An exploration of customer information

AXIS INSURANCE

Key insights & business decisions

OBJECTIVES

1. **Medical claims of smokers vs. non-smokers**

   Are the mean charges claimed by smokers higher than those claimed by non-smokers?

2. **BMI of females vs. males**

   Are the BMIs of males and females statistically different from one another?

3. **Proportion of smokers by region**

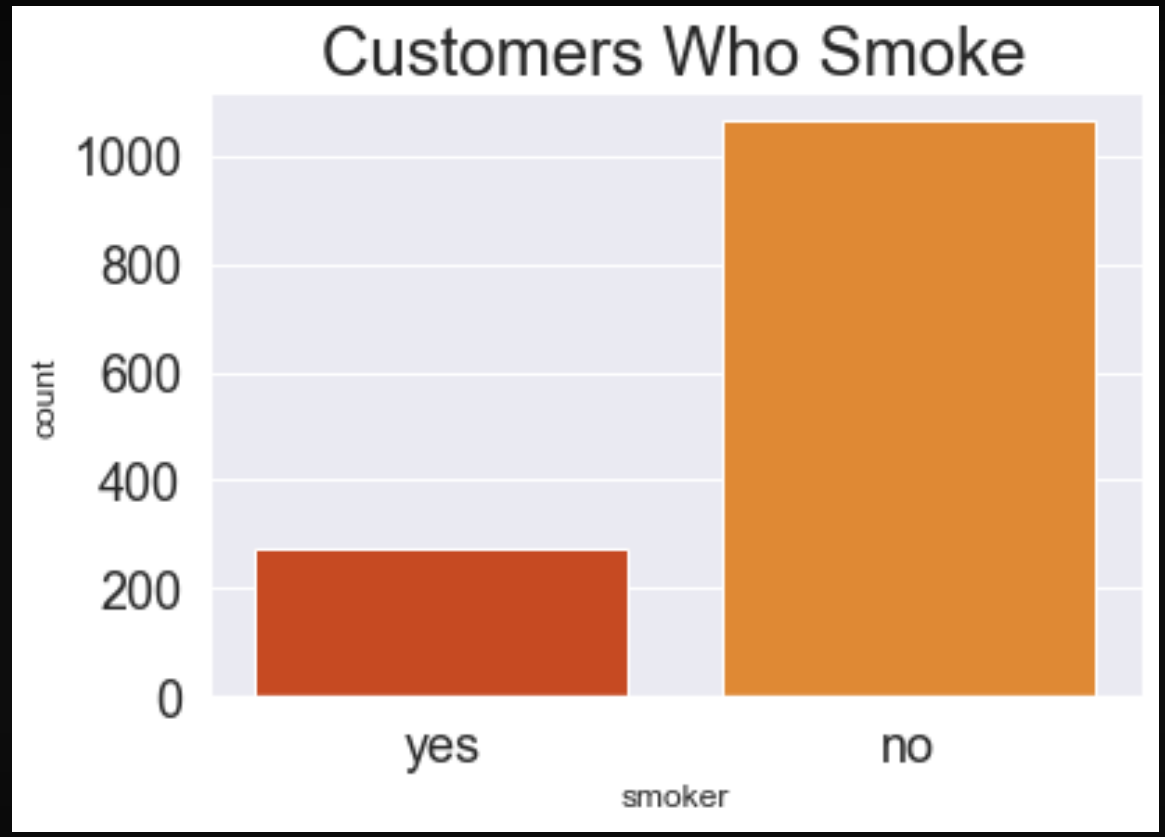
   Is the proportion of smokers statistically different in each region of the country?

4. **BMI of women based on number of children**

   Is the mean BMI of women statistically different based on the number of children they have?

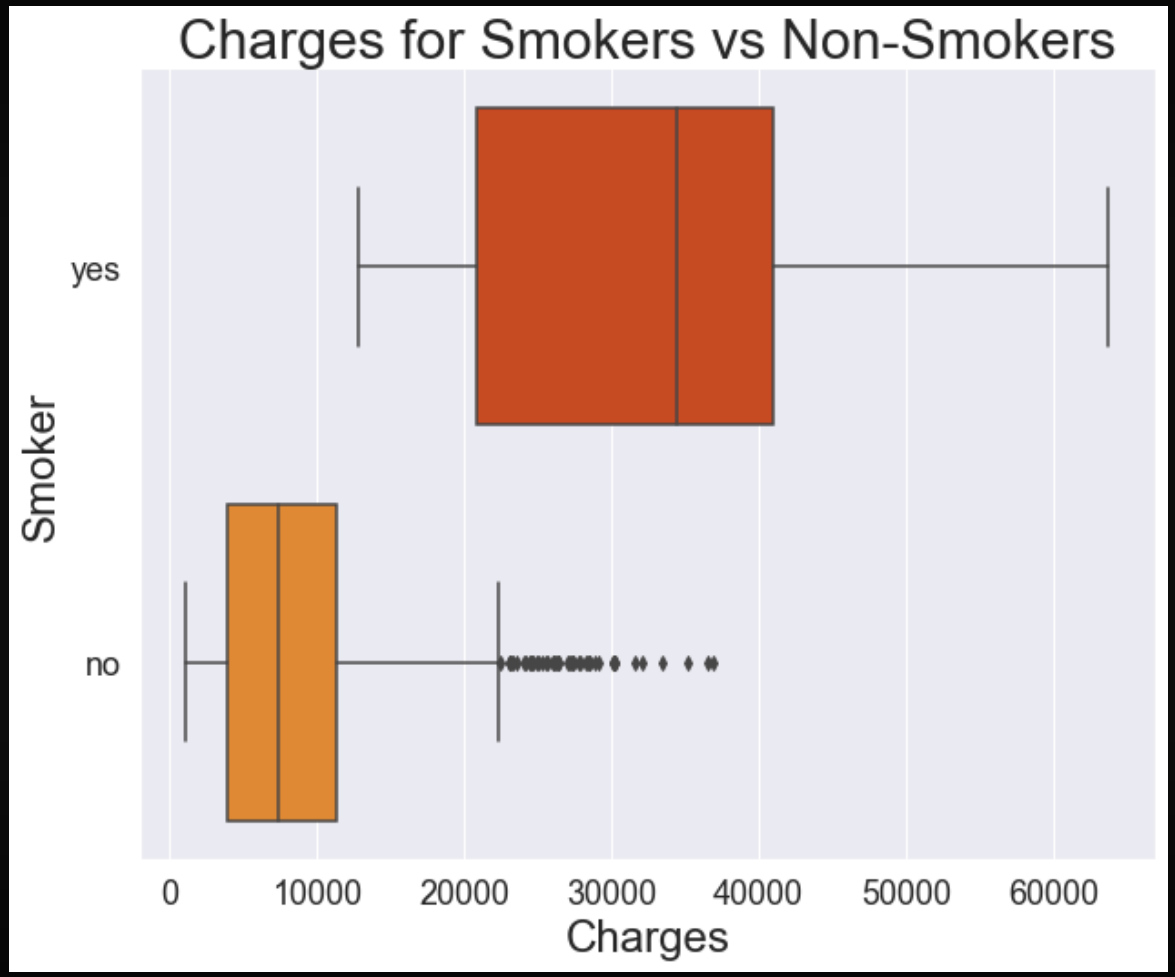
1 Medical claims of smokers vs. non-smokers

- 1,338 customers were analyzed.
- 274 customers smoke (20.5%)
- 1,064 do not smoke (79.5%)



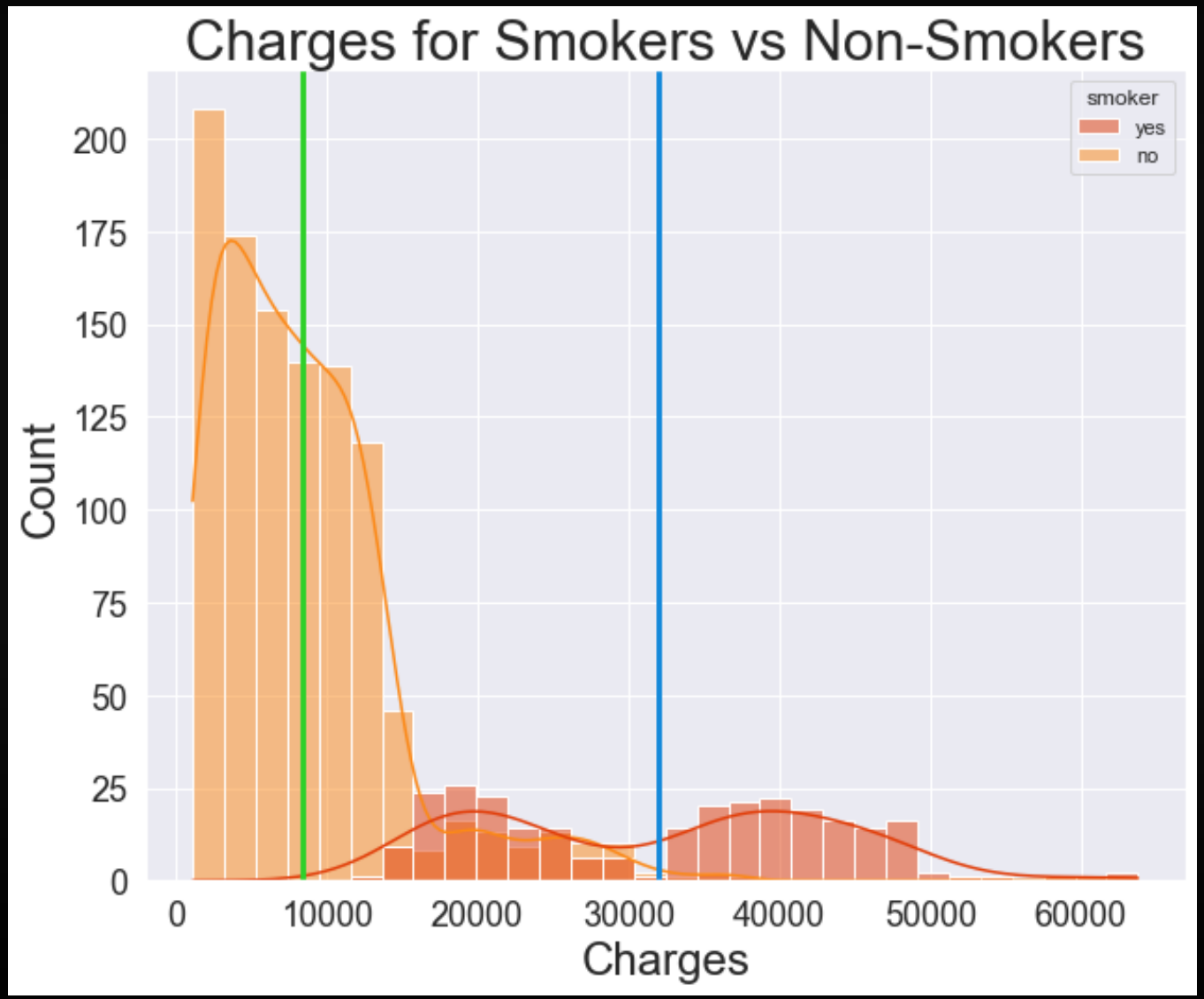
1 Medical claims of smokers vs. non-smokers

- 75% of customers who smoke have claims of approximately $21,000 or more.
- 75% of customers who do not smoke have claims of approximately $12,000 or less.



1 Medical claims of smokers vs. non-smokers

- The average claim of a smoker is $32,050.23.
- The average claim of a non-smoker is $8,434.27.



1 Medical claims of smokers vs. non-smokers

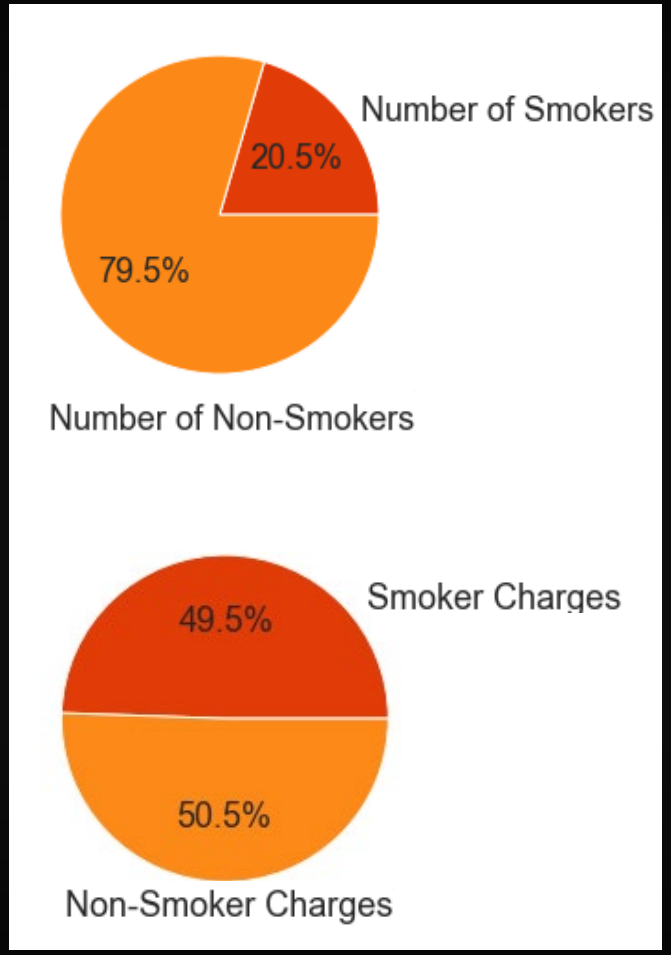
- Let μ_1 equal the mean claim value of a smoker
- Let μ_2 equal the mean claim value of a non-smoker
- Let the significance level be $\alpha = 0.05$

- Null Hypothesis:
  $H_0: \mu_1 = \mu_2$
- Alternative Hypothesis:
  $H_a: \mu_1 > \mu_2$

- Using a two independent sample t-test for equality of means, we find a p-value of 2.9×10^{-103}. Therefore, we reject the null hypothesis.

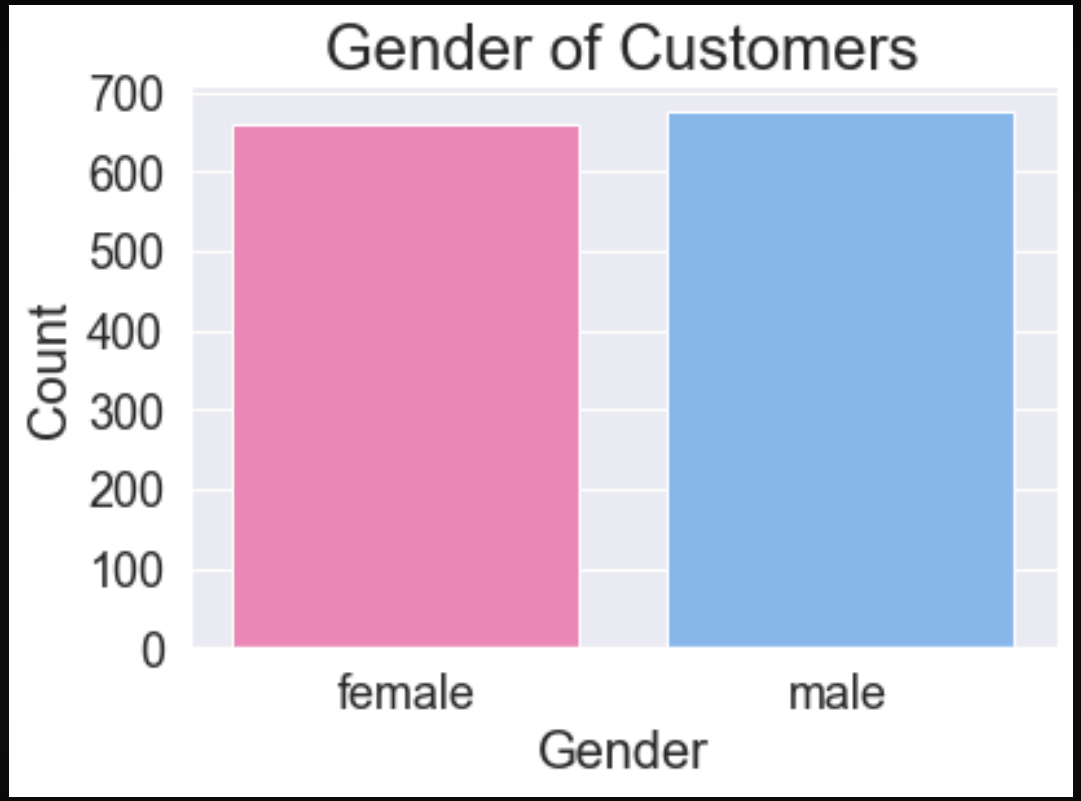
1 Medical claims of smokers vs. non-smokers

- Charges for smokers are statistically greater than the charges for non-smokers.
- Total claims from smokers account for almost 50% of total charges claimed, even though smokers account for only 20.5% of our customers.
- Therefore, we should consider increasing the premiums of smokers to compensate for the cost of insuring them.



2 BMI of females vs. males

- 1,338 customers were analyzed.
- 662 customers are female (49.5%)
- 676 customers are male (50.5%)

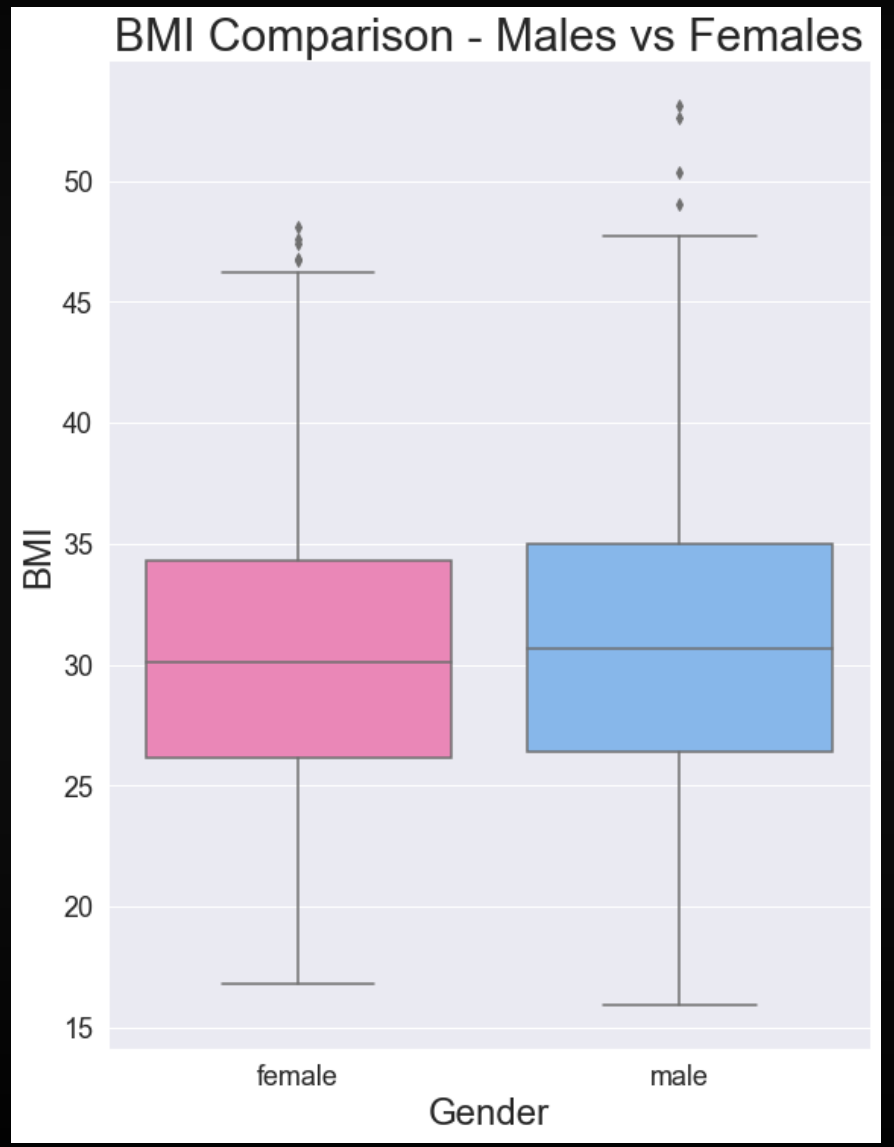


2 BMI of females vs. males

- Median BMI:
  Female = 30.1
  Male = 30.7
- Lowest BMI:
  Female = 16.8
  Male = 16.0
- Middle 50%:
  Female = 26.1–34.3
  Male = 26.4 –35.0
- Highest BMI:
  Female = 48.1
  Male = 53.1

- Conclusion:

The BMIs of males and females appear to be quite similar.



2 BMI of females vs. males

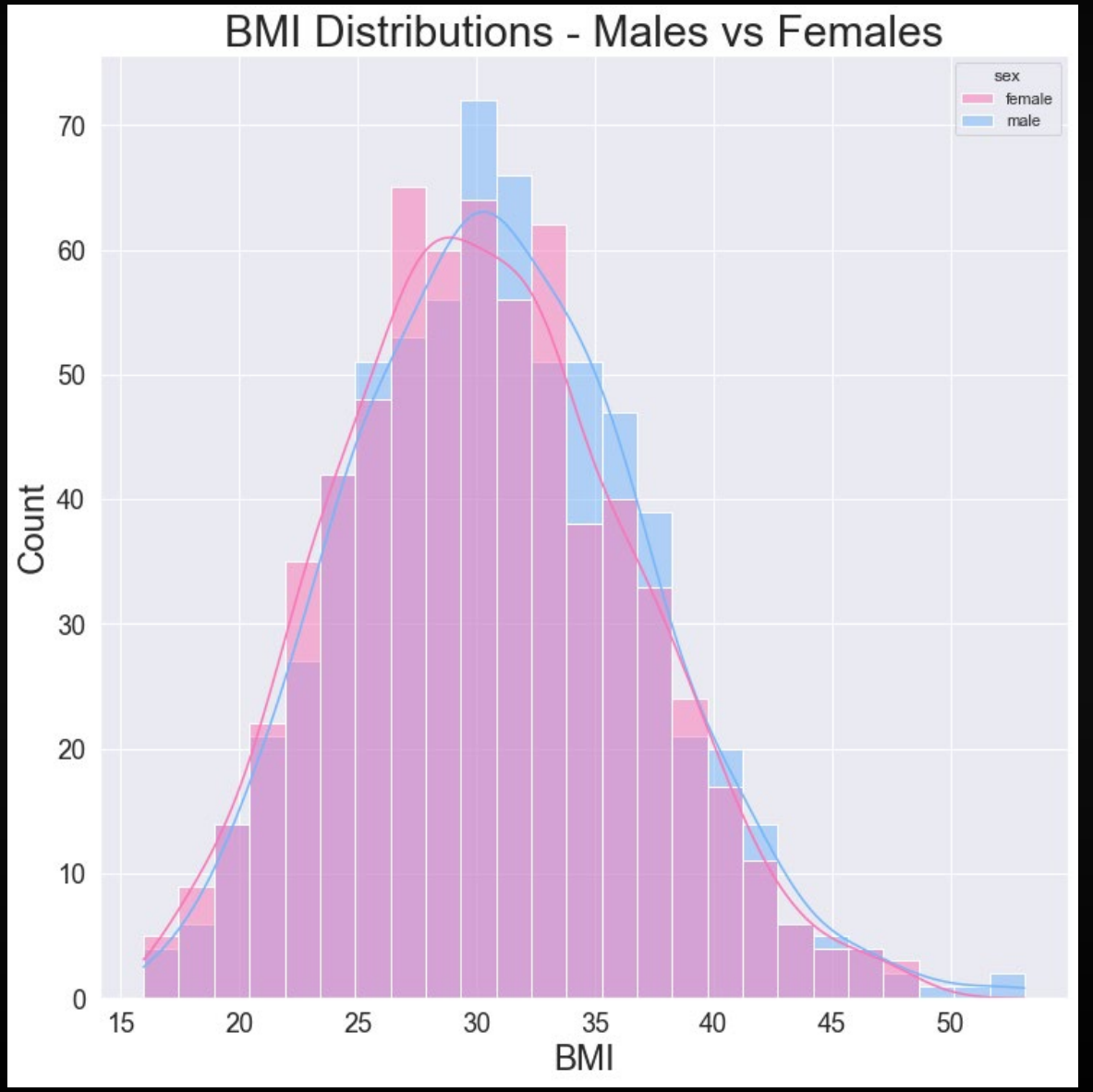
- Let μ_1 equal the mean BMI of a female customer
- Let μ_2 equal the mean BMI of a male customer
- Let the significance level be $\alpha = 0.05$

- Null Hypothesis:
  $H_0: \mu_1 = \mu_2$
- Alternative Hypothesis:
  $H_a: \mu_1 \neq \mu_2$

- Using a two independent sample t-test for equality of means, we find a p-value of 0.0899. Therefore, we fail to reject the null hypothesis.

2 BMI of females vs. males

- Hypothesis testing confirm that the mean BMIs of male customers are statistically equal to the mean BMIs of female customers.



3 Proportion of smokers by region

	Smoker	Non-smoker	TOTAL
Northeast	67	257	324
Northwest	58	267	325
Southeast	91	273	364
Southwest	58	267	325
TOTAL	274	1064	1338

3 Proportion of smokers by region

- Each region appears to have relatively equal proportions of smokers vs non-smokers:
  - Northeast: 20.7% smoke, 79.3% do not smoke
  - Northwest: 17.8% smoke, 82.2% do not smoke
  - Southeast: 25.0% smoke, 75.0% do not smoke
  - Southwest: 17.8% smoke, 82.2% do not smoke

3 Proportion of smokers by region

- Let the significance level be $\alpha = 0.05$
- Null Hypothesis:

H_0: Smoking preference is independent of region

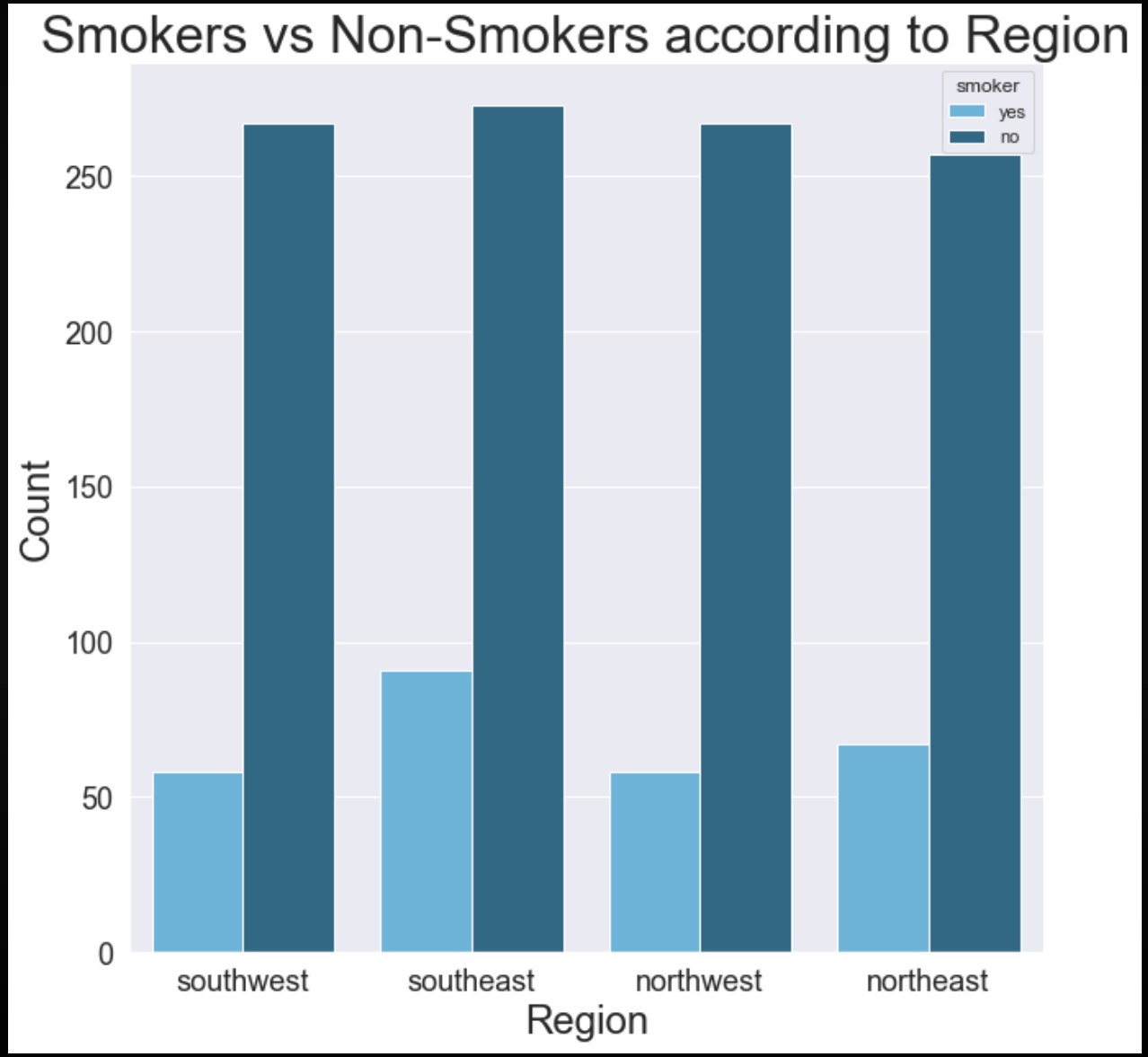
- Alternative Hypothesis:

H_a: Smoking preference is not independent of region

- Using a chi-squared test for independence, we find a p-value of 0.0617. Therefore, we fail to reject the null hypothesis.

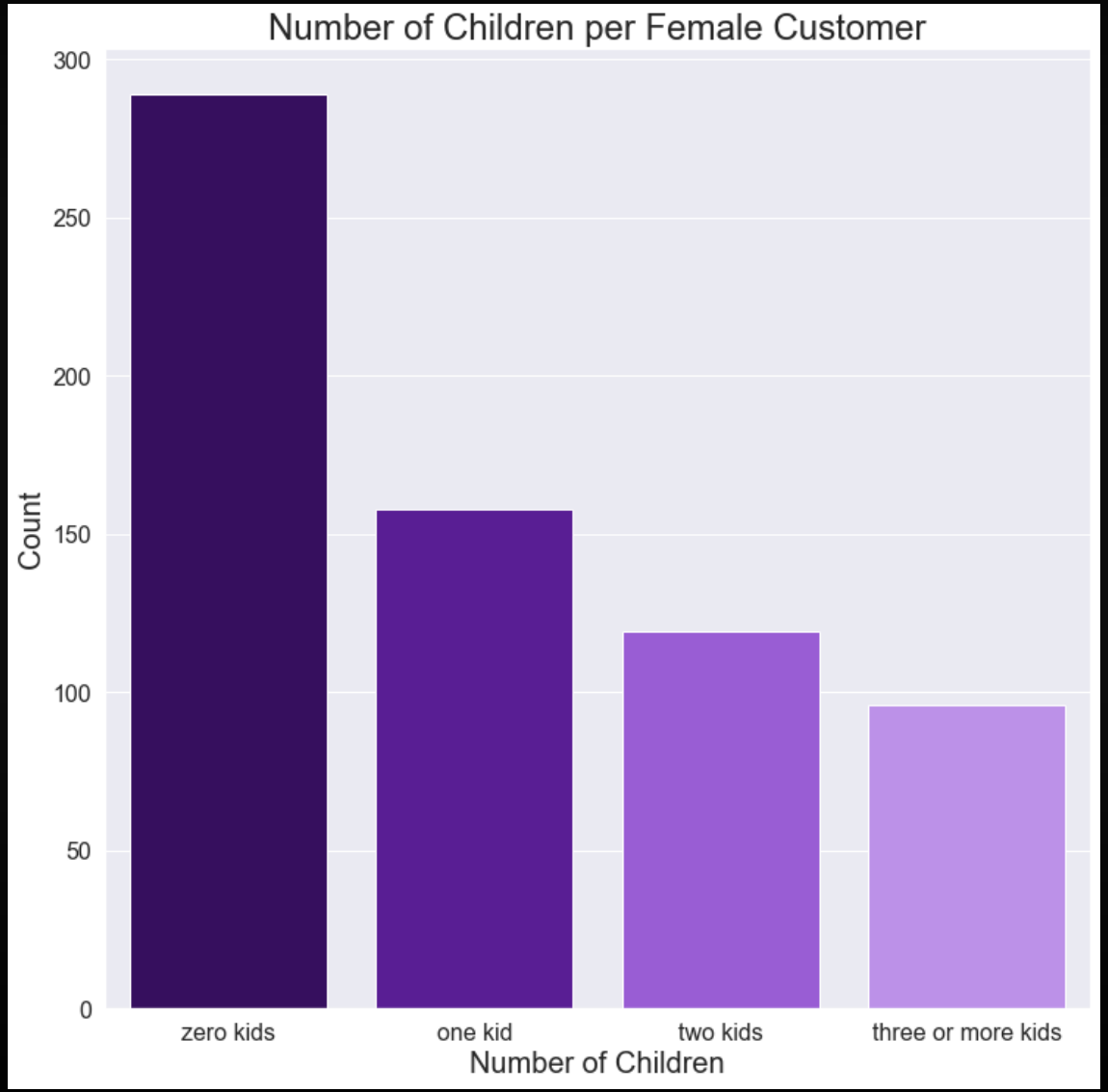
3 Proportion of smokers by region

- Hypothesis testing confirms that the proportion of smokers is independent of region.
- Therefore, we conclude that the proportion of smokers is not significantly different across regions.



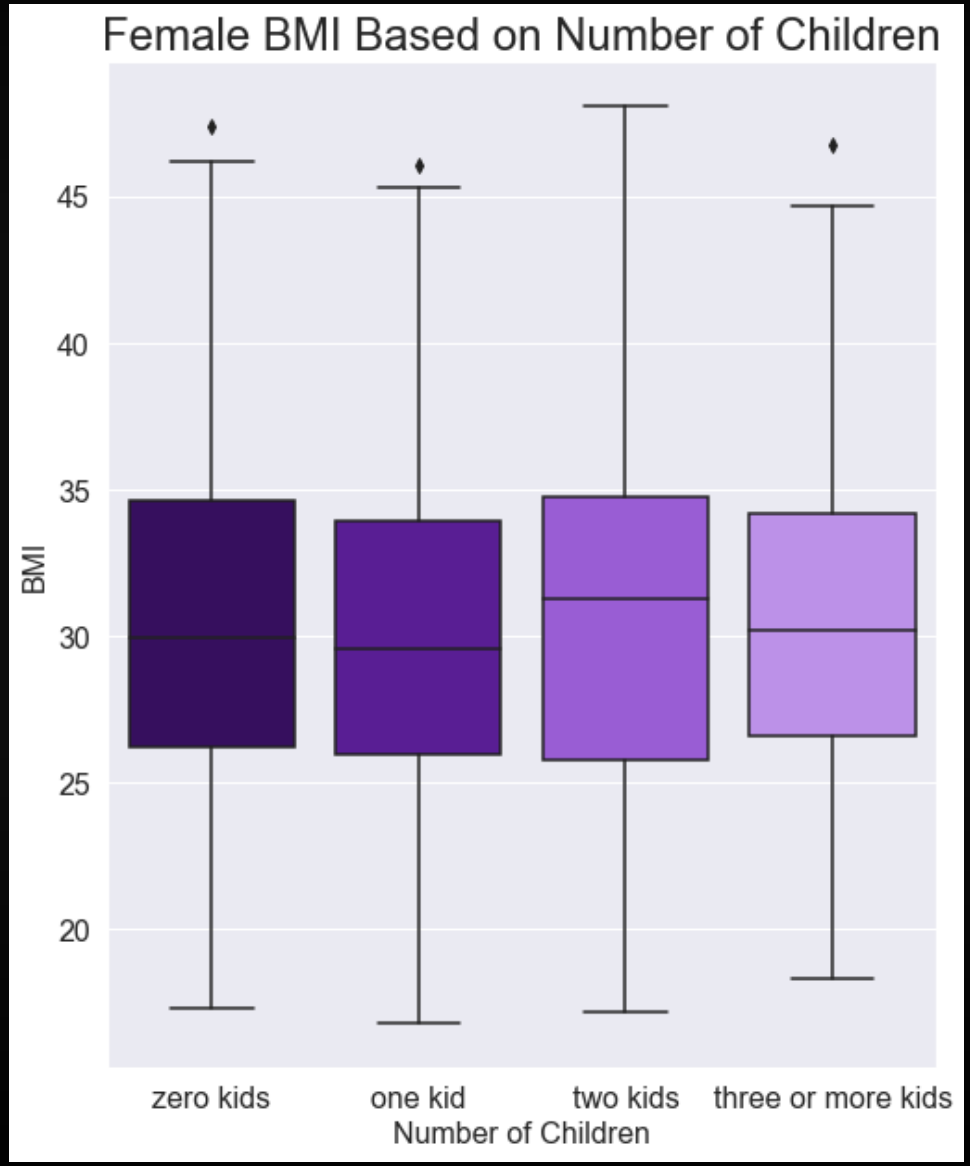
4 BMI of women based on number of children

- 662 female customers
- 289 have zero children (43.7%)
- 158 have one child (23.9%)
- 119 have two children (17.9%)
- 96 have three+ children (14.5%)



4 BMI of women based on number of children

- 0 children
  Min: 17.3
  Median: 29.9
  Mean: 30.4
  Max: 46.09
- 1 child
  Min: 16.8
  Median: 29.6
  Mean: 30.1
  Max: 46.09
- 2 children
  Min: 17.2
  Median: 31.3
  Mean: 30.6
  Max: 48.1
- 3+ children
  Min: 18.3
  Median: 30.2
  Mean: 30.6
  Max: 46.8



4 BMI of women based on number of children

- Let μ_0 equal the mean BMI of a female customer with zero children
- Let μ_1 equal the mean BMI of a female customer with one child
- Let μ_2 equal the mean BMI of a female customer with two children
- Let μ_3 equal the mean BMI of a female customer with 3+ children
- Let the significance level be $\alpha = 0.05$

- Null Hypothesis:

H_0: $\mu_0 = \mu_1 = \mu_2 = \mu_3$

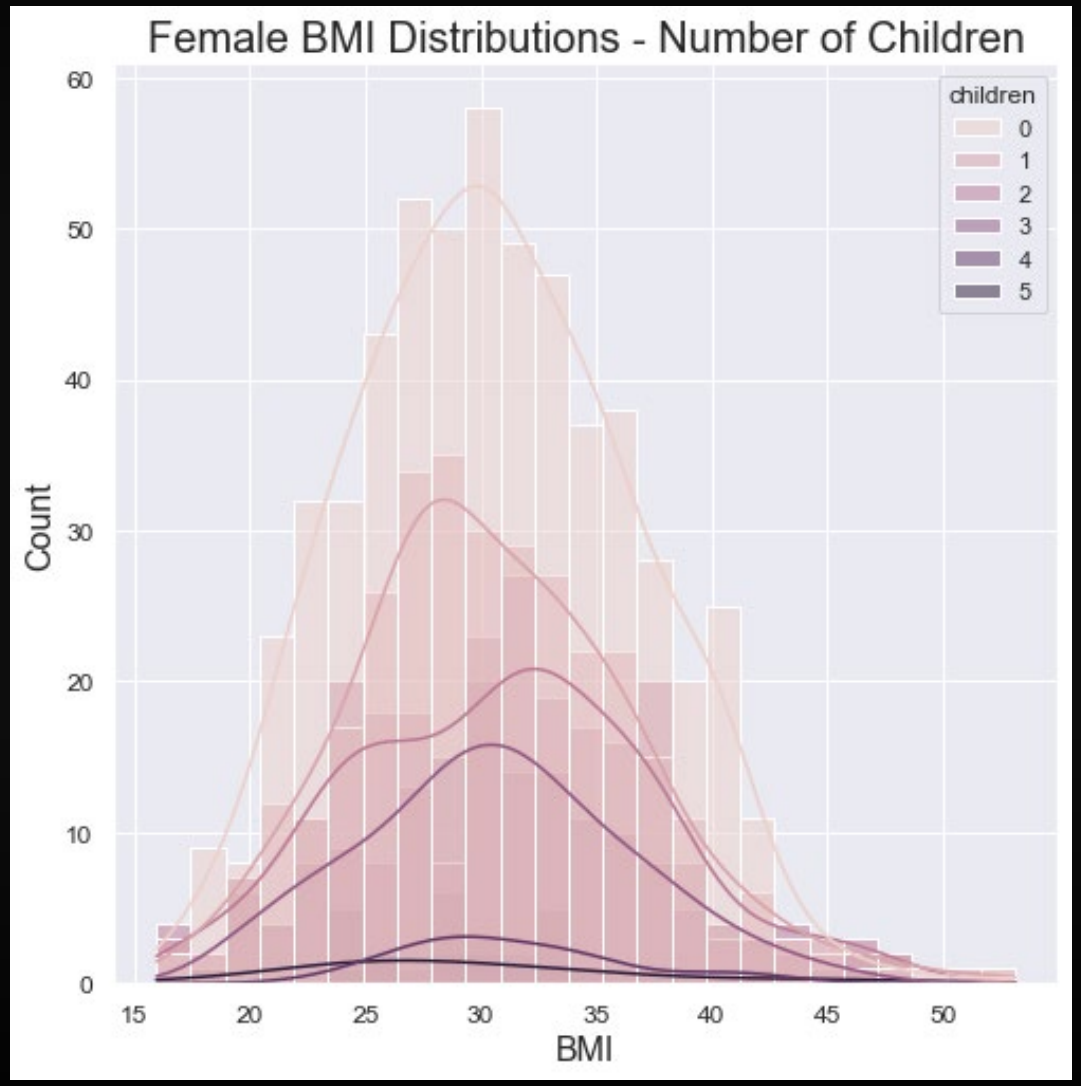
- Alternative Hypothesis:

H_a: At least one of the means listed in H_0 is not equal to the others

- Using an ANOVA test, we find a p-value of 0.84. Therefore, we fail to reject the null hypothesis.

4 BMI of women based on number of children

- Hypothesis testing confirms that the mean BMIs of women with 0, 1, 2, or 3+ children are statistically equal.



CONCLUSIONS

1. **Medical claims of smokers vs. non-smokers**

   Mean charges claimed by smokers are statistically higher than those of non-smokers.

2. **BMI of females vs. males**

   The mean BMIs of males are statistically equal to the mean BMIs of females.

3. **Proportion of smokers by region**

   The proportion of smokers is not statistically different in each region of the country.

4. **BMI of women based on number of children**

   Is the mean BMIs of women with zero, one, two, or three+ children are statistically equal.