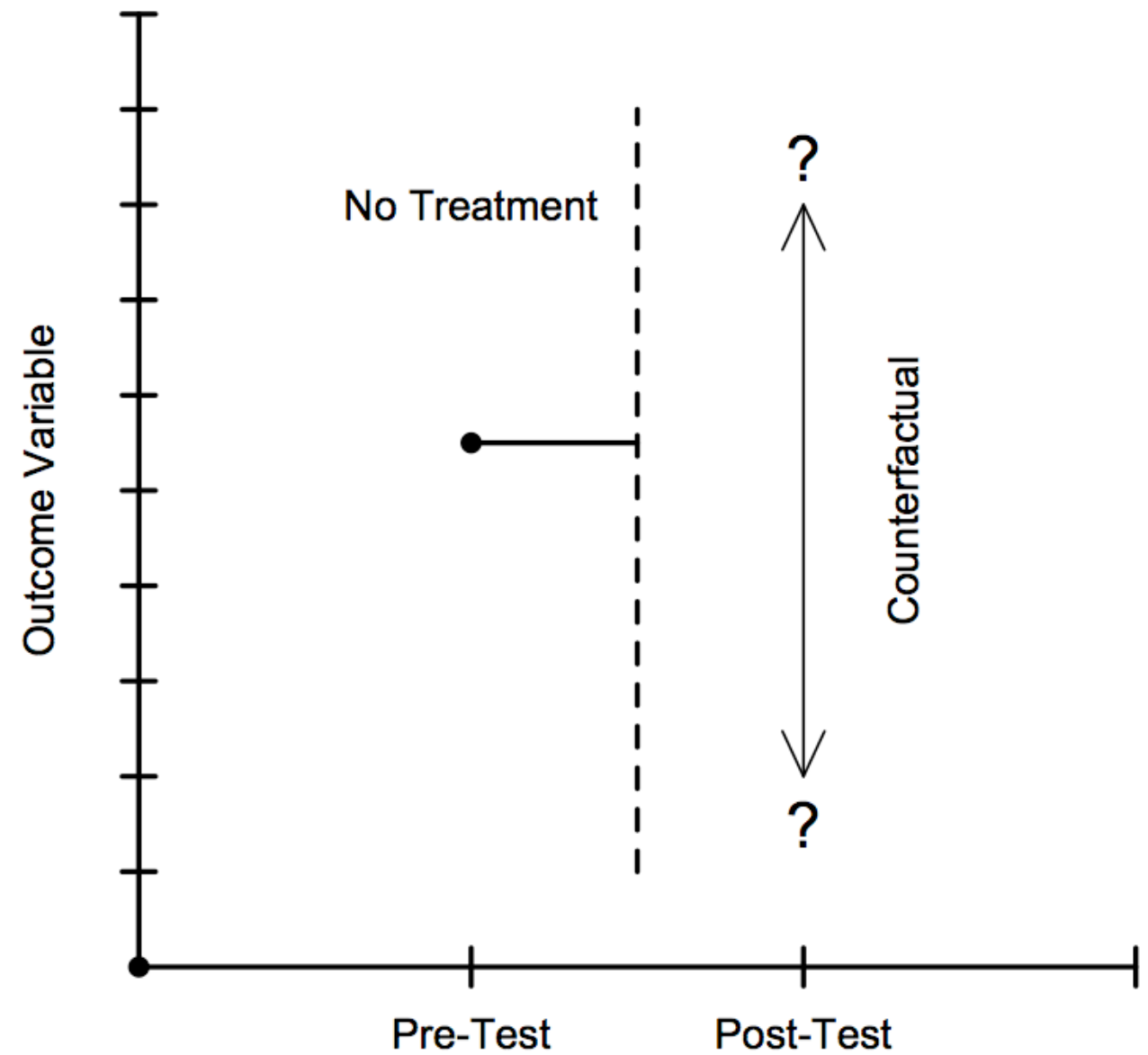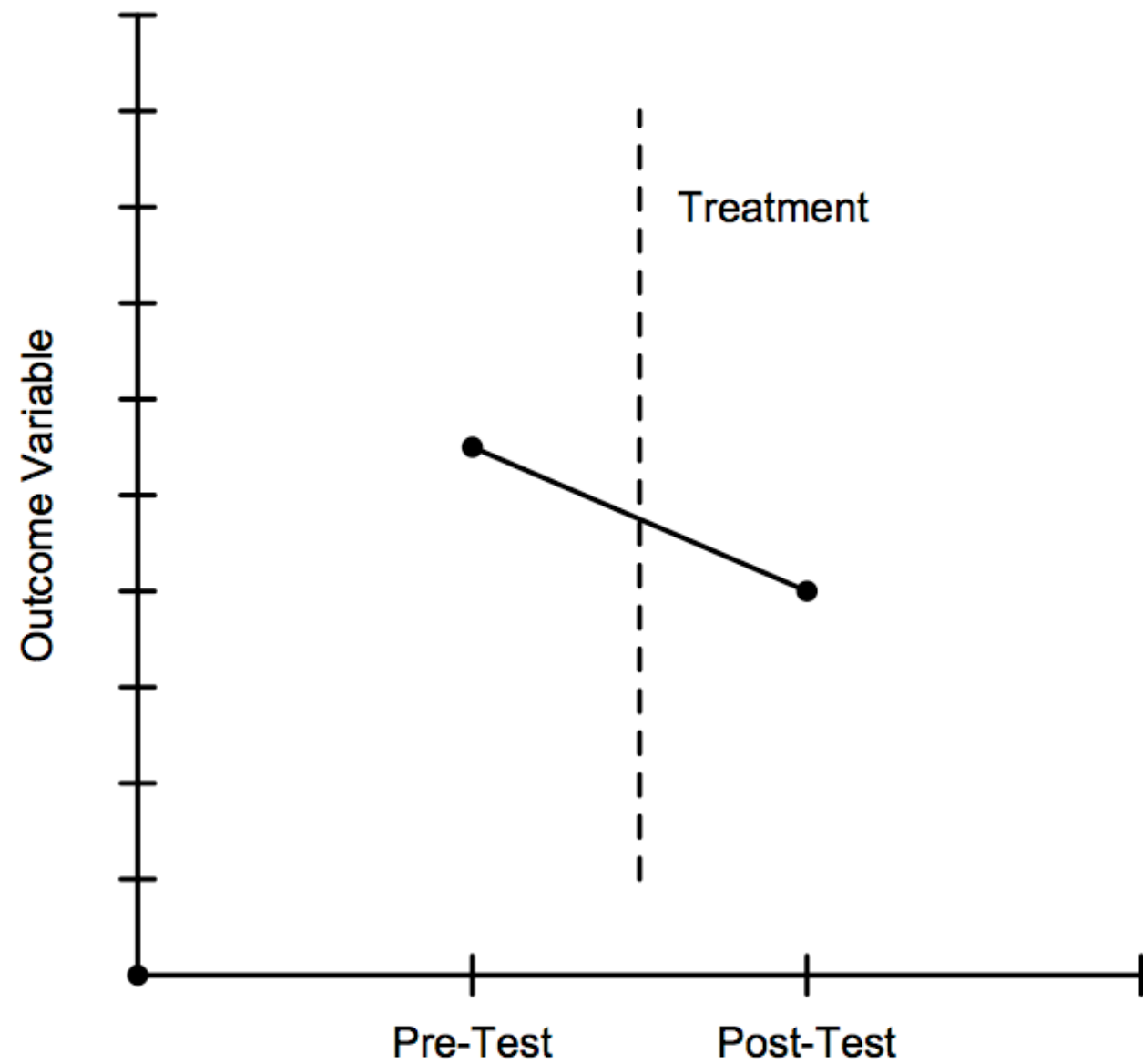
Source: Alex R. Piquero (2005). Reliable information and rational policy decisions: does gun research fit the bill? Criminology & Public Policy, 4:779-798.

Florida Gun Robberies (1971-2009)
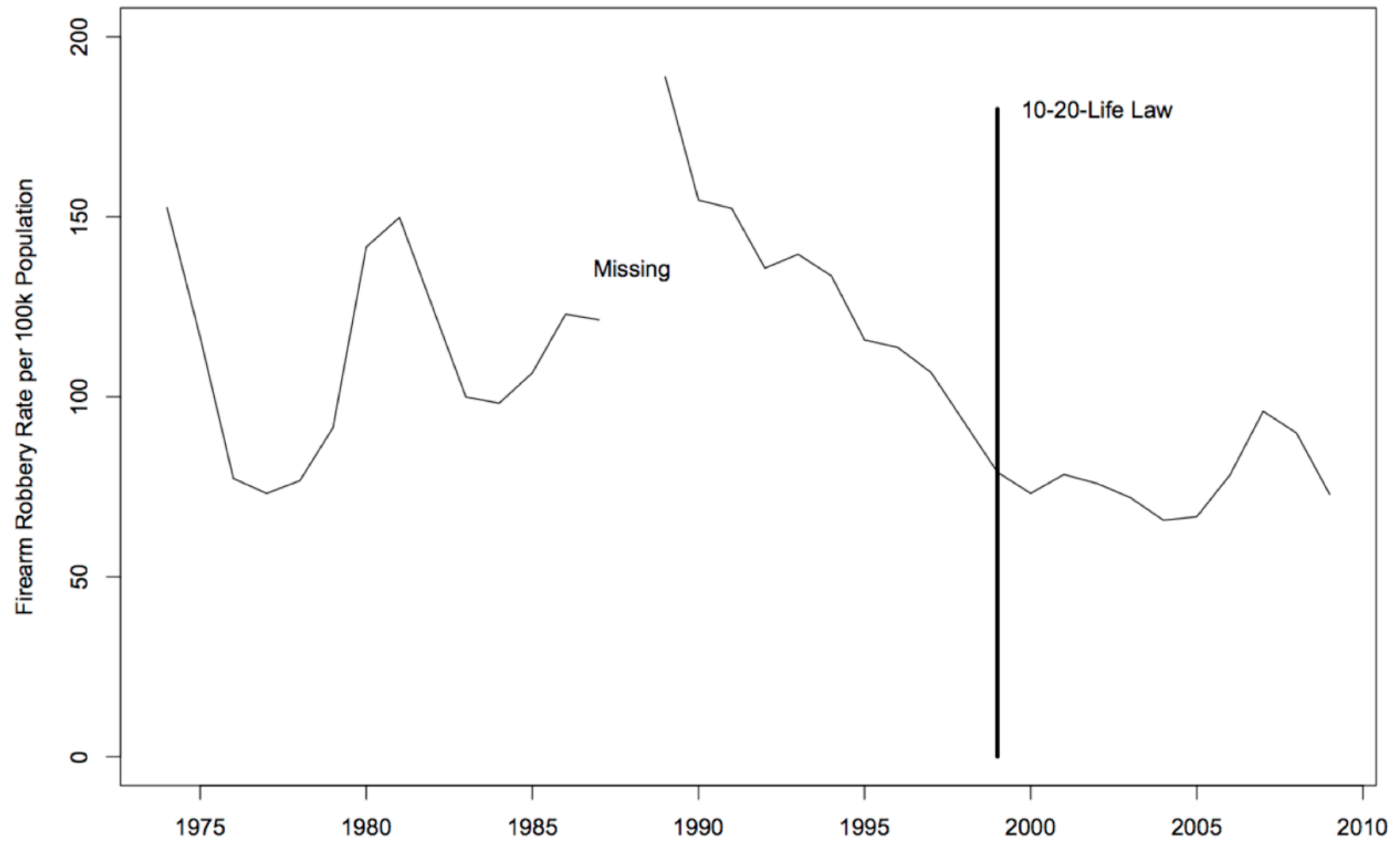
Fundamental Problem of Causal Inference

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?

- <u>Note</u>: 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)
```
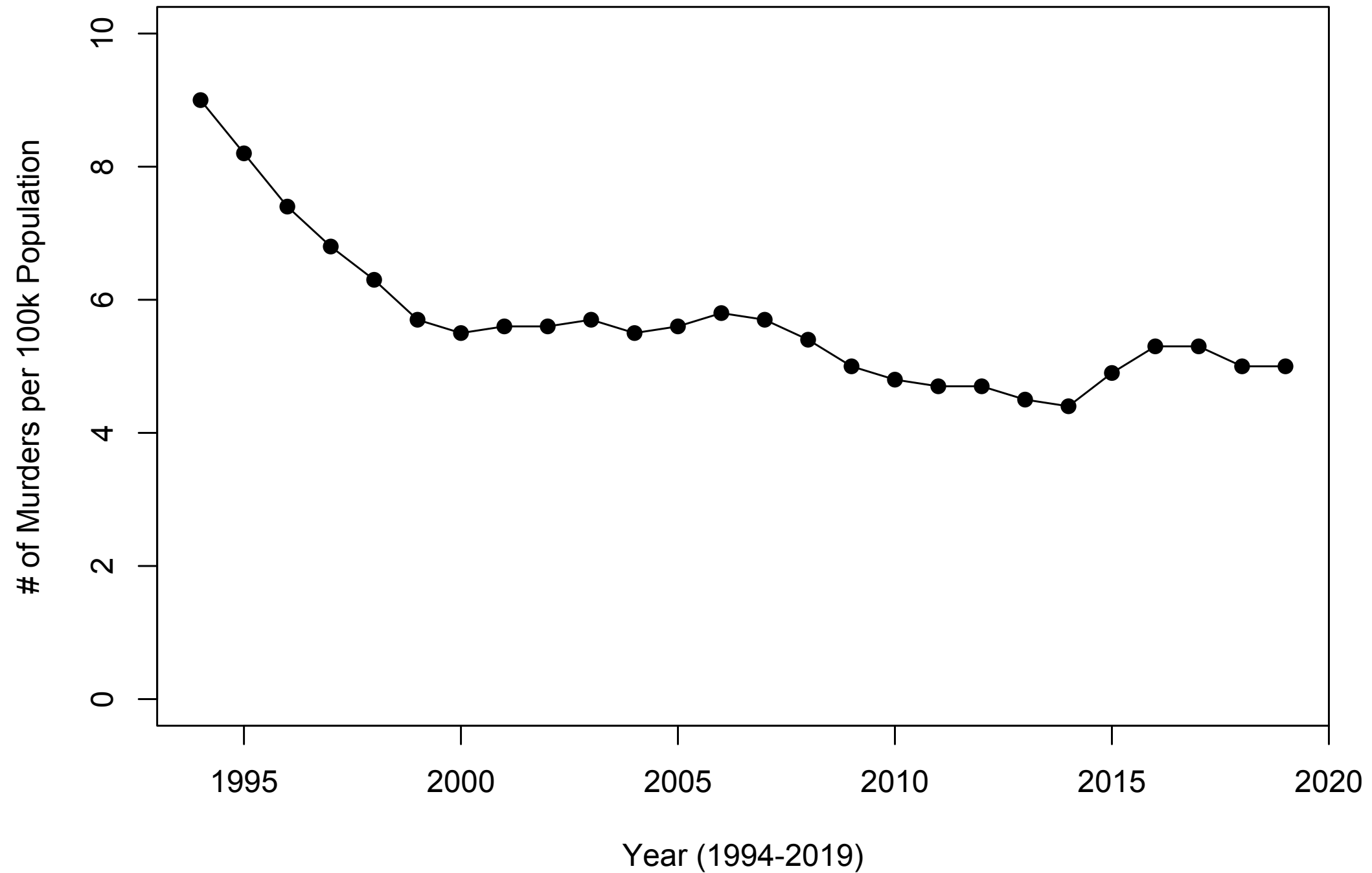
R Code on Last Slide Draws This Chart

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

Age at Release from Prison (1978 NCDOC)

N = 9,327
Mean = 29.328

Age at Release for Random Sample

N = 100
Mean = 29.58