Panel 1

Difference of Means

$H_0: \mu_1 = \mu_2$

$H_a: \mu_1 \neq \mu_2$

z_0 or t_0 $\qquad \dfrac{\bar{X}_1 - \bar{X}_2 - \cancel{(\mu_1 - \mu_2)}^{=0}}{S}$, $S = \sqrt{\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}}$

large n   small n

Decide:

reject

$p = 2P(z > |z_0|) < 0.05$, $n_1 > 30$, $n_2 > 30$

$df = n_1 + n_2 - 2$, $t_{0.025}$ col: t_a if $|t_0| > t_a \Rightarrow$ reject H_0

Answer: Reject H_0 Inconclusive

Panel 2

Ex: Sample I: $n_1 = 110$, $\bar{X}_1 = 17.8$, $S_1 = 4.91$

$n_2 = 140$, $\bar{X}_2 = 14.1$, $S_2 = 5.25$

$H_0: \mu_1 = \mu_2$

$H_a: \mu_1 \neq \mu_2$

$t_0 = \dfrac{\bar{X}_1 - \bar{X}_2 - (\mu_1 - \mu_2)}{S} = \dfrac{17.8 - 14.1}{2.04} =$ $\qquad S = \sqrt{\dfrac{4.91^2}{11} + \dfrac{5.25^2}{14}}$

$= \sqrt{2.19 + 1.96} = 2.04$

$= 1.81 = z_0$, $p = 2P(z > 1.81) = 2 \cdot 0.0352 = 0.07$

$df = 11 + 14 - 2 = 23$ $\Big\}$ $t_a = 2.069$ If $t_0 > t_a$, $\cancel{1.81 > 2.069}$

$t_{0.025} =$

Inconclusive

Panel 3

Proportions

So far our procedures (tests + conv. intervals) work only for numerical variables!

What if I have categorical variables?

Ex: Do you have health insurance
use the proportion of people with health insur.

As a Canadian, are you for or against Quebec's independence
use proportion of people for independence

3

Panel 4

Consider experiment with 2 outcomes
success = 1 , failure = 0

Ex: person with insurance = S
person for Quebec indep = S
heads in a coin toss = S

Let π be the probability of success: $\pi = P(x=S)$

To estimate π, conduct exp. N times and use proportion of S.

4

Panel 5

Fact: The std. dev. is $S = \sqrt{\pi(1-\pi)}$

Confidence Intervals, $n \geq 30$

Recall: $\bar{X} \pm M \cdot S/\sqrt{n}$, $M = 1.645$ or 1.96 or 2.54

Thus: $\bar{X} - M \cdot \sqrt{\frac{\pi(1-\pi)}{n}}$ to $\bar{X} + M \cdot \sqrt{\frac{\pi(1-\pi)}{n}}$

Ex: A 2006 Florida poll asked: Is it okay to create laws restricting access to guns. Ask 1200 voters, 396 say "yes". Want confidence interval for π (yes = success)

5

Panel 6

π is between $\bar{X} - M \cdot S/\sqrt{n}$ =

$\bar{x} + M\ S/\sqrt{n}$ 95%

$\bar{X} = 396/1200 = 0.33$ (When in doubt, $M = 1.96$)

$1.96 \cdot \sqrt{\frac{\pi(1-\pi)}{n}} = 1.96 \sqrt{\frac{0.33 \cdot (1-0.33)}{1200}} = 0.0136 \cdot 1.96 = 0.026$

From $0.33 - 0.026 = 0.304$

to $0.33 + 0.026 = 0.356$

6