Formulas for Final (HS 167)

Notes:

- Focus on Purpose, Methods, and Results (biostatistics *not* merely computational methods)
- Testing steps: H_0, test stat, *P*-value and interpretation (interpret *P*-value on a continuum)
- Interpret confidence in context of parameter being estimated

Ch 11 Inference about means (single samples and paired samples) – inferential focus is unknown value of population mean or expected value μ

- To test H_0: $\mu = \mu_0$: $t_{stat} = \dfrac{\bar{x} - \mu_0}{SE_{\bar{x}}}$ where $SE_{\bar{x}} = \dfrac{s}{\sqrt{n}}$ and $df = n - 1$
- $(1 - \alpha)100\%$ Confidence interval for $\mu = \bar{x} \pm t_{n-1,1-\frac{\alpha}{2}} \cdot SE_{\bar{x}}$ where $SE_{\bar{x}} = \dfrac{s}{\sqrt{n}}$
- For paired samples, $\bar{x}$ represents mean difference of within-pair differences (i.e., $\bar{x}_d$), s represents standard deviation of within-pair differences (i.e., s_d), and μ represents mean difference parmeter

Ch 12 Two independent means– inferential focus is unknown value of population mean difference or expected mean difference $\mu_1 - \mu_2$

- To test H_0: $\mu_1 - \mu_2 = 0$: $t_{\mathbf{stat}} = \dfrac{\bar{x}_1 - \bar{x}_2}{SE_{\bar{x}_1 - \bar{x}_2}}$ where $SE_{\bar{x}_1 - \bar{x}_2} = \sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}$
  with $df_{\text{conservative}}$ = smaller of $(n_1 - 1)$ or $(n_2 - 1)$ [use df_{Welch} when available]
- $(1 - \alpha)100\%$ CI for $\mu_1 - \mu_2 = (\bar{x}_1 - \bar{x}_2) \pm (t_{df,1-\frac{\alpha}{2}})(SE_{\bar{x}_1 - \bar{x}_2})$

Ch 16: Inference about proportions (single sample) – inferential focus is unknown value of population proportion or expected "probability of success" *p*

- Sample proportion (incidence or prevalence): $\hat{p} = \dfrac{x}{n}$
- $(1 - \alpha)100\%$ CI for $p = \tilde{p} \pm z_{1-\frac{\alpha}{2}} \cdot \sqrt{\tilde{p}\tilde{q}/\tilde{n}}$ where $\tilde{p} = \dfrac{x+2}{n+4}$ and $\tilde{q} = 1 - \tilde{p}$
- To test H_0: $p = p_0$: $z_{stat} = \dfrac{\hat{p} - p_0}{\sqrt{p_0 q_0 / n}}$

Chapters 17: Comparing Two Proportions (cohort samples) – inferential focus is unknown value of ratio of two proportions p_1 / p_2 (otherwise known as the "relative risk")

	+	–	Total
Exposed	a_1	b_1	n_1
Non-exposed	a_2	b_2	n_2

- $\hat{p}_1 = \dfrac{a_1}{n_1}$, $\hat{p}_2 = \dfrac{a_2}{n_2}$, and $\hat{RR} = \dfrac{\hat{p}_1}{\hat{p}_2}$
- $(1 - \alpha)100\%$ CI for $RR = e^{\ln \hat{RR} \pm z_{1-\frac{\alpha}{2}} \cdot SE_{\ln \hat{RR}}}$ where $SE_{\ln \hat{RR}} = \sqrt{\dfrac{1}{a_1} - \dfrac{1}{n_1} + \dfrac{1}{a_2} - \dfrac{1}{n_2}}$
- Use CI at various levels of confidence to test H_0: $RR = 1$