

How does change in page's background color affect the conversion rate?

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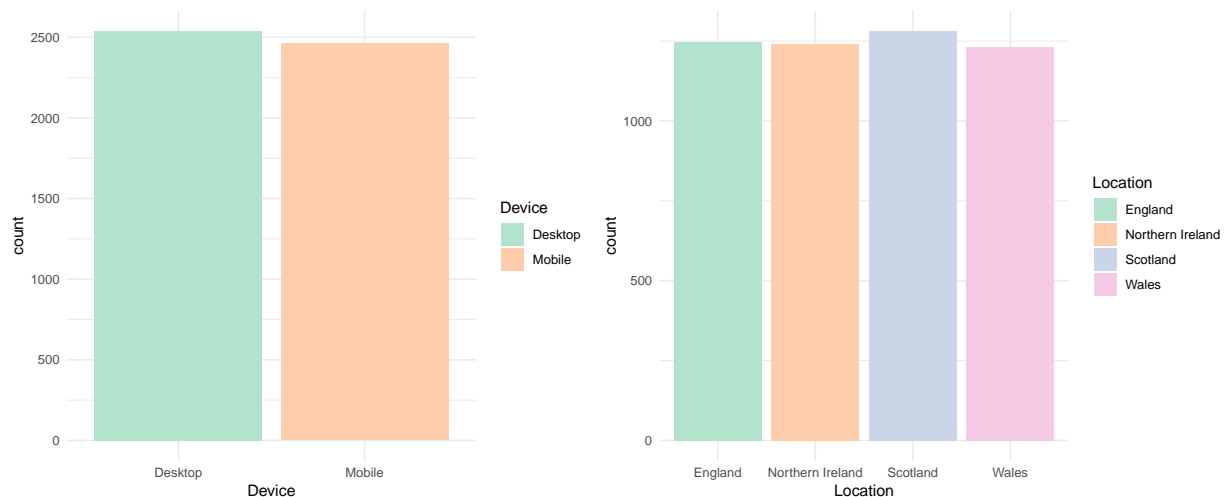
2025-11-10

Data source: <https://www.kaggle.com/datasets/adarsh0806/ab-testing-practice?resource=download>

Introduction

Company X in United Kingdom was interested whether changing the background color of their website from white to black would have an effect on the customer conversion rates. In this analysis, I answer this question, provide the extent of the effect and behavioural interpretation.

At the top, I provided an overview of the customer information available (age, sex, and many more relevant variables were not available).



Methodology

If you are not interested in statistical details of this report, feel free to skip to results part.

I'll assume I have no information on how the experiment was conducted, and hence I cannot assume the random group assignment. To strengthen my claim for causality, I will verify the groups' equality with propensity scores.

Propensity scores are calculated with logistic regression, hence I need to ensure its assumptions are met:

```
##
##      Desktop Mobile
##  A      1244    1275
##  B      1294    1187

##
##      England Northern Ireland Scotland Wales
##  A      606              614          670    629
##  B      640              628          611    602
```

Covariates are approximately evenly distributed between groups, hence complete separations is ruled out.

As I am operating with the discrete variables, linearity of logit assumptions does not apply. Nonetheless, I should detect potential collinearity.

```
##
##      England Northern Ireland Scotland Wales
##  Desktop      621              642          654    621
##  Mobile      625              600          627    610
```

Lack of collinearity is evident.

I proceed to calculating propensity scores:

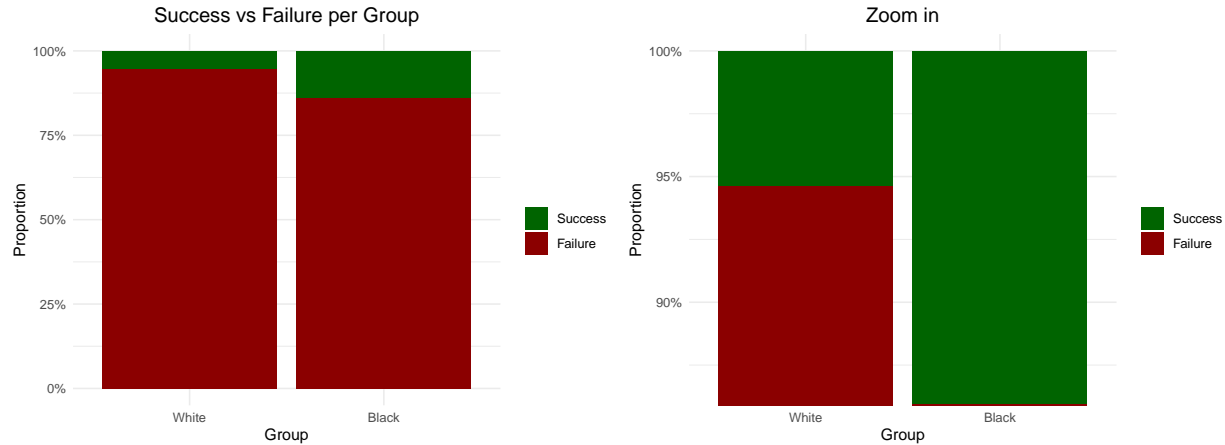
```
## [1] 0.4627781 0.5276082
```

It's clear that covariates are not predictive of groups assignment.

Now that my data suggests random group assignment, I can proceed to the hypothesis testing. Namely, I want to see if conversion rate differs for people visiting the website with changed (black) background vs old (white) background. For that purpose, I will use Fisher's Exact Test.

```
##
## Fisher's Exact Test for Count Data
##
## data:  test_mat
## p-value < 2.2e-16
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  2.324693 3.552844
## sample estimates:
## odds ratio
##  2.867716
```

Results



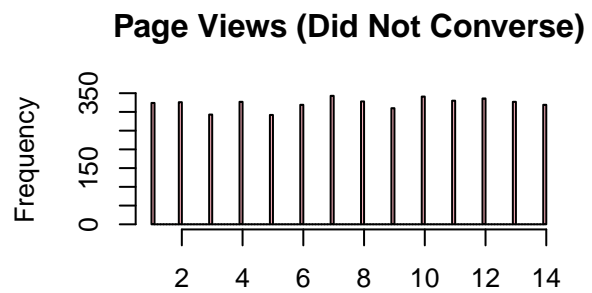
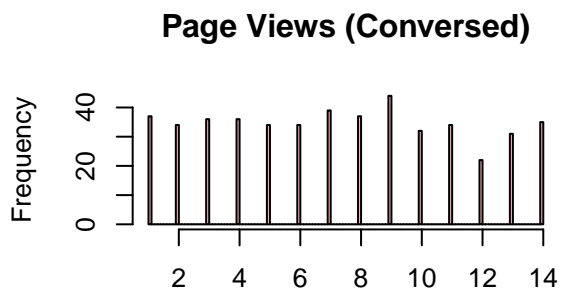
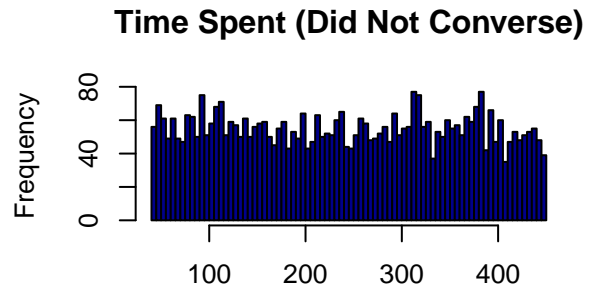
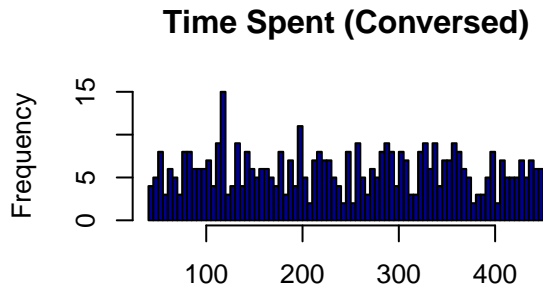
There is evidence that people who entered the website with new, black background converse more than people who entered website with a white background.

Visitors to the black-background site have about 3 times the odds of converting compared to visitors to the white-background site. In other words, using a black background seems to significantly boost conversions. However, there are many possible explanations of why exactly.

- people simply prefer the black color as a website background
- feeling of novelty led customers to make a purchase
- the background made website more readable
- if Company X sells luxury products, black color might have given a ‘premium feel’
- **the experiment might have been conducted in low-light setting**
- **other change in design was made simultaneously**

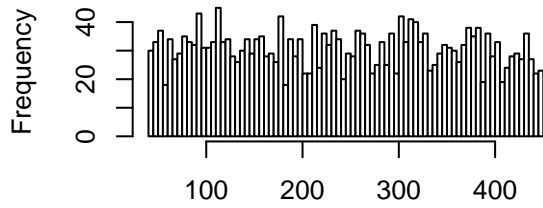
While the first 4 possible reasons are harmless, **the last 2 explanations are dangerous**. If true, they would indicate that there is no proof that background color change is beneficial for the sales, and there isn’t enough evidence to invest money in it. **Until they are ruled out, I advise against changing the background color, to prevent fruitless expenses.**

As a final step, I will provide some insight for advertising team to see how conversion is related to time spent on a website and page views.

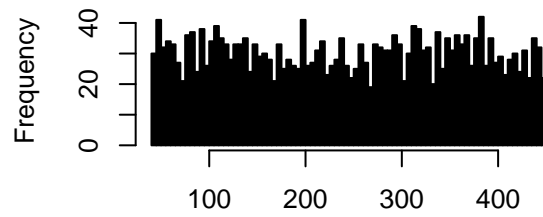


There are no apparent differences between clients who conversed and who did not converse with respect to page views and time spent. Nonetheless, according to the **mere-exposure effect**, both of these factors can result in increased conversion rates in the future. Hence, here is how page views and time spent differ between the background groups.

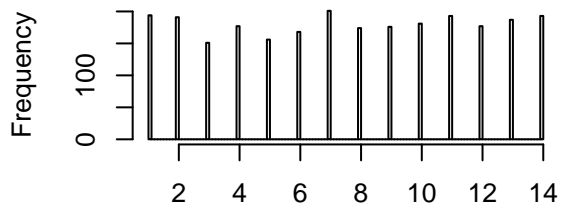
Time Spent (White BG)



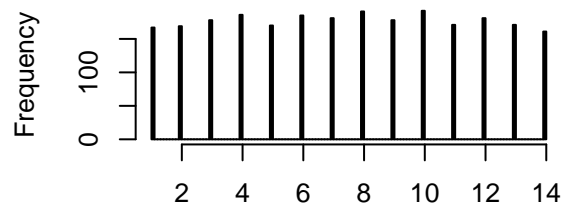
Time Spent (Black BG)



Page Views (White BG)



Page Views (Black BG)



The change of background does not seem to affect the exposure anyhow.

In sum: using a black background seems to significantly boost conversions. However, certain possibilities should be ruled out before fully dedicating to the change