Solution

1.5

$\pi_0 = 0.50$ and $\hat{\pi} = \frac{587}{587+636} = 0.48$.

$z_S = \frac{0.48-0.5}{\sqrt{0.5(1-0.5)/(587+636)}} = -1.40$.

P-value = $P(|Z| \geq 1.40) = 0.16$.

Wald 95% CI: $0.48 \pm 1.96 * \sqrt{0.48(1-0.48)/(587+636)} = 0.48 \pm 0.028 = (0.452, 0.508)$.

Score 95% CI: $(0.48*\frac{1223}{1223+1.96^2}+0.5*\frac{1.96^2}{1223+1.96^2})\pm 1.96*\sqrt{\frac{1}{1223+1.96^2}[0.48(1-0.48)\frac{1223}{1223+1.96^2}+0.5*0.5*\frac{1.96^2}{1223+1.96^2}]} = 0.48 \pm 0.028 = (0.452, 0.508)$.

P-value is greater than 0.05 and $\pi_0 = 0.50$ is contained in 95% CI, so we CANNOT reject the null hypothesis.

2.1

(a)

$p_{mm} = 4351/6716 = 0.648$

$p_{mf} = 1710/6716 = 0.255$

$p_{fm} = 455/6716 = 0.068$

$p_{ff} = 200/6716 = 0.030$

(b)

$p_{m|m} = 4351/6061 = 0.718$

$p_{f|m} = 1710/6061 = 0.282$

$p_{m|f} = 455/655 = 0.695$

$p_{f|f} = 200/655 = 0.305$

(c)

$p_{m|m} = 4351/4806 = 0.905$

$p_{f|m} = 455/4806 = 0.095$

$p_{m|f} = 1710/1910 = 0.895$

$p_{f|f} = 200/1910 = 0.105$