H.W. Type I + II Errors & Power New Book

p. 565-567 23, 25, 30-32

p. 608-610 85, 87, 89, & 93

23. $H_0: \mu = \$85{,}000$ $H_a: \mu > \$85{,}000$

Type I Reject H_0 but H_0 is true

You find convincing evidence that residents make more than $\$85{,}000$/yr on average but they don't.

Conseq. You open a business in an undesirable location & business could possibly lose $ & close.

Type II Fail to reject H_0 but H_a is true

You do not find convincing evidence that resident make more than $\$85{,}000$/yr on average but they do.

Conseq. You do not open a business in a good area & lose opportunity to make $.

(Type I worse)

25. a) $H_0: p = 0.22$ $H_a: p < 0.22$ p = prop of calls > 8 minutes

Type I Reject H_0 but H_0 is true

You find convincing evidence that emergency responders have decreased the proportion of calls that took them more than 8 minutes to respond, but they really didn't

Conseq. They may stop trying to improve their response time & people may die waiting.

Type II Fail to reject H_0 but H_a is true

You do not find evidence that emergency responders have decreased the proportion of calls that took > 8 minutes But they really did improve.

Conseq. Responders may keep trying to improve their response times

b) (Type I worse) - see part a.

c) Because the consequence may be the difference between life & death. should use lower α like .01 instead of .05 smaller α means smaller Type I error

$H_0: p = 0.50$ $H_a: p > 0.50$ p = prop of residents who support 1% increase

30. b.
(not 'a' because 'a' suggest that there could be evidence to support H_0) to fix roads

31. C

32. E

p.608-610 85, 87, 89, 93

85. Power - is the probability that a test will find convincing evidence for H_a (alternative) when a specific alternative value is true
So a power value of 0.764 means there is a 76.4% chance that the company will find convincing evidence that $H_a: p > 0.08$, if the true proportion of potatoes with blemishes in a given truckload is $p = 0.11$

87. a) if ↑ α to 0.10 then β ↓ ∴ Power ↑
if you increase α it is easier to reject H_0 is favor of H_a + Power is when you Reject H_0 in Favor of H_a correctly.

b) if n ↓ 250 instead of 500 then variability goes ↑ more overlap
Power ↓

c) $p = 0.10$ instead of $p 0.11$, effect size ↓, then less distance between the parameter ∴ more overlap → Power ↓
Harder to detect a difference between the parameters

89. a) Larger α increases probability of a Type I error.
More easily reject H_0 when H_0 is true.
You send potatoes back when you should'n't

b) Larger sample takes more time + money.

93. a) Power = $1 - \beta$ (Prob Type II error)
Power = $1 - 0.14 = 0.86$

b) Prob of Type I Error = α $\alpha = 0.01$