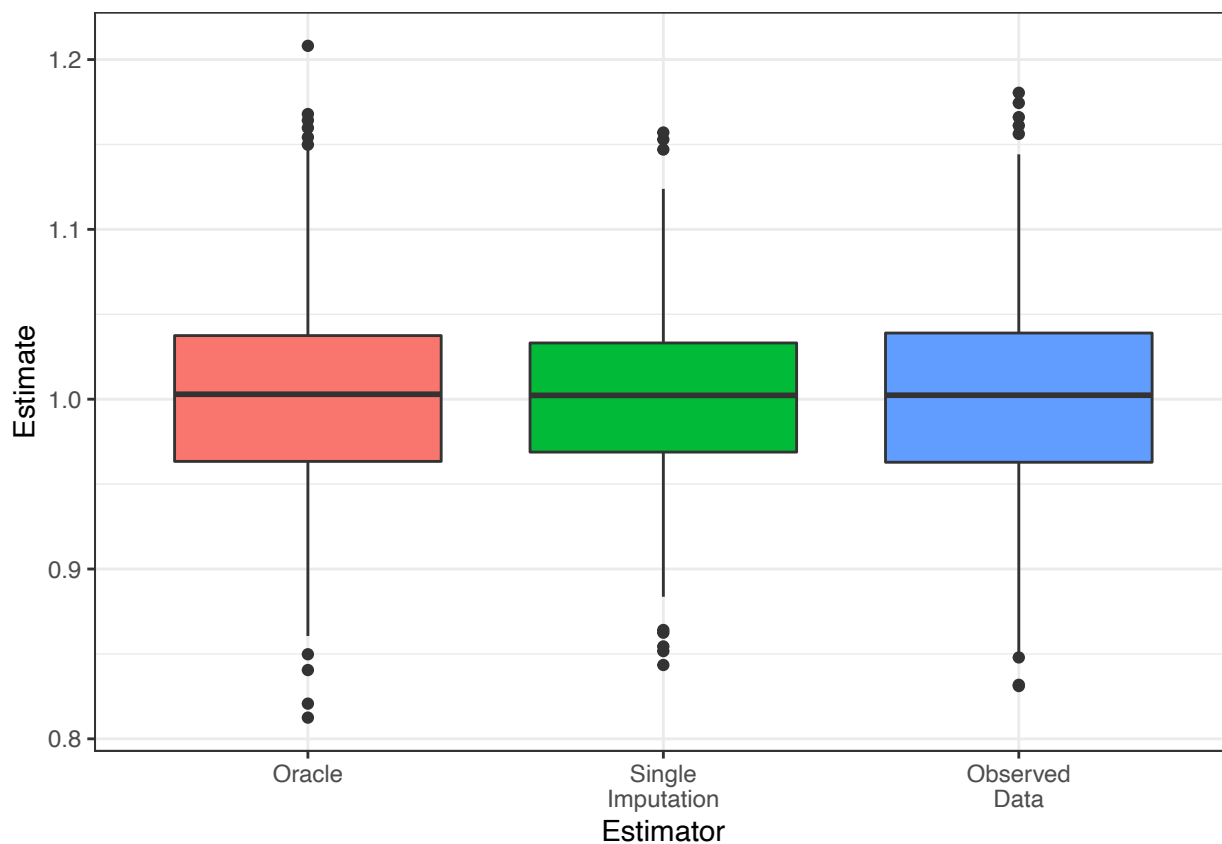# Beta unkown and correctly specified
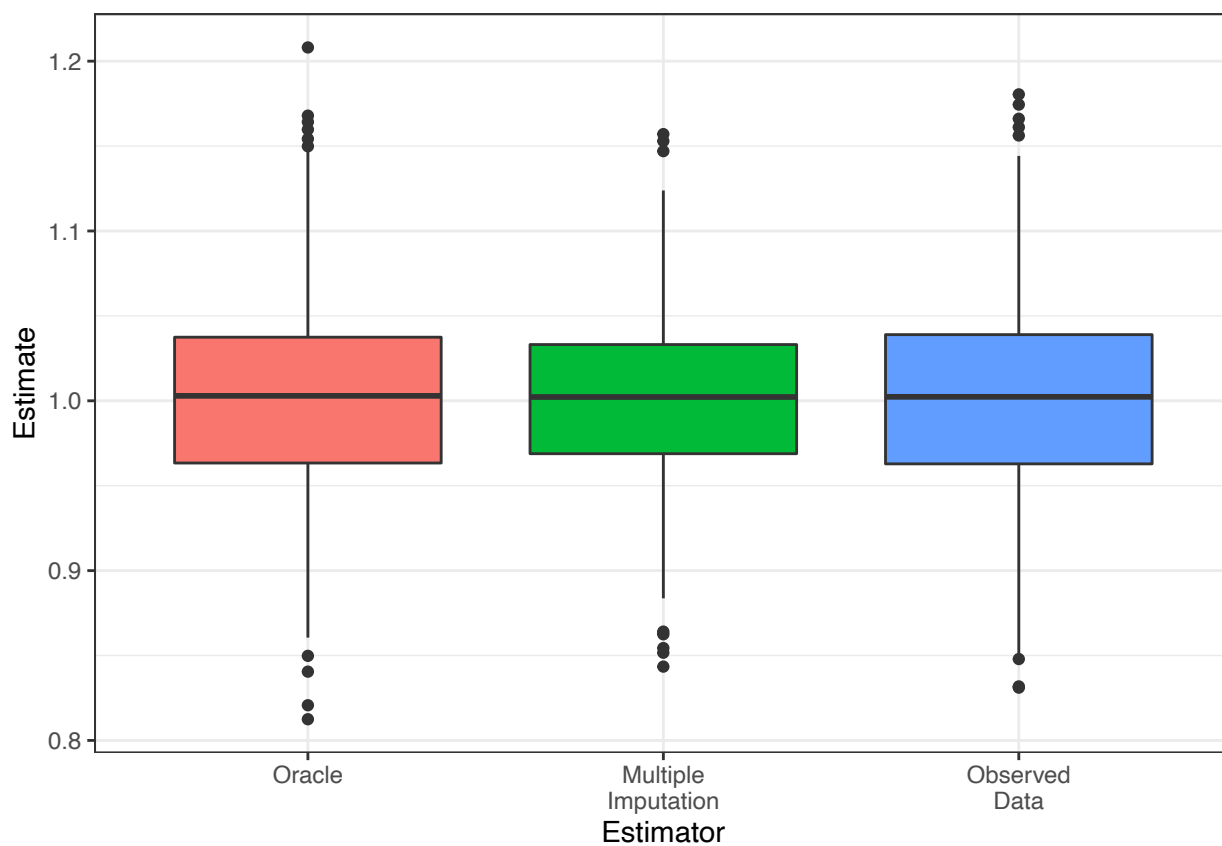


```
## # A tibble: 3 x 3
##   estimator    est     se
##   <chr>      <dbl>  <dbl>
## 1 si          1.00 0.0570
## 2 obs         1.00 0.0578
## 3 oracle      1.00 0.0563

##              oracle   observed single imputation
## empirical 0.05603238 0.05706055        0.04802895
## estimated 0.05630954 0.05781393        0.05695516
```
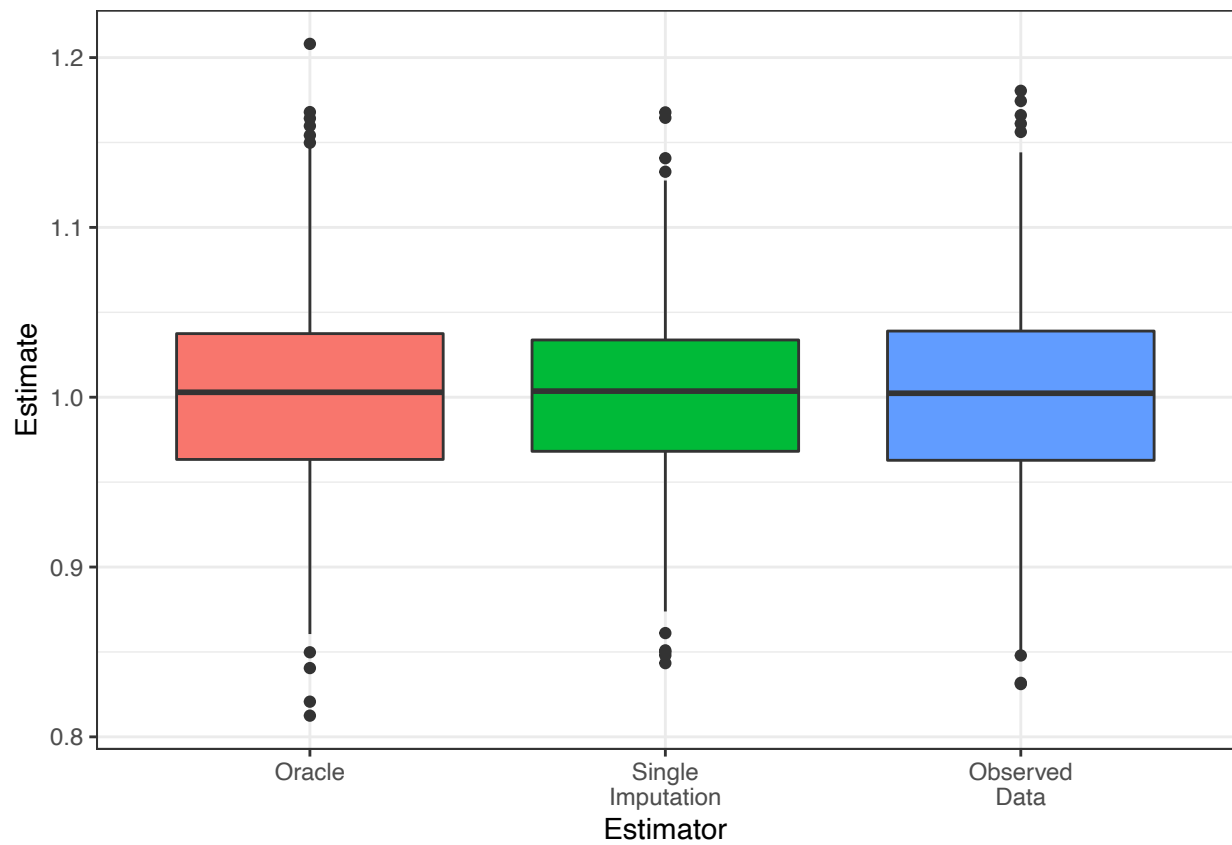
Beta unkown and incorrectly specified

$\hat{Y} \sim G, X$

Beta unknown, model correctly specified


```
## # A tibble: 3 x 3
##   estimator   est     se
##   <chr>     <dbl>  <dbl>
## 1 mi         1.00 0.0570
## 2 obs        1.00 0.0578
## 3 oracle     1.00 0.0563

##           oracle_est    obs_est     mi_est
## empirical 0.05603238 0.05706055 0.04802895
## estimated 0.05630954 0.05781393 0.05695516
```
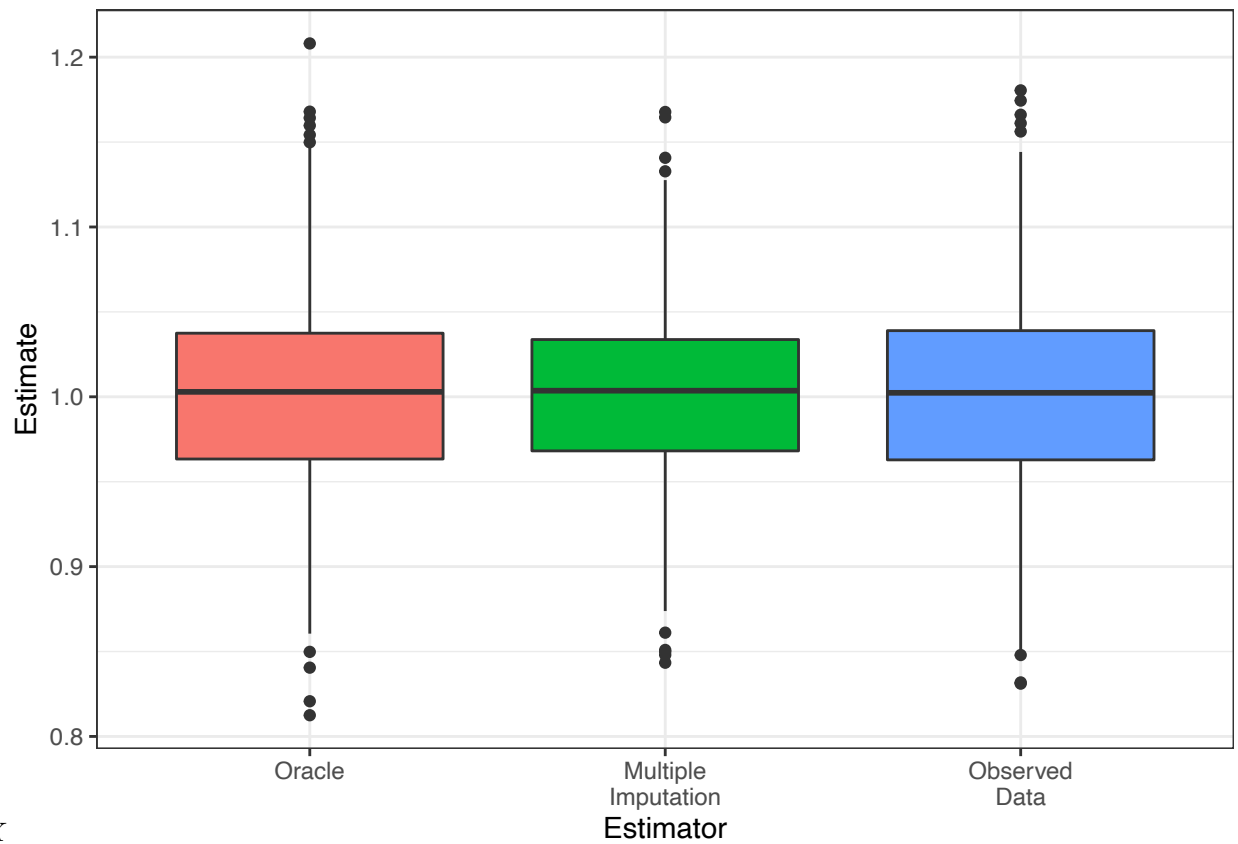
```
## # A tibble: 3 x 3
##   estimator   est      se
##   <chr>     <dbl>   <dbl>
## 1 si         1.00  0.0595
## 2 obs        1.00  0.0578
## 3 oracle     1.00  0.0563

##                oracle   observed single imputation
## empirical 0.05603238 0.05706055        0.04890523
## estimated 0.05630954 0.05781393        0.05942240
```

$\hat{Y} \sim X, Z$

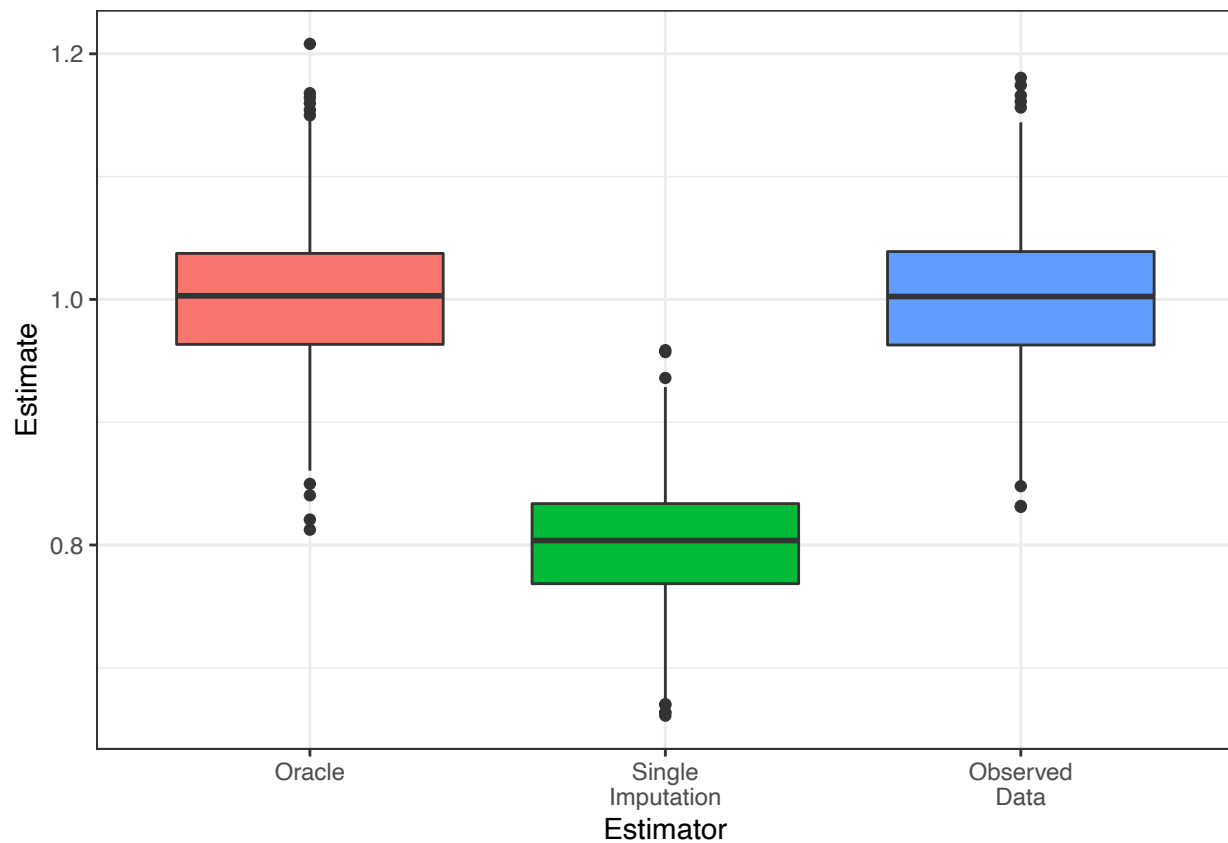**Beta unknown, model incorrectly specified**

$\hat{Y} \sim G+X$

```
## # A tibble: 3 x 3
##   estimator    est      se
##   <chr>      <dbl>   <dbl>
## 1 mi          1.00  0.0595
## 2 obs         1.00  0.0578
## 3 oracle      1.00  0.0563

##              oracle_est      obs_est      mi_est
## empirical    0.05603238   0.05706055  0.04890523
## estimated    0.05630954   0.05781393  0.05942240
```
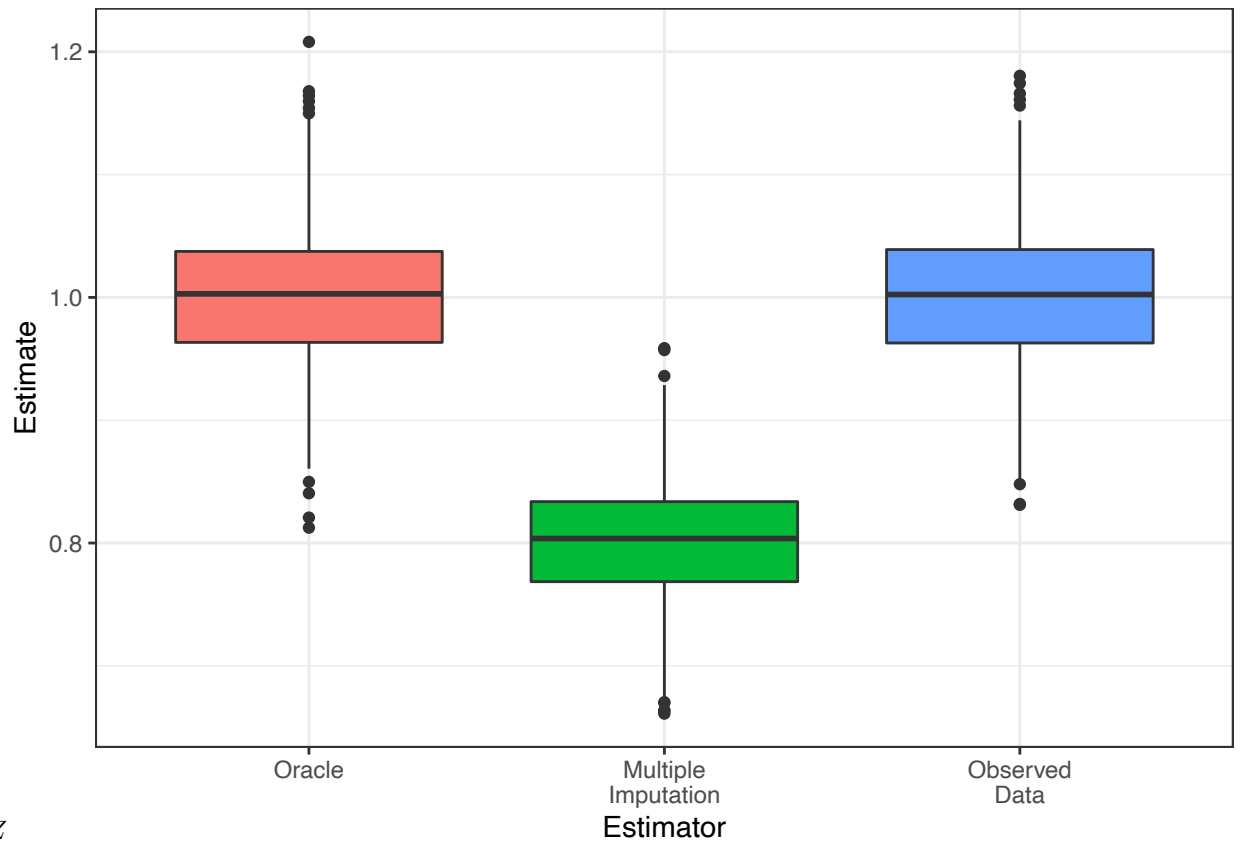
```
## # A tibble: 3 x 3
##   estimator   est      se
##   <chr>     <dbl>   <dbl>
## 1 si        0.801  0.0619
## 2 obs       1.00   0.0578
## 3 oracle    1.00   0.0563

##               oracle   observed single imputation
## empirical 0.05603238 0.05706055          0.04947508
## estimated 0.05630954 0.05781393          0.06178609
```

Multiple Imputation

$\hat{Y} \sim X{+}Z$

```
## # A tibble: 3 x 3
##   estimator   est      se
##   <chr>     <dbl>   <dbl>
## 1 mi        0.801  0.0619
## 2 obs       1.00   0.0578
## 3 oracle    1.00   0.0563

##          oracle_est    obs_est     mi_est
## empirical 0.05603238 0.05706055 0.04947508
## estimated 0.05630954 0.05781393 0.06178609
```