

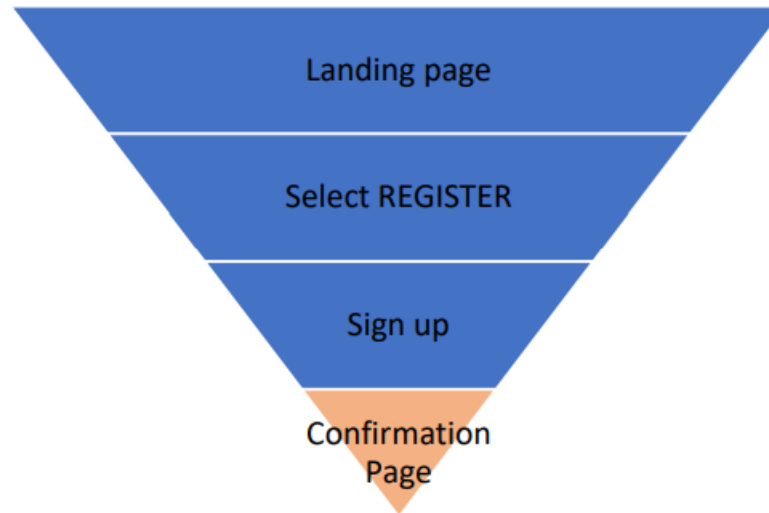
Stakeholder:

Director of List Management.

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Problem 1:

Product manager wanted to know if the new size variant for the data policy disclaimer box on a specific partner site impacted user drop off of that site.



Method: two two-sample tests of proportions were performed with two variants vs a control

Variant 1: 1.5 x normal px width

Variant 2: 0.5 x normal px width

Control: 1 x normal px width

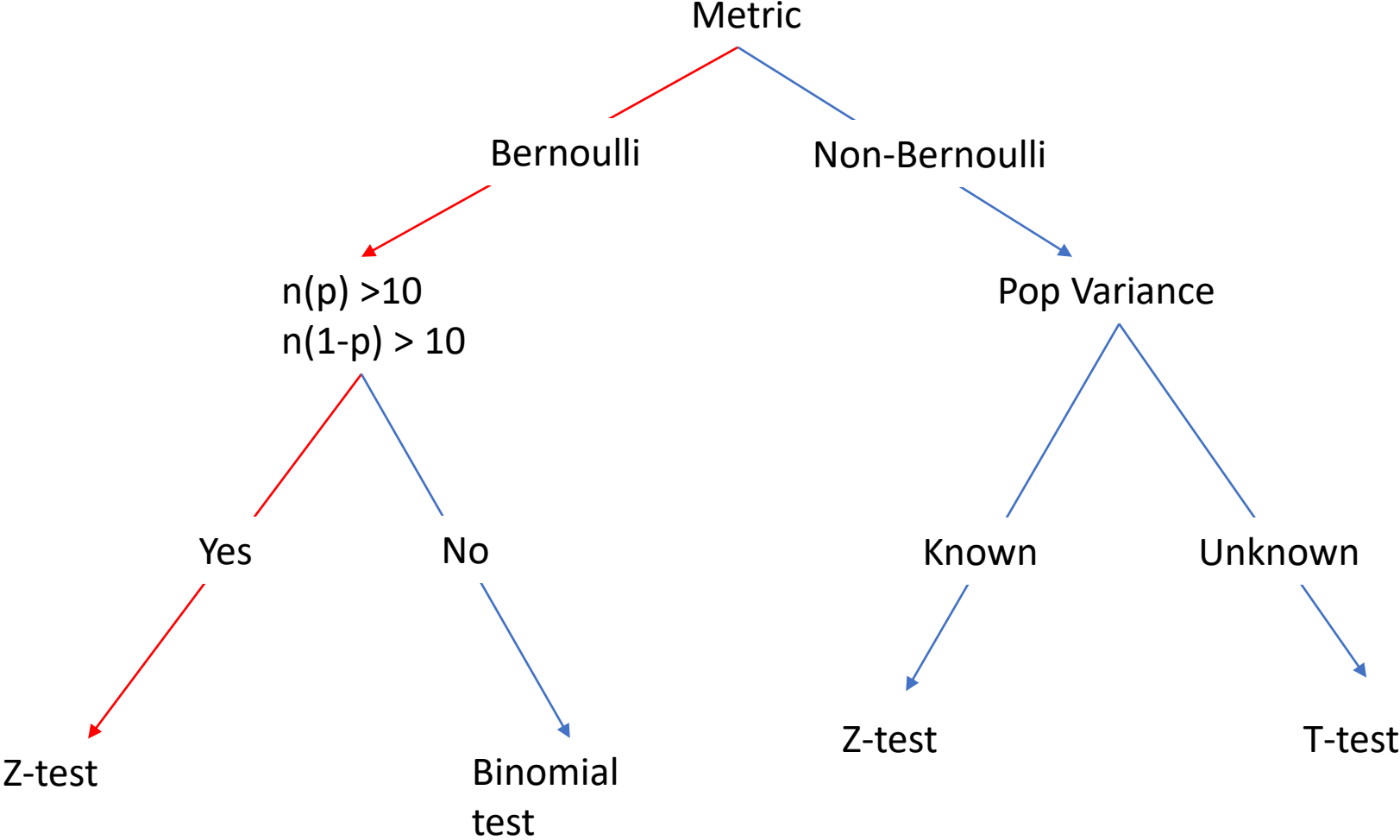
with $t_{\alpha} = t_{0.05}$

Results:

Treatment effect from Variant 1 was both statistically and practically significant, and the new feature was approved for launch

Treatment effect from Variant 2 was neither statistically nor practically significant, and feature deployment was suspended

Decision path



- Bernoulli Population: conversion or no conversion
- Control group: $n \times \hat{p} = 1000 \times 1\% = 10$ $10 > 10$
- Treatment group: $n \times \hat{p} = 1000 \times 2\% = 20$ $20 > 10$

1. Hypothesis

- $H_0: \hat{p}_{trmt} - \hat{p}_{ctrl} = 0$

2. Measurements

number of users: n_{ctrl}, n_{trmt}

users who clicked: x_{ctrl}, x_{trmt}

3. Estimated probabilities

Estimated probability of clicks in cntl $\hat{p} = \frac{x_{ctrl}}{n_{ctrl}} = \frac{10}{1000}$

Estimated probability of clicks in trmt $\hat{p} = \frac{x_{trmt}}{n_{trmt}} = \frac{20}{1000}$

4. Z-Test statistic

• Difference Estimate

- $\Delta\hat{p} = \hat{p}_{trmt} - \hat{p}_{ctrl} = 0.020 - 0.010 = 0.010$

• Standard Error:

- “Pooled” probability of a click across two groups: $P(\hat{p}) = \frac{x_{ctrl} + x_{trmt}}{n_{ctrl} + n_{trmt}} = \frac{10 + 20}{1000 + 1000} = 0.015$

- $SE_{pool} = \sqrt{\hat{p}(1 - \hat{p}) \left(\frac{1}{n_{ct}} + \frac{1}{n_{tr}} \right)} = \sqrt{0.015(1 - 0.015) \left(\frac{1}{1000} + \frac{1}{1000} \right)} = 0.00543$

- $t - stat = \frac{\hat{p}_{trmt} - \hat{p}_{ctrl}}{SE} = \frac{0.010}{0.00543} = 1.84$

5. Margin of Error (CI)

$m = z \times SE_{pool} = 1.96 \times 0.00543 = 0.0106$, CI of $\Delta\hat{p}$: $0.010 \pm 0.0106 = 0.0014 - 0.0226$

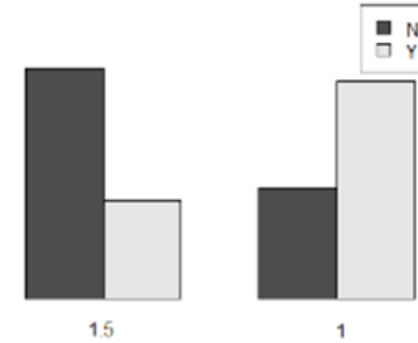
6. Is $t\text{-stat} > \text{critical } z\text{-score}(\alpha: 0.05) = |1.96|$?

No \rightarrow not statistically significant, accept null

7. Is $\hat{p}_{tr} > CI$?

No \rightarrow not practically significant, do not launch feature

Proportions of Registrations per Disclaimer Box width



Disclaimer Box width as times standard size in pixel

R CODE

```
#Contingency Table
tab = table(dataframe$Y, dataframe$X)
barplot(tab, beside = T, legend = T)
```

```
SE <- function(Xtr, Xctrl, ntr, nctrl){
  P_pool <- (Xtr + Xctrl) / (ntr + nctrl)
  B <- A(1 - A)
  C <- 1/Ntr
  D <- 1/Nctrl
  E <- C+D
  Final <- sqrt(A*B*E)
  return(Final)
}
```

```
Stat_signif <- function(Xtr, Xctrl, ntr, nctrl, crit_z_score=1.96) {
  t <- t-stat(Xtr, Xctrl, ntr, nctrl)
  M <- crit_z_score * SE(Xtr, Xctrl, ntr, nctrl)
  P <- Xtr/ntr
  P_diff <- (Xtr/ntr) - (Xctrl/nctrl)
  Upper <- P_diff + M
  Lower <- P_diff - M
  If (t > crit_z_score) {
    print("statistically significant")
  } else{
    print("not statistically significant")
  }
  If (P > Upper || P < Lower) {
    print("practically significant")
  } else{
    print("not practically significant")
  }
}
```

```
t-stat <- function((Xtr, Xctrl, ntr, nctrl) {
  P_Trt <- Xtr/ntr
  P_Ctrl <- Xctrl/nctrl
  t_stat <- (Ptr - Pctrl) / SE(Xtr, Xctrl, ntr, nctrl)
}
```