Dr.YMT

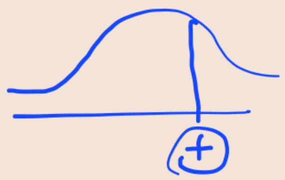
Q.1: The chi-square distribution is:

A) Two-sided, with equal tails on both sides of the mean

B) One-sided, with a single tail to the right

C) One-sided, with a single tail to the left

D) Symmetrical, like the normal distribution



always χ^2 calc.

Q.2: To determine the critical value for a chi-square test, which two pieces of information do you need?

A) Sample size and mean

B) Standard deviation and p-value

C) Degree of freedom and significance level (alpha)

D) Variance and test statistic

Q.3: When the chi-square test is not valid due to having expected frequencies that are too small, which alternative test should be used?

A) Z-test

B) ANOVA

C) T-test

D) Exact test (e.g., Fisher's Exact Test)

(continuity)

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Q.4: A researcher studied the relationship between a new medication and recovery status in 120 patients. The number of patients who recovered using the new medication was 45, while 35 recovered using the standard treatment. The number of patients who did not recover was 15 for the new medication group and 25 for the standard treatment group. Calculate the chi-square statistic with continuity correction and decide if there is an association between between medication type and recovery.

	Recovered	Not Recovered	Total
New medication	45	15	60
standard Medication	35	25	60
Total	80	40	120

- Calc. → 3.0375 * fail to reject Ho.
- Critical → 3.841

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Q.5: To investigate effect of tobacco chewed on oral cancer it's observed that 50 out of 100 patients were tobacco chewers, as compared to 20 tobacco chewers out of 100 control subjects. Is there an association between tobacco chewing and oral Cancer?

	Cancer patients	Controls (Normal)	Total
Chewers	50 35	20 35	70
Non chewers	50 65	80 65	130
Total	100	100	200

① Step 1 ⇒ Observed.

② Step 2 ⇒ Chewers $P_o = \frac{70}{200} \times 100\%$

$= 0.35 \times 100\%$

$= 35\%$

③ Step 3 ⇒ $E = P_o \times N$ (way 1)

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for obs. chew.

$E_1 = 35\% \times 100 = 35$

$E_2 = 35\% \times 100 = 35$

* What's left for nonchewers:

$E_3 = 65$

$E_4 = 65$

4 Step4 ⇒ $\chi^2 = \sum \frac{(O-E)^2}{E}$

A $\frac{(O_1 - E_1)^2}{E_1} = \frac{(50-35)^2}{35} = \frac{(15)^2}{35} = \frac{225}{35} \approx 6.43$

B $\frac{(O_2 - E_2)^2}{E_2} = \frac{(20-35)^2}{35} = \frac{(-15)^2}{35} = \frac{225}{35} \approx 6.43$

c $\frac{(O_3 - E_3)^2}{E_3} = \frac{(50-65)^2}{65} = \frac{(-15)^2}{65} = \frac{225}{65} \approx 3.46$

d $\frac{(O_4 - E_4)^2}{E_4} = \frac{(80-65)^2}{65} = \frac{(15)^2}{65} = \frac{225}{65} \approx 3.46$

* $x^2 = 3.46 + 3.46 + 6.43 + 6.43 = 19.78$

5 Step5 Critical → df $= (r-1)(c-1) = 1$ → always in 2X2 table

→ $\alpha = 0.05$

* Tabulated (critical value) = 3.84

6 Step6 ⇒ critical vs. calculated

calculated (19.78) > critical (3.84)

⇒ So, reject the Ho (fail to Accept Ho).

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($E<1$)

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Q.6: In a hospital ,15 patients were placed in the ICU.8 were given treatment A and 7 were given treatment B. Among them, only one patient showed a rare symptom, and that participant was in treatment A. Is there an association between the presence of the symptoms and treatment type?

	Show Symptoms	Doesn't Show	Total
Treatment A	1	7	8
Treatment B	0	7	7
Total	1	14	15

* Step 1 ⇒ obs.
  - χ^2 not valid
  - use fischer's test.

* Step 2 ⇒ $A\text{-}P_o = \frac{8}{15} \times 100\% = 53.3\%$

* Step 3 ⇒

A → $E_1 = 53.3\% \times 1 = 0.533$

→ $E_2 = 53.3\% \times 0 = 0$

Q.7: The total population of certain city, was 20,000 individuals. There were 1200 DM and of them 200 were MI and died. A study done in 2017, collected all the DM without MI, and 2000 Health (non MI no DM)were followed up for 8 years to find out the develapment of MI. The development of MI was detected in 150 of the DM and 150 of non-DM, within the follow-up period of the study.can we conclude that DM is risk factor of MI?

	MI	No MI	Total
DM	150 99.99	850 899.99	1000
No DM	150 200.01	1850 1800.01	2000
Total	300	2700	3000

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1 Step 1 ⇒ Observed.

2 Step 2 ⇒ DM $P_o = \frac{1000}{3000} \times 100\% = 33.3\%$

(3) Step 3 $\Rightarrow$ $E = P_0 \times N$ (way 1)

* DM $\rightarrow E_1 = 33.3\% \times 300 = 99.99$
$\rightarrow E_2 = 33.3\% \times 2700 = 899.99$

* What's left for non-DM:

* Non-DM $\rightarrow E_3 = 200.01$
$\rightarrow E_4 = 1800.01$

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(4) Step 4 $\Rightarrow$ $\chi^2 = \sum \frac{(O-E)^2}{E}$

(A) $\frac{(O_1 - E_1)^2}{E_1} = \frac{(150 - 99.99)^2}{99.99} \approx 25.01$

(B) $\frac{(O_2 - E_2)^2}{E_2} = \frac{(850 - 899.99)^2}{899.99} \approx 2.78$

(C) $\frac{(O_3 - E_3)^2}{E_3} = \frac{(150 - 200.01)^2}{200.01} \approx 12.5$

(d) $\frac{(O_4 - E_4)^2}{E_4} = \frac{(1850 - 1800.01)^2}{1800.01} \approx 1.39$

* $x^2 = 25.01 + 2.78 + 12.5 + 1.39 = 41.68$

5 Step5 Critical → df $= (r-1)(c-1) = 1$ always in 2x2 table
→ $\alpha = 0.05$

* Tabulated (critical value) = 3.84

6 Step6 ⇒ critical vs. calculated

calculated (41.68) > critical (3.84)

⇒ So, reject the Ho (fail to Accept Ho).

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Q.8: A study was done on 18 of the Asthma patients. Nine patients were treated by bronchodilator inhalers, and the other nine were treated by corticosteroid inhalers . Among the patients using the bronchodilator inhalers, 7 patients showed improvement, while 2 did not. In the patients using corticosteroid inhalers , 4 showed improvement and 5 did not. Is there any relationship between the type of inhaler and the patient's improvement? (Sample Total <20)

	Improved	not Improved	Total
Bronchodilator Inhaler	7	2	9
Corticosteroids inhalers	4	5	9
Total	11	7	18

Sample total <20

χ^2 not valid
use fischer's test

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Q.9: A researcher wants to test if there is an association between gender (male/female) and preference for a new product (like/dislike). The data collected from 100 participants show:

- Males who like the product: 30
- Males who dislike the product: 20
- Females who like the product: 25
- Females who dislike the product: 25

Use a significance level of 0.05 to decide whether to reject or accept the null hypothesis of no association.

Accept H_0

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	like	Dislike	Total
Male	30	20	50
Female	25	25	50
Total	55	45	100

* Calc. → 1.01
* Critical → 3.084

Calc. < Critical
Accept H_0

Q.10: The association between low birth weight and maternal smoking during pregnancy have been studied by obtaining smoking histories from500 women at the time of the first prenatal visit and then subsequently assessing and assigning the low birth weight at delivery. They found that, 50 low birth weight at deliveryamong the 100 women with smoking while 75 low birth weight at delivery among those with non-smoking histories. IS there an association between smoking and low birth weight at delivery?

	low B.W	Not low B.W	Total
Smoking	50 25	50 75	100
Non-Smoking	75 100	325 300	400
Total	125	375	500

1 step 1 → observed

2 step 1 → Smoking $P_o = \frac{1\cancel{00}}{5\cancel{00}} \times 100\% = 20\%$

3 step3 → Smoking expected

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*(way 2) $E = \frac{\text{total column} \times \text{total row}}{N}$

Smoking

$$E_1 = \frac{100 \times 125}{500} = 25$$

$$E_2 = \frac{100 \times 375}{500} = 75$$

Non Smoking

$$E_3 = \frac{400 \times 125}{500} = 100$$

$$E_4 = \frac{400 \times 375}{500} = 300$$

4 Step 4 $\Rightarrow$ $\chi^2 = \sum \frac{(O-E)^2}{E}$

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A $\frac{(O_1-E_1)^2}{E_1} = \frac{(50-25)^2}{25} = \frac{(25)^{\cancel{2}}}{\cancel{(25)}} = 25$

B $\frac{(O_2-E_2)^2}{E_2} = \frac{(50-75)^2}{75} = \frac{(-25)^2}{75} = \frac{625}{75} = 8.33$

C $\frac{(O_3-E_3)^2}{E_3} = \frac{(75-100)^2}{100} = \frac{(-25)^2}{100} = \frac{625}{100} = 6.25$

d $\frac{(O_4-E_4)^2}{E_4} = \frac{(325-300)^2}{300} = \frac{(25)^2}{300} = \frac{625}{300} = 2.083$

$* \chi^2 = 25 + 8.33 + 6.25 + 2.083 \approx 41.67$

5 Step5 $\Rightarrow$ critical $\begin{cases} df = 1 \\ \alpha = 0.05 \end{cases} = 3.84$

6 step6 $\Rightarrow$ $3.84 < 41.67$

Reject the H_o

Dr. YMT

- Began at 2:00 am
- Done at 7:31 am

11/8/2025

Monday