A/B testing for New Website Redesign

Use and Explanation of Fisher's Exact Test

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A. Executive Summary

This report discusses the current redesign of the landing page to determine if conversion rate is increased.

1. The total number of observations is **n = 20,123** for this experiment.
    - The Conversion rate when exposed to the treatment was 11.44%.
    - The Conversion rate when NOT exposed to the treatment page was 10.77%

Conclusion:

1. The new landing page redesign did not have any statistically significant change over the original landing page.
2. I recommend that experimentation be continued to find a higher conversion rate.
3. The Fisher's Exact Test is used to calculate the probability and the odds for this to occur.
    - **The Probability of the two events being equivalent are < 2.2e-16**.
    - **The Odds are on average 0.0156601 to 1 for this event to occur**.

B. Discussion

2 x 2 Contingency Table for Treatment Versus New Images

	Treatment-Yes	Treatment-No	Marginal Sums
New_images-Yes	1151	8982	10133
New_images-No	8906	1084	9990
Sums	10057	10066	20123

1. **Treatment**

- 49.9776375 % of the 20,123 observations viewed the treatment page.
- The conversion rate of the Treatment page is 11.4447648 %.

2. **NOT-Treatment**

- 50.0223625 % of the 20,123 observations did NOT view the treatment page
- The conversion rate of the Original page is 10.7689251 %.

C. Results

- Load Redesign Test Data

```
library(readr)
redesign <- read_csv("redesign.csv",
     col_types = cols(treatment = col_factor(levels = c("yes","no")),
                      new_images = col_factor(levels = c("yes","no")),
                      converted = col_factor(levels = c("0","1"))))
# View(redesign)
```

1. The summary below shows that there no missing values.
2. Redesign test data
    - “treatment” - The set of this categorical variable are {“yes”,“no”}
    - “new_images” - The set of this categorical variable are {“yes”,“no”}
    - “converted” - This discrete output variable is {“0”,“1”}.
        - “0” is NOT converted, “1” IS converted.

```
summary(redesign)
```

```
##  treatment   new_images  converted
##  yes:20242   yes:20242   0:35895
##  no :20242   no :20242   1: 4589
```

3. Filter dataset based on 2 x 2 input variables dsiplaying the number of conversions.

```
redesign_TT = subset(redesign, treatment == "yes" & new_images == "yes" &
                     converted == "1")
#nrow(redesign_TT)

redesign_TF = subset(redesign, treatment == "yes" & new_images == "no" &
                     converted == "0")
#nrow(redesign_TF)

redesign_FT = subset(redesign, treatment == "no" & new_images == "yes" &
                     converted == "0")
#nrow(redesign_FT)

redesign_FF = subset(redesign, treatment == "no" & new_images == "no" &
                     converted == "1")
#nrow(redesign_FF)
```

```
- 1151 observations for Treatment=Yes, New Images=Yes, and Converted=Yes.

- 8906 observations for Treatment=Yes, New Images=No, and Converted=NO

- 8982 observations for Treatment=No, New Images=Yes, and Converted=Yes.

- 1084 observations for Treatment=No, New Images=No, and Converted=NO
```

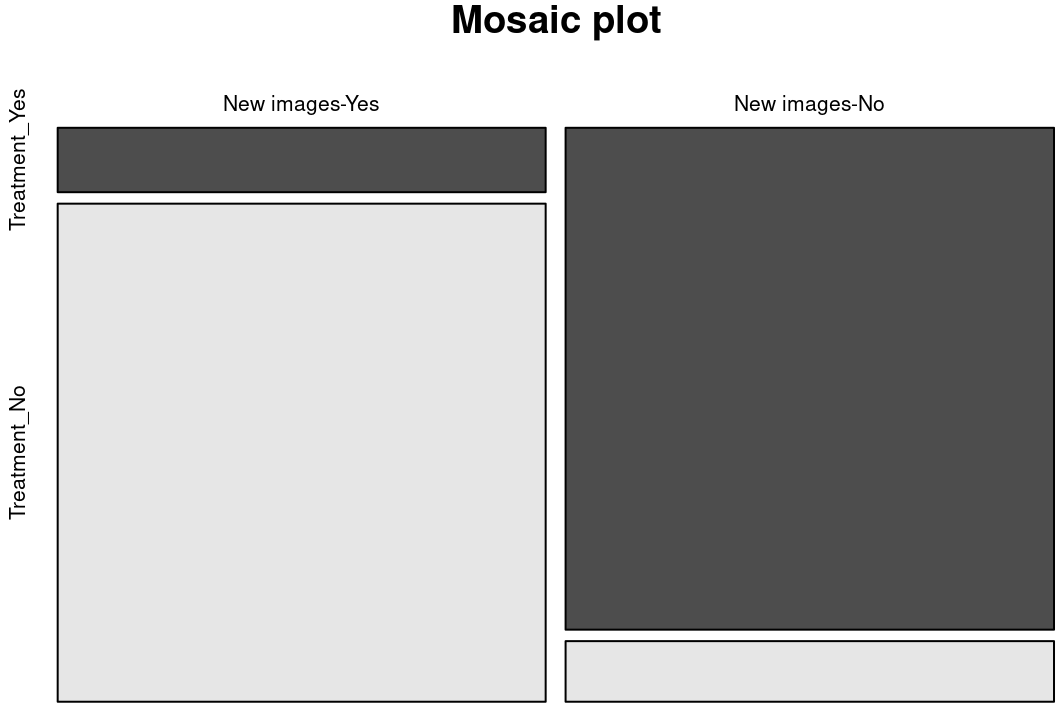
4. Conversion Ratio
    - The conversion rate of the Treatment page is 11.4447648 %.
    - The conversion rate of the Original page is 10.7689251 %.
5. Create 2x2 Contingency table

```
Contingency_table <- data.frame("Treatment_Yes" = c(1151, 8982),
                                "Treatment_No" = c(8906, 1084),
                                row.names = c("New images-Yes", "New images-No"),
                                stringsAsFactors = FALSE)

colnames(Contingency_table) <- c("Treatment_Yes", "Treatment_No")

Contingency_table
```

```
##                Treatment_Yes Treatment_No
## New images-Yes          1151         8906
## New images-No           8982         1084
```

6. Mosaic plot of Conversion testing

```
mosaicplot(Contingency_table,
           main = "Mosaic plot",
           color = TRUE
           )
```



7. Fisher Exact Test

```
f_test <- fisher.test(Contingency_table)
f_test
```

```
##
##  Fisher's Exact Test for Count Data
##
## data:  Contingency_table
## p-value < 2.2e-16
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.01424845 0.01707176
## sample estimates:
## odds ratio
## 0.01561694
```

8. P-value for Fisher's test
    - From the Fisher's Exact Test output and specifically from the test$p.value we see that the p-value (Pr < 2.2e-16) is much less than the significance level of 1% for a two-tailed test.
    - ODDS??

D. Conclusion and Interpretation

From the Fisher's Exact Test output and specifically from the test$p.value we see that the p-value (< 2.2e-16) is much less than the significance level of 1% for a two-tailed test.

In statistical testing, if the p-value is less than the significance level, **we can reject the null hypothesis**.

In this circumstance, rejecting the null hypothesis for the Fisher's exact test of independence means that there is a NO significant relationship between the two categorical variables (Treatments and New Images).