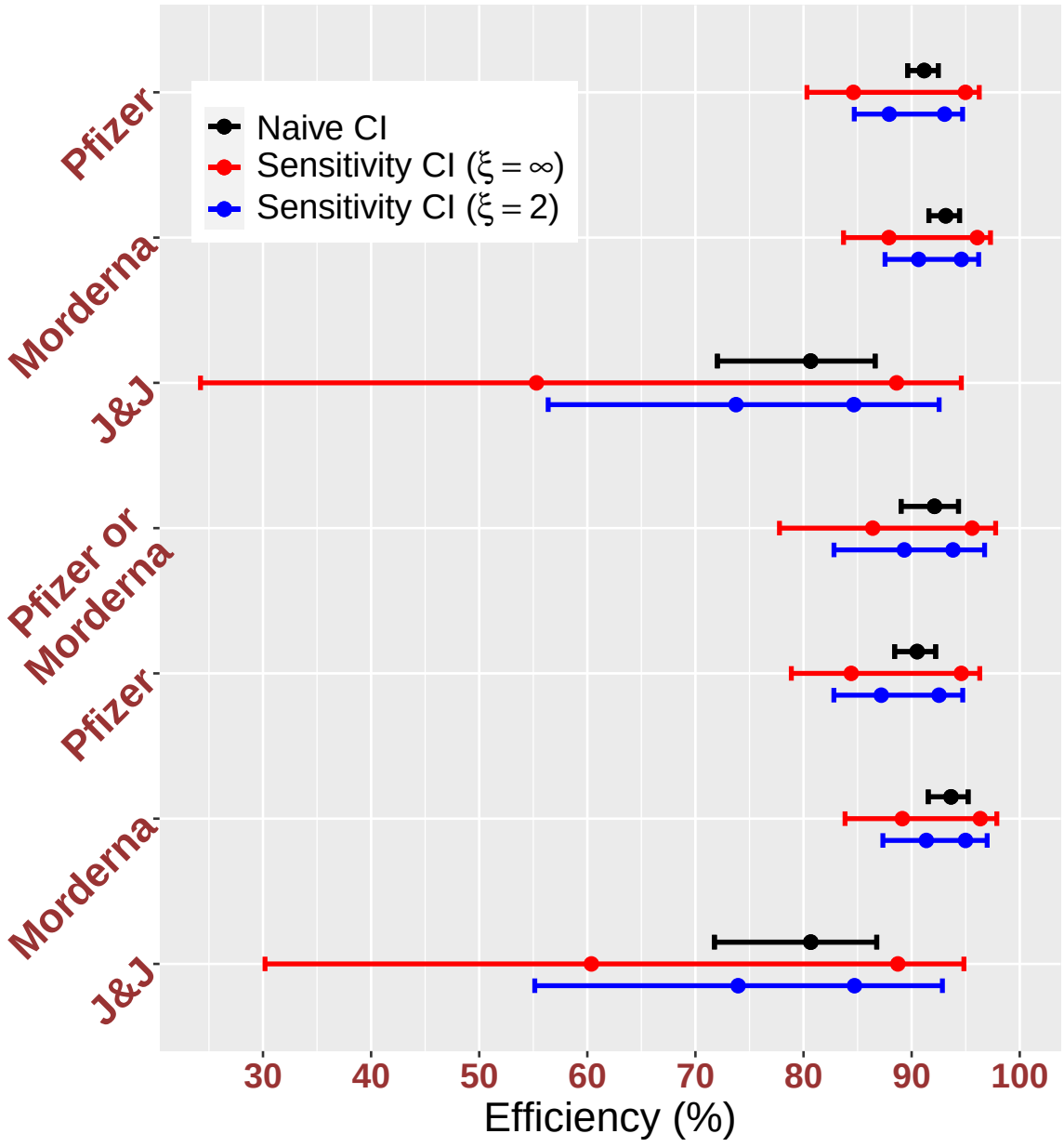
Plots

Real Data Plots

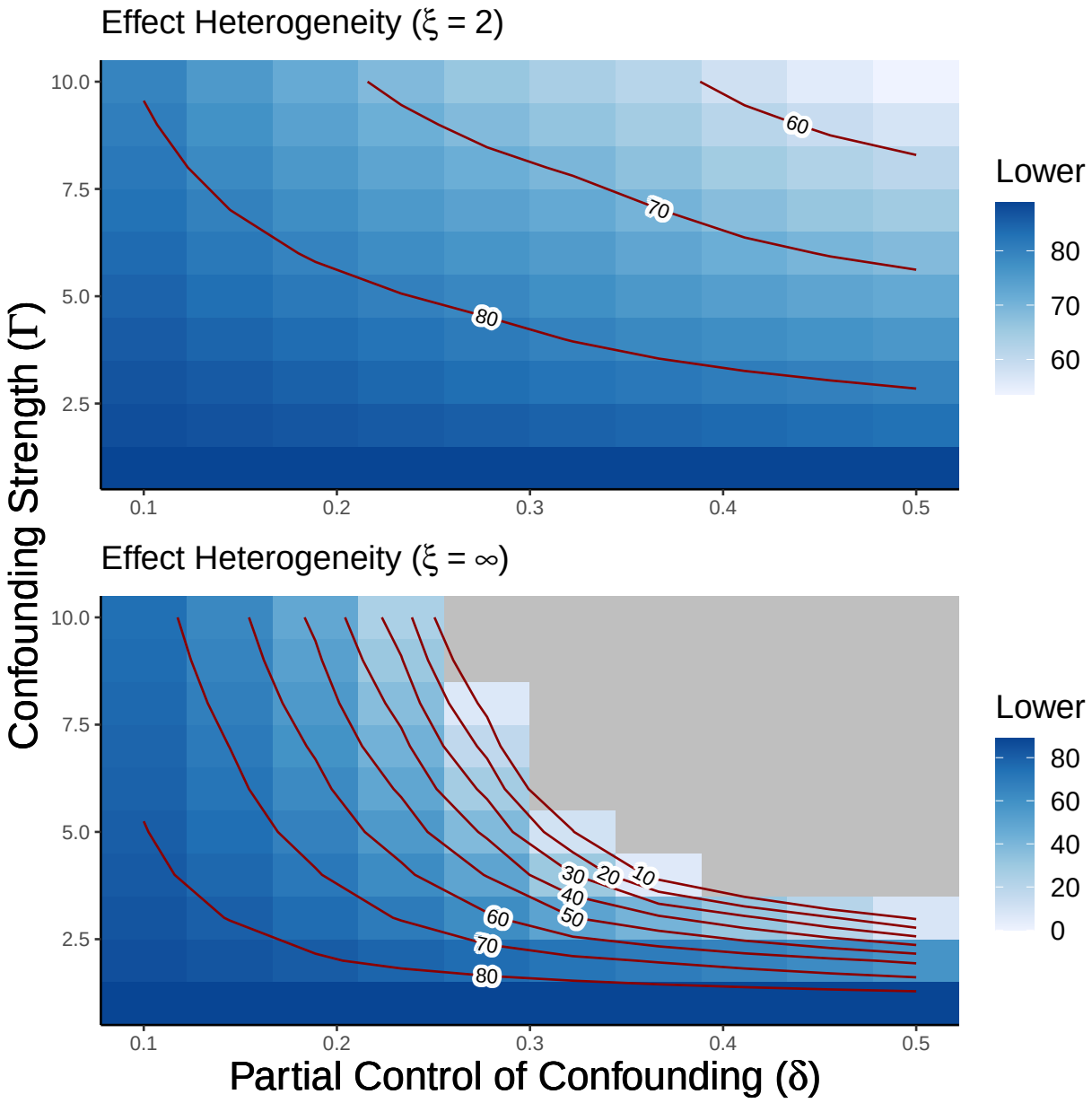
New England Journal Plot

```
library(grid)
library(pBrackets)

source('./scripts/datasets.R')
source('./scripts/real_data_plots.R')

#### Data from New England Journal of Medicine
#### The last column is indicator of non-vaccinated referent group
data_vaccine = data.frame(matrix(c(
                            20406, 3695, 1,
                             8500,  163, 0,
                             6374,   95, 0,

                            10761, 2006, 1,
                              707,   30, 0,

                            4024,   692, 1,
                            2359,    38, 0,

                            11812, 2847, 1,
                             3589,  105, 0,
                             2476,   49, 0,

                             8461, 2200, 1,
                              456,   29, 0), ncol = 3, byrow = TRUE))
colnames(data_vaccine) = c("All", "Control", "non-vaccinated")


#### Plot
new_england_data = new_england(data_vaccine)
real_data_graphs(new_england(data_vaccine),
                     delta = 0.1, gamma = 5, xi = c(2, Inf), alpha = 0.95, conf.type = 'normal',
                     title = "Vaccine Efficiency for Different Vaccines",
                     labs = c("Pfizer", "Morderna", "J&J", "Pfizer or\nMorderna",
                                    "Pfizer", "Morderna", "J&J"))
```



Contour Plot for Pfizer

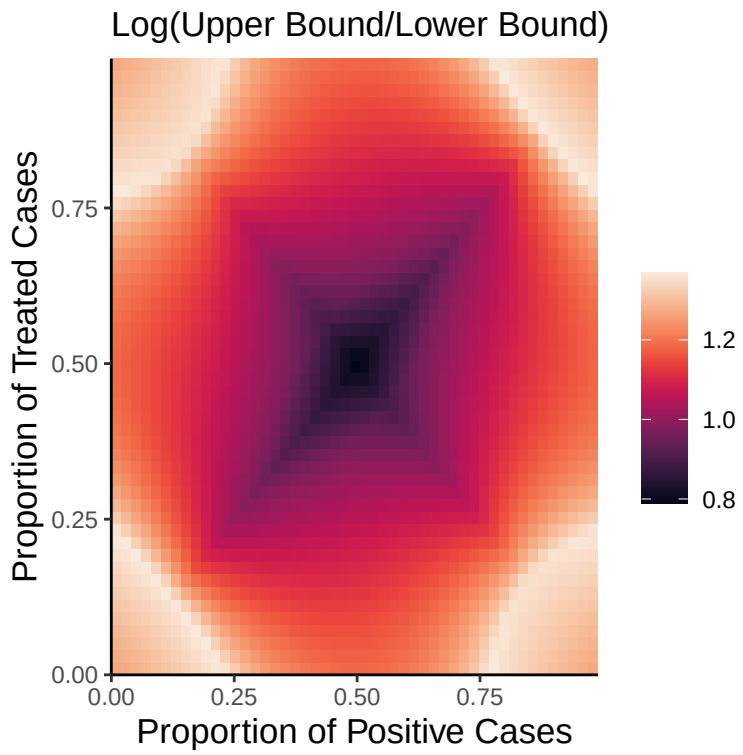
```
source('./scripts/heatmap.R')
source('./scripts/datasets.R')

causal_bounds_heatmap(c(as.numeric(new_england_data[1,1:4])),
                      delta.range = c(0.1, 0.5), gamma.range = c(1,10), xi = c(2,Inf),
                      alpha = 0.95, conf.type = "normal",  ,
                      OR = seq(0.1,0.9,0.1), bound.type = 'upper', n.contours = 5, grid = 10)
```


Effect Heterogeneity (ξ = 2)
10.0
7.5
5.0
2.5
60
70
80
Lower
80
70
60
Effect Heterogeneity (ξ = ∞)
10.0
7.5
5.0
2.5
30
20
10
40
50
60
70
80
Lower
80
60
40
20
0
0.1
0.2
0.3
0.4
0.5
Confounding Strength (Γ)
Partial Control of Confounding (δ)

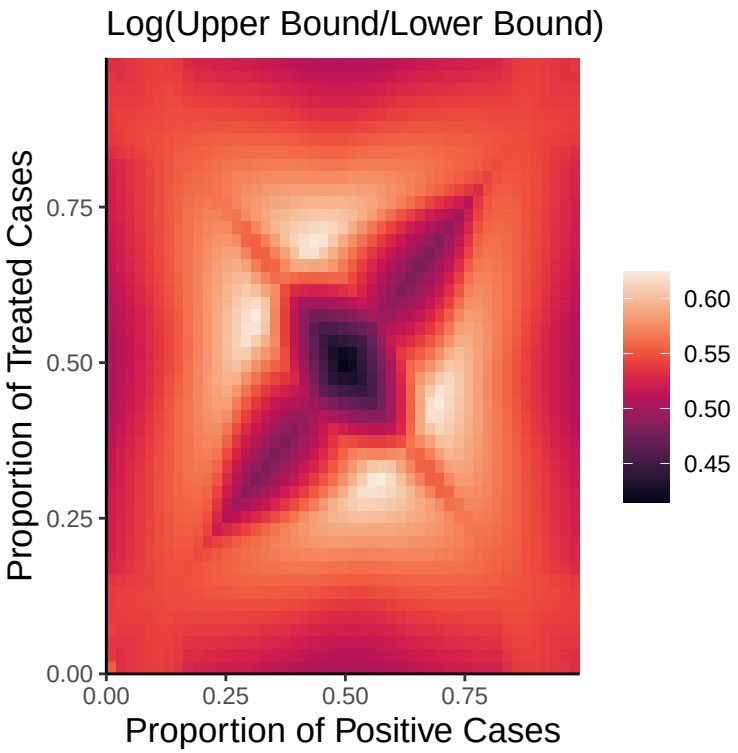
Numerical Simulations

Heatmap for same Odds Ratio

```
source('./scripts/heatmap_same_odds_ratio.R')
heatmap_same_odds_ratio(0.5, 0.1, 5, xi = Inf, choice = 1, grid = 50, log.transform = TRUE)
```




```
heatmap_same_odds_ratio(0.5, 0.1, 5, xi = 2,   choice = 1, grid = 50, log.transform = TRUE)
```



Compare Confidence Interval

```
source('./scripts/CI_compare.R')
set.seed(123)
o = c(0.1, 0.2, 0.3, 0.4)
CI_comparison(o, delta=0.1, gamma=5, xi=2, alpha=0.95, n.population=1000, n.sim=20)
```