Geometric Dist.

X = # trials required to observe the first success

Each trial results in Success or Failure

p = P(Success on single trial) is constant

$$P(x) = (1-p)^{x-1}\,p \quad \text{for } x = 1, 2, 3, \ldots$$

$$\mu = \frac{1}{p}$$

$$\sigma = \sqrt{\frac{1-p}{p^2}}$$

Normal Dists:

Properties

Standard Normal Dist

$Z \sim$ Normal, $\mu = 0$, $\sigma = 1$

Normal Dist. Applications

$P(X < a)$

$P(X > b)$

$P(a < X < b)$

Z-transform

$$Z = \frac{X - \mu}{\sigma}$$

Standard Normal Table (E)

Normal Approx. of Binomial Probs:

$\mu = np$

$\sigma = \sqrt{np(1-p)}$

Continuity Correction

Conditions:

$np > 5$ and $n(1-p) > 5$

R.2.13

ch 7

Population (Actual vs. Conceptual)

Sample

Representative Sample

Reasons for Sampling

Save time, money, effort

Make inferences

Sampling Methods

Random Sampling

Randomized Controlled Experiment

Measured Value =

true value + bias + random error

Central Limit Thm.

1) IF the data from normal dist. then $\bar{X}$'s dist is normal (any n)

2) IF n large, $\bar{X}$'s dist is approx. normal

Effect on $\bar{X}$'s dist - sample size n

$$\sigma_{\bar{x}} = \sigma/\sqrt{n}$$

$$\mu_{\bar{x}} = \mu$$

Point estimator

Interval estimate

$100(1-\alpha)\%$ C.I. on μ (large n):

$$\bar{X} \pm z\,(\sigma/\sqrt{n}) \qquad s \approx \sigma$$

$$\bar{x} \pm z\,(s/\sqrt{n})$$

$100(1-\alpha)\%$ C.I on μ (Small n):

$$\bar{X} \pm t\,(s/\sqrt{n}) \qquad df = n-1$$

t-dist:

Properties

Using table

Determining the Sample Size for $100(1-\alpha)\%$ CI on μ

$$z*(s/\sqrt{n}) = B \qquad \text{solve for } n$$

R.2.16

Factors affecting width of a C.I.

1) n

2) s

3) confidence level

$(1-\alpha)100\%$

90%	$z = 1.645$
95%	$z = 1.960$
99%	$z = 2.578$

$100(1-\alpha)\%$ C.I. on p:

$$\hat{p} \pm Z\sqrt{\frac{(\hat{p})(1-\hat{p})}{n}}$$

Determining Sample Size for

$100(1-\alpha)\%$ C.I. on p:

$$Z\sqrt{\frac{(\hat{p})(1-\hat{p})}{n}} = B$$

Solve for n

$100(1-\alpha)\%$ C.I. on μ_d (Paired diff.):

$$\bar{d} \pm t\left(s_d/\sqrt{n}\right)$$

$$s_d = \sqrt{\frac{\Sigma(d-\bar{d})^2}{n-1}}$$

$$= \sqrt{\frac{\Sigma d^2 - \frac{(\Sigma d)^2}{n}}{n-1}}$$

$100(1-\alpha)\%$ C.I. on $\mu_x - \mu_y$ (Small Samples from Normal pops.

(Unpaired Data):

$$(\bar{x} - \bar{y}) \pm t\, s_p \sqrt{\frac{1}{n} + \frac{1}{m}}$$

where

$$s_p = \sqrt{\frac{(n-1)s^2 + (m-1)s^2}{n_1 + m - 2}}$$

$$df = n + m - 2$$

$100(1-\alpha)\%$ C.I on $\mu_x - \mu_y$ (Large Samples)

$$(\bar{x} - \bar{y}) \pm z \sqrt{\frac{s_x^2}{n} + \frac{s_y^2}{m}}$$

$100(1-\alpha)\%$ C.I. on $p_1 - p_2$

$$(\hat{p}_1 - \hat{p}_2) \pm z \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n} + \frac{\hat{p}_2(1-\hat{p}_2)}{m}}$$