

Homework №18

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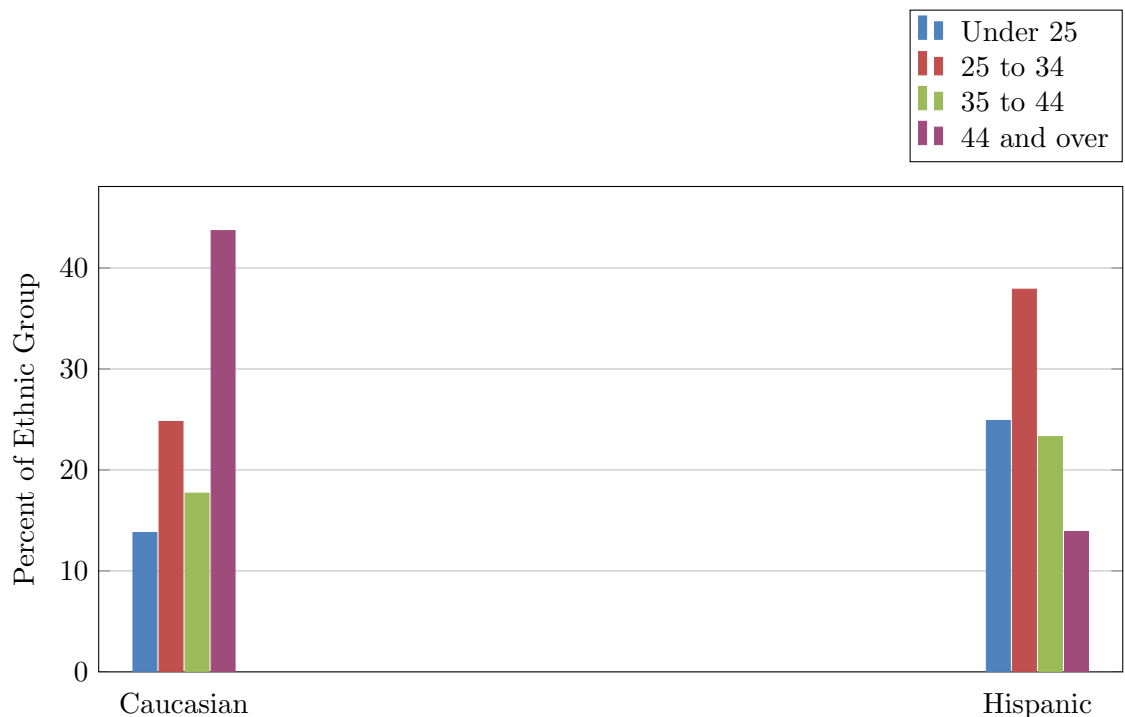
- 25.1 (a) We first need to calculate percentages. For under 25 (Caucasian), we have $\frac{181}{(181 + 324 + 232 + 571)} \approx 13.8\%$, for under 25 (Hispanic), we have $\frac{79}{(79 + 120 + 74 + 44)} \approx 24.9\%$, and we proceed in the same manner.

Finally, we end up with the following two conditional distributions (or a table):

	Caucasian	Hispanic
Under 25	13.8%	24.9%
25 to 34	24.8%	37.9%
35 to 44	17.7%	23.3%
45 and over	43.7%	13.9%

(b)

Below is the bar graph that compares the two conditional distributions.



From the bar graph above, it is easy that over 40% of Caucasian visitors are older than 45. Also, it should be noted that, on average, Hispanic visitors are younger.

- 25.5 (a) Let's first build a table of expected counts.

	Caucasian	Hispanic	Row Total
Under 25	209.3	50.7	260
25 to 34	357.4	86.6	444
35 to 44	246.3	59.7	306
45 and over	495.0	120.0	615
Column Total	1308.0	317.0	1625

From the table above, it is easy to see that row and column totals agree with the totals for the observed counts.

- (b) Hispanic visitors are, on average, younger than Caucasian visitors since the expected counts are smaller than the observed counts for the Caucasians in the older age categories. Besides, observed counts are greater than the expected counts for younger age groups of Hispanics.
- 25.7 (a) The cell-count requirement is satisfied as the expected counts are 209.28, 50.72, 357.39, 86.614, 246.31, 59.694, 495.03, 119.97 and all of these expected counts are greater than 5.
- (b) H_0 : there is no relationship between ethnic group and age of Monterey Bay Aquarium visitors.
 H_a : there is a relationship between ethnic group and age of Monterey Bay Aquarium visitors.
 SAS output shows that $\chi^2 = 99.6058$ and $P < 0.0001$.
- (c) The most significant difference is that Hispanic people visits the aquarium at younger ages. Now, since every cell contributes to χ^2 and the more the difference between the expected and observed, the more the contribution, cells in the Hispanics column contribute the most.
- 25.11 (a) Since there was one sample which was then categorized by two variables, we need to use the chi-square test of independence.
- (b) We start with the **PLAN** part as the **STATE** part is the description of the problem itself.

PLAN

Then our null hypothesis is H_0 : there is no relationship between the age and how politically informed a person is and the alternative hypothesis is H_a : there is a relationship between the age and how politically informed a person is.

SOLVE

Since all expected counts are greater than 5, we can use the chi-procedures. We have $\chi^2 \approx 32.062$ and $df = 12$ with $0.001 < P < 0.0025$ which.

CONCLUDE

Since $0.001 < P < 0.0025 < 0.05$, we reject the null hypothesis H_0 and conclude that there is a relationship between the age and how politically informed a person is.

25.12 (a) $df = (r - a) \times (c - 1) = (4 - 1) \times (2 - 1) = 3 \times 1 = 3.$

(b) With $\chi^2 = 99.6058$ and $df = 3$, we have $P < 0.0005$ which indicates that the result from SAS is more precise than the result from Table D. Besides, the P-value from the SAS output gives us a bigger evidence against the null hypothesis than the P-value from the Table D.

(c) $df = (r - a) \times (c - 1) = (4 - 1) \times (4 - 1) = 3 \times 3 = 9.$

25.14 We start with the **PLAN** part as the **STATE** part is the description of the problem itself.

PLAN

Then our null hypothesis is H_0 : there is no relationship between the bird strikes and tilting windows down so that they reflect earth rather than sky and the hypothesis is H_a : there is a relationship between the bird strikes and tilting windows down so that they reflect earth rather than sky.

SOLVE

We first need to construct a table. We get:

	Vertical	20-degree tilt	40-degree tilt	Total
Strikes	31	14	8	53

From the data above, we get that $\chi^2 \approx 16.11$ and $df = 3 - 1 = 2$ with $P < 0.0005$ (from Table D)

CONCLUDE

Since $P < 0.0005 < 0.05$, we reject the null hypothesis H_0 and conclude that there is a relationship between the bird strikes and tilting windows down so that they reflect earth rather than sky.

25.15 (a) If all days have the same probability, then $p_1 = p_2 = p_3 = p_4 = p_5 = p_6 = p_7 = \frac{1}{7}$ and we expect 100 births on every day.

(b) $\chi^2 = \frac{(84 - 100)^2}{100} + \dots + \frac{(72 - 100)^2}{100} = 19.12.$

(c) $df = c - 1 = 7 - 1 = 6$ with $0.0025 < P < 0.005 < 0.05$ which gives us a strong evidence that births are not spread evenly across the week.