1. $\hat{p} = \frac{856}{1228} \doteq 0.6971$

Critical value z^* for 99% = 2.58

∴ An approximate 99% confidence interval for

p = proportion of medical malpractice lawsuits that are dropped or dismissed

is $\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$= 0.6971 \pm (2.58)\sqrt{\frac{(0.6971)(1-0.6971)}{1228}}$

$= 0.6971 \pm 0.0338$

$\doteq 0.697 \pm 0.034$

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2. Let p = proportion of cell phone users who develop cancer of the brain or nervous system.

$\hat{p} = \frac{135}{420{,}095} \doteq 0.0003214$

$z^* = 1.96$

∴ An approximate 95% confidence interval for p is

$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$= 0.0003214 \pm (1.96)\sqrt{\frac{(0.0003214)(1-0.0003214)}{420{,}095}}$

$= 0.0003214 \pm 0.0000542$

$= 0.0321 \pm 0.0054$ %

3

$n = 190$ μ = mean birthweight of infants born to mothers who used cocaine.

$\bar{x} = 2700$ g

$s = 645$ g

$z^* = 1.96$

$\therefore$ An approximate 95% confidence interval for μ is

$$\bar{x} \pm z^* \frac{s}{\sqrt{n}} = 2700 \pm (1.96)\frac{645}{\sqrt{190}}$$

$$= 2700 \pm 91.7$$

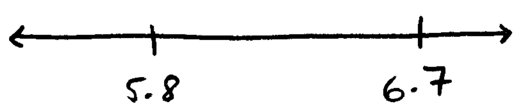
$$= 2700 \pm 92 \text{ g.}$$

4

$n = 150$

$z^* = 1.64$

Confidence interval :



$\bar{x} - z^* \frac{s}{\sqrt{n}}$

$\bar{x} + z^* \frac{s}{\sqrt{n}}$

$$\therefore \quad \frac{2z^* s}{\sqrt{n}} = 6.7 - 5.8$$

$$s = \frac{(6.7-5.8)\sqrt{n}}{2\,z^*} = \frac{(6.7-5.8)\sqrt{150}}{(2)(1.64)}$$

$$= 3.36$$

$$\doteq 3.4 \text{ years.}$$

(5) p = proportion of crimes which are drug offences.

$H_0: \; p = 0.287$

$H_a: \; p > 0.287$

$\alpha = 0.05$

$\hat{p} = \dfrac{31{,}969}{109{,}857} \doteq 0.291.$

$\hat{p}$ normal, mean $\mu = p = 0.287$, standard deviation $\sigma = \sqrt{\dfrac{p(1-p)}{n}} = \sqrt{\dfrac{0.287(1-0.287)}{109{,}857}} \doteq 0.00136$

$z = \dfrac{\hat{p}-\mu}{\sigma} = \dfrac{0.291 - 0.287}{0.00136} \doteq 2.9$

$P(Z \geq 2.9) = \dfrac{100 - 99.81}{100} = 0.0019$

Since $0.0019 < \alpha$, we reject H_0 in favour of H_a: there is reason to believe that more than 28.7% of crimes were for drug offences.

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(6) p = proportion of crashes within 5 miles of home.

$H_0: \; p = 0.5$

$H_a: \; p > 0.5$

$\alpha = 0.01$

$\hat{p} = \dfrac{5720}{11000} = 0.52$ } normal, mean $\mu = 0.5$, standard deviation $\sigma = \sqrt{\dfrac{(0.5)(1-0.5)}{11\,000}} \doteq 0.0048$

$z = \dfrac{\hat{p}-\mu}{\sigma} = \dfrac{0.52 - 0.5}{0.0048} \doteq 4.2$ } Off the scale!

$P(Z \geq 4.2) \doteq 0$ (certainly <u>much</u> less than $\alpha = 0.01$).

$\therefore$ We reject H_0 in favour of H_a: there is strong evidence to conclude that more than 50% of car crashes occur within 5 miles of home.

⑦ p = proportion of households using email.

$H_0: \; p = 0.15$

$H_a: \; p > 0.15$

$\alpha = 0.05$

$\hat{p} = \dfrac{149}{880} \doteq 0.169$ } Approx. normal, mean $\mu = 0.15$, standard deviation

$\sigma = \sqrt{\dfrac{(0.15)(1-0.15)}{880}} \doteq 0.0120$

$z = \dfrac{\hat{p}-\mu}{\sigma} = \dfrac{0.169 - 0.015}{0.0120} \doteq 1.6$.

$P(Z \geq 1.6) = \dfrac{100-94.52}{100} \doteq 0.0548$

Since $P = 0.0548 > \alpha$ we do not have enough evidence to reject H_0.

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⑧ p = proportion of adults who never drink.

$H_0: \; p = \frac{1}{3} \doteq 0.333$

$H_a: \; p < 0.333$

$\alpha = 0.05$

$\hat{p} = \dfrac{312}{976} \doteq 0.320$ } Approx. normal, $\mu = 0.333$, $\sigma = \sqrt{\dfrac{(0.333)(1-0.333)}{976}} \doteq 0.015$

$z = \dfrac{\hat{p}-\mu}{\sigma} = \dfrac{0.320 - 0.333}{0.015} \doteq -0.9$

$P(Z \leq -0.9) = \dfrac{18.41}{100} \doteq 0.18$

Since $P = 0.18 > \alpha$ (much greater!) there is no reason to believe that less than ⅓ of adults never drink.

(9) p = proportion of Clarinex users experiencing fatigue

H_0 : $p = 0.012$

H_a : $p > 0.012$

$\alpha = 0.01$

$\hat{p} = 0.021$

$n = 1655$

$\Big\}$ Approx normal, $\mu = 0.012$, $\sigma = \sqrt{\dfrac{0.012(1-0.012)}{1655}} \doteq 0.0027$

$$z = \frac{\hat{p}-\mu}{\sigma} = \frac{0.021-0.012}{0.0027} \doteq 3.3$$

$$P(Z \geq 3.3) = \frac{\cancel{100}\ 99.95}{100} = 0.0005$$

Since $P = 0.0005 < \alpha$ we reject H_0 in favour of H_a : there is strong evidence to conclude that the percentage of Clarinex users who experience fatigue is greater than 1.2%.

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(10) μ = mean weight change of those on diet

H_0 : $\mu = 0$

H_a : $\mu < 0$.

$\sigma = 4.8$ lbs.

$\bar{x} = -2.1$ lbs.

$n = 40$

$\Big\}$ $\bar{x}$ approx. normal, mean 0, standard deviation $\dfrac{4.8}{\sqrt{40}} \doteq 0.76$

$$z = \frac{\bar{x}-0}{0.76} = \frac{-2.1-0}{0.76} \doteq -2.8$$

$$P(Z \leq -2.8) = \frac{100-99.74}{100} = 0.0026.$$

Since $P = 0.0026$ is much less than $\alpha = 0.05$, there is sufficient reason to believe that the mean weight change of those on the diet is less than zero.

(11) μ = mean perceived length of a minute for general population

$H_0 : \quad \mu = 60$

$H_a : \quad \mu < 60$

$n = 40$

$\bar{x} = 58.3$ seconds

$\sigma = 9.5$ seconds

$\bar{x}$ approx. normal, mean 60, standard deviation $\frac{9.5}{\sqrt{40}} \doteq 1.5$

$$z = \frac{58.3 - 60}{1.5} = -1.1$$

$$P(Z \leq -1.1) = \frac{13.57}{100} \doteq 0.14$$

Though no level of significance was given, $P = 0.14$ is not small enough to warrant rejecting H_0 at any reasonable α. That is, the evidence is not sufficient to conclude that, for the general population, the mean perceived length of a minute is less than 60 seconds.