
بسم الله الرحمن الرحيم
In the name of ALLAH
the most Beneficent and the most merciful

Standard Error of Proportions

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Standard Error of Difference between Two Proportions

- Now qualitative data in which the character remains the same while frequency varies will be studied. Number with the same class such as male, rich, survived, vaccinated, cured, died, etc. are counted to form a group.

Standard Error of Proportions

- Information is not always quantitative and all data cannot be expressed as measured values. If a quality, attribute or character of a series of persons is described as vaccinated or unvaccinated, alive or dead, etc. such data, being qualitative in nature, is presented simply as the number counted to be positive or negative for the attribute.

Standard Error of Proportions

- For example, out of 100 persons whose blood groups were typed, 10 were negative. This type of data is expressed as a proportion by saying that the proportion of Rh negativity in the sample is 10/100 or 0.1.

Standard Error of Proportions

- If a sample is divided into two classes only, such as successes and failures, vaccinated and not vaccinated, polymorphs and nonpolymorphs, etc. it is called a binomial sample having binomial classification

Standard Error of Proportions

- If the sample is divided into more than two classes such as blood groups A, B, O and AB or WBC types polymorphs, lymphocytes, eosinophils, etc. the sample is called multinomial.

Standard Error of Proportions

- The proportions of positive and negative attributes or classes in a binomial sample are expressed as:

$$p = \frac{r}{n}$$

$$= \frac{\text{Number having a specific character}}{\text{Total number in the sample}}$$

Standard Error of Proportions

- p is the probability of occurrence of the positive attribute such as attacked, vaccinated, etc. and
- q = (1 – p) is the probability of non-occurrence of the same attribute such as not attacked, unvaccinated, etc.

Standard Error of Proportions

- The concept of standard error of proportion (SEP) and its derivation is similar to that of standard error of the mean.

$$SEp = \sqrt{\frac{pq}{n}}$$

- where p is the positive attribute and
- q = 1 – p.

Standard Error of Proportions

- Example. 30 out of 100 persons in a sample had blood group A.
- Find the SEp and the 95 percent limits of confidence.
- Could this sample be from a universe in which the prevalence of blood group A is 40 percent ?

Standard Error of Proportions

- p = 0.3,   q = 1 – 0.3 = 0.7,   n = 100

$$SEp = \sqrt{\frac{pq}{n}} = \sqrt{\frac{0.3x0.7}{100}} = 0.0458$$

- 95% confidence limits = 0.3 + 2 × 0.0458
- i.e. 0.3916 and 0.2084
- Since the proportion 0.4 is outside the 95 percent confidence limits, we can say with 95 percent confidence that the sample is not drawn from a universe having 40 percent prevalence of blood group A.

Standard Error of Difference between Two Proportions

- This test measures the probability of chance occurrence of a particular difference between two sample proportions. If the observed difference between two proportions ($p_1 - p_2$) is more than twice the SE of difference, it is significant at 95 percent confidence level.

Standard Error of Difference between Two Proportions

SE of difference in proportions $= \sqrt{\dfrac{p1q1}{n1} + \dfrac{p2q2}{n2}}$

Standard Error of Difference between Two Proportions

- Example . Suppose cholera mortality in one sample of 50 is 7 and in another sample of 50 it is 18.
- Find SE of difference between proportions.
- Is the difference in mortality rates significant?

Standard Error of Difference between Two Proportions

For sample 1,

$$p1 = \frac{7}{50} = 0.14$$

$$q1 = 1 - 0.14 = 0.86$$

- For sample 2,

$$p2 = 18 \div 50 = 0.36$$

$$q2 = 1 - 0.36 = 0.64$$

Standard Error of Difference between Two Proportions

- SE of difference between p1 and p2

$$\sqrt{\frac{0.14 \times 0.86}{50} + \frac{0.36 \times 0.64}{50}}$$

- $\sqrt{0.00241 + 0.00461} = \sqrt{0.00702} = 0.0838$

Standard Error of Difference between Two Proportions

- The difference in mortality rates is more than twice the SE of difference, hence it is significant at 95 percent confidence level.
- The above two tests related to proportions are applicable in case of large samples. For small samples, the Chi-square test is usually applied.

Thank You