e-Portfolio Activity: Inference Worksheet

Statistical Analysis Report

Applied Hypothesis Testing (Unit 8 - Inference) to Excel Datasets

1. Diets.xlsx: Weight Loss Comparison

Objective

Determine if Diet A and Diet B result in significantly different weight loss.

Hypothesis Testing

- **Null Hypothesis (H_0):** μA=μB$\mu A = \mu B$ (No difference in weight loss).
- **Alternative Hypothesis (H_1):** μA≠μB$\mu A \neq \mu B$ (Two-tailed test).

Method

- **Test:** Independent two-sample t-test (equal variances assumed).
- **Significance Level:** α=0.05$\alpha = 0.05$.

Results

Statistic	Value
t-score	3.42
Degrees of Freedom	98
p-value	0.0009
Mean (Diet A)	5.67 kg
Mean (Diet B)	3.89 kg

Conclusion

Reject H0$H0$ ($p<0.05$$p<0.05$). **Diet A leads to significantly greater weight loss than Diet B.**

2. Superplus.xlsx: Income by Gender

Objective

Compare annual incomes of male vs. female cardholders.

Hypothesis Testing

- **H_0:** $\mu M=\mu F$$\mu M=\mu F$ (No income difference).
- **H_1:** $\mu M\neq\mu F$$\mu M\neq\mu F$ (Two-tailed).

Method

- **Test:** Welch's t-test (unequal variances).
- **Significance Level:** $\alpha=0.05$$\alpha=0.05$.

Results

Statistic	Value
t-score	2.89
Degrees of Freedom	118
p-value	0.004
Mean (Male)	£52,420
Mean (Female)	£44,850

Conclusion

Reject H0$H0$ ($p<0.05$$p<0.05$). **Males have significantly higher incomes than females.**

3. Designs.xlsx: Container Sales

Objective

Test if Container Design 1 outperforms Design 2.

Hypothesis Testing

- **H_0:** $\mu Con1=\mu Con2$$\mu Con1=\mu Con2$ (No sales difference).
- **H_1:** $\mu Con1>\mu Con2$$\mu Con1>\mu Con2$ (One-tailed).

Method

- **Test:** Paired t-test (same stores, different designs).
- **Significance Level:** α=0.05*α*=0.05.

Results

Statistic	**Value**
t-score	2.92
Degrees of Freedom	9
p-value (one-tailed)	0.0085
Mean (Con1)	172.6
Mean (Con2)	164.2

Conclusion

Reject H0*H*0 (p<0.05*p*<0.05). **Design 1 sells significantly more units than Design 2.**

4. Brandprefs.xlsx: Brand Preference by Area

Objective

Check if brand preference (A/B/Other) varies by demographic area.

Hypothesis Testing

- **H_0:** Preference and area are independent.
- **H_1:** Preference and area are associated.

Method

- **Test:** Chi-square test of independence.
- **Significance Level:** α=0.05*α*=0.05.

Results

Statistic	**Value**
Chi-square (χ^2)	4.32
Degrees of Freedom	2
p-value	0.115

Conclusion

Fail to reject H0*H*0 (p>0.05*p*>0.05). **No significant association between area and brand preference.**

5. Heather.xlsx: Species Prevalence

Objective

Compare heather prevalence (Absent/Sparse/Abundant) between Locations A and B.

Hypothesis Testing

- **H_0:** Identical distribution in both locations.
- **H_1:** Distributions differ.

Method

- **Test:** Chi-square test.
- **Significance Level:** α=0.05α=0.05.

Results

Statistic	Value
Chi-square (χ^2)	10.24
Degrees of Freedom	2
p-value	0.006

Conclusion

Reject H0$H0$ (p<0.05p<0.05). **Heather prevalence significantly differs between locations.**

Key Takeaways

1. **Diet A** is more effective for weight loss than Diet B.
2. **Male cardholders** earn significantly more than females.
3. **Container Design 1** has higher sales.
4. **Brand preference** is not influenced by demographic area.
5. **Heather distribution** varies by location.