

1)

$H_0: p_1 = 56\%, p_2 = 28\%, p_3 = 12\%, p_4 = 4\%$

H_a : These proportions have changed since 2010.

$\chi^2 = 13.96, p = 0.3\%$. We have evidence that phone ownership proportions have changed since 2010. The second and third categories (cellphone only has far more than expected, and landline only has far fewer than expected) have the largest contribution to χ^2 .

2)

$H_0: p_0 = p_1 = \dots = p_9 = 1/10$ (Digits are chosen randomly.)

H_a : These proportions are not all equal. (Digits are not chosen randomly.)

$\chi^2 = 16.88, p = 5.1\%$. We have evidence that these digits were not chosen randomly. A wee bit ironic, wouldn't you say? Zero is most suspicious, contributing about half of the total to χ^2 , and occurring 21 fewer times than the expected 50.

3)

$H_0: p_1 = p_2 = p_3 = 30\%, p_4 = 10\%$

H_a : The proportions of outs are different than what is claimed in H_0 .

$\chi^2 = 4.48, p = 21.4\%$. We do not have evidence that the proportion of outs in MLB games is different than what is claimed (30% flyout, 30% forceout, 30% strikeout, 10% other). Flyouts are most suspicious, contributing more than half of the total χ^2 , with about 29 more than expected.