

Reproducibility Guidelines: Step 3

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Load the R packages

- Set the location of this readme file as the working directory.
- Make sure to install the CAPPMx and OpenMPController R packages.
- Please double check whether **Steps 1 and 2** have been executed and **NO output has been deleted**.

```
packages=c("Rcpp", "RcppArmadillo", "RcppGSL", "RcppDist", "plyr", "reshape2", "ggplot2",  
           "caret", "parallel", "psrwe", "mvtnorm", "foreach", "doParallel", "MASS",  
           "inline", "devtools", "writexl", "ggpubr", "coda", "ggmcmc", "latex2exp",  
           "ape", "survival", "survminer", "data.table", "dplyr", "optmatch", "MCMCpack",  
           "ROCR", "dbarts", "randomForest", "mltools", "gtools", "ape", "OpenMPController", "CAPPMx")  
lapply(packages, require, character.only = TRUE)
```

Analyzing the Glioblastoma Data

- The figures in the section will not be exactly same as those presented in the paper since we have to use a slightly modified version of the actual data to maintain the patients' privacy.

Resample the Glioblastoma data for studying the frequentist operating characteristics:

```
input_dir=output_dir=paste0(getwd(), "/GBM_real_data/")  
source("GBM_real_data/repeat_sims_gendata.R")
```

Fit CA-PPMx on the data:

```
source("GBM_real_data/MDACC_Data_repeat_sims_analysis.R")
```

Showing Covariate Equivalence

```
input_dir=output_dir=paste0(getwd(), "/GBM_real_data/"); nsamp1=49  
load(file=paste(output_dir, "out_CAPPMx_GBM", nsamp1, ".RData", sep="_"))  
source("GBM_real_data/GBM_get_auc.R")  
source("GBM_real_data/cov_equivalence.R")  
ggsave(plot=gg.all, filename = paste0(output_dir, "freq_plots_adjustment.pdf"),  
        height = 6, width=10.28, units = "in", bg = "white")  
gg.all
```

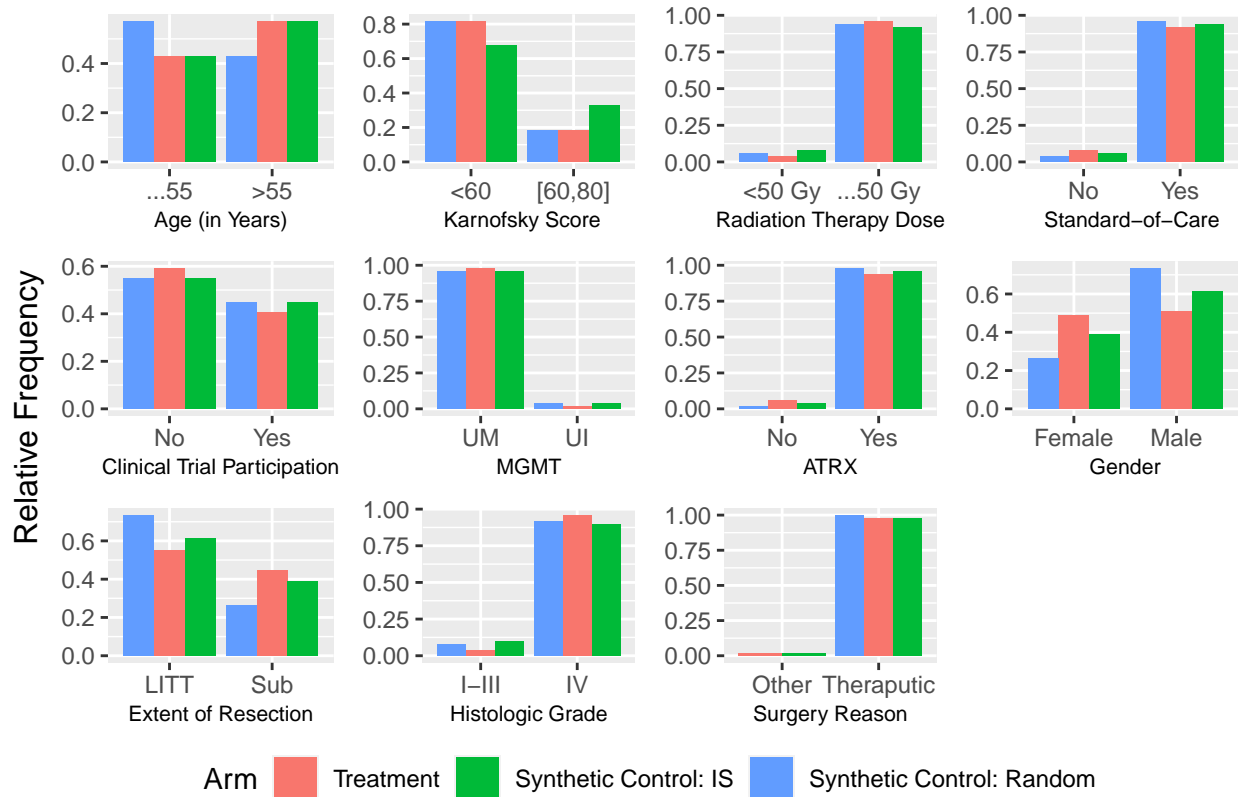


Figure 1: Figure 5 of the main paper

A pdf copy this figure is saved in the folder `GBM_real_data` with the name `freq_plots_adjustment.pdf`.

Two-step Analyses

IS-based Analysis

```
source("GBM_real_data/MDACC_Data_repeat_sims_two_step_analysis.R")
ggsave(gg_pvals+theme(legend.position = "top" ),filename =paste0(output_dir,"gg_pvals_top_legend.pdf")
       width=4,height=4,units = "in",bg = "white")
gg_pvals+theme(legend.position = "top",text = element_text(size=10))
```

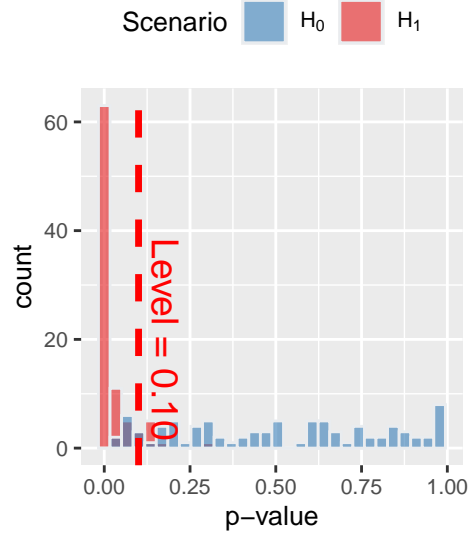


Figure 2: Upper panel of Figure 6(a) in the main paper

A pdf copy of the histogram is saved in the folder GBM_real_data with the name gg_pvals_top_legend.pdf.

```
ggsave(plot=p_KM, file=paste0(output_dir, "KM_narrow.pdf"),
       width = wd*2, height = hg, units = "in")
p_KM
```

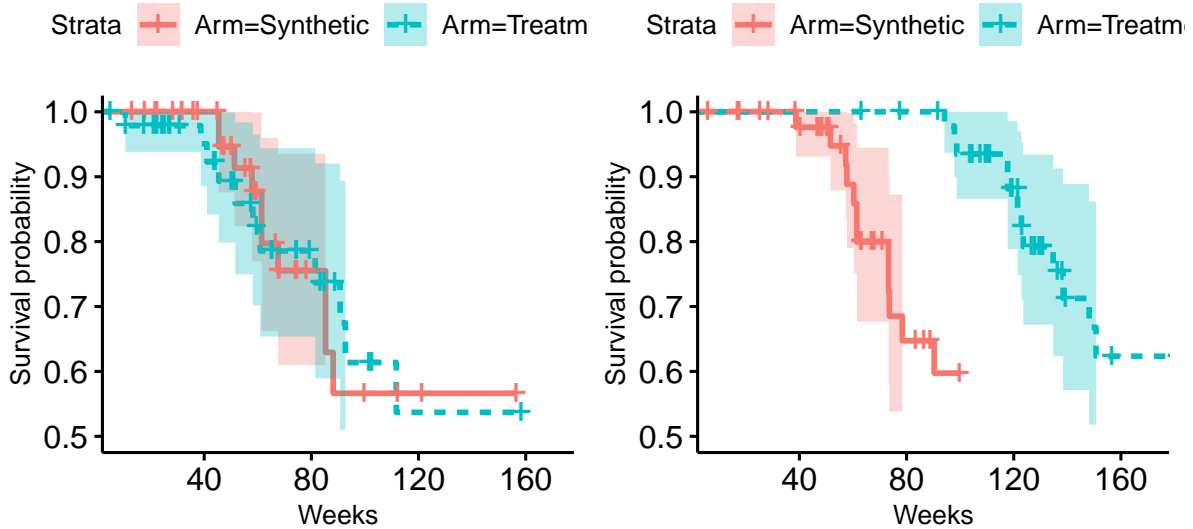


Figure 3: Upper panel of Figure 6(b) in the main paper

A pdf copy of the Kaplan-Meier curves is saved in the folder GBM_real_data with the name KM_narrow.pdf.

Matching-based Analysis

```
output_dir=paste0(getwd(), "/GBM_real_data/optmatch_analysis/")
input_dir=paste0(getwd(), "/GBM_real_data/")
source(paste0(output_dir, "MDACC_Data_repeat_sims_optmatch_frequentist_analysis.R"))
gg_pvals+theme(text = element_text(size=10))
```

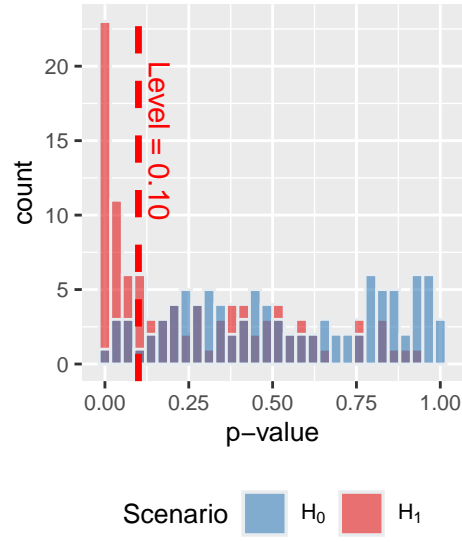


Figure 4: Lower panel of Figure 6(a) in the main paper

A pdf copy of this figure is saved in the folder GBM_real_data/optmatch_analysis with the name gg_pvals_optmatch.pdf.

```
ggsave(plot=p_KM, file=paste0(output_dir, "KM_narrow_optmatch.pdf"),
       width = wd*2, height = hg, units = "in")
p_KM
```

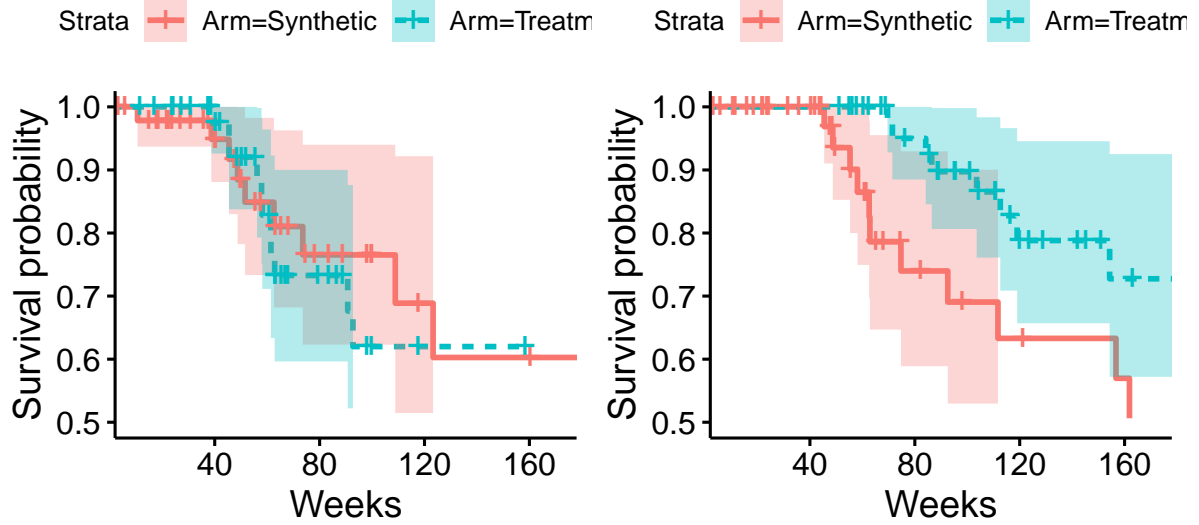


Figure 5: Lower panel of Figure 6(b) of the main paper

A pdf copy of this figure is saved in the folder GBM_real_data/optmatch_analysis with the name KM_narrow_optmatch.pdf.

Bayesian Model-based Analysis

```
output_dir=paste0(getwd(),"/GBM_real_data/")
source(paste0(getwd(),"/GBM_real_data/MDACC_Data_repeat_sims_Bayesian_analysis.R") )
ggsave(qplot_aug, file=paste0(output_dir,"qqplot_both.pdf"),
       width=9.5,height = 5,units = "in")
qplot_aug
```

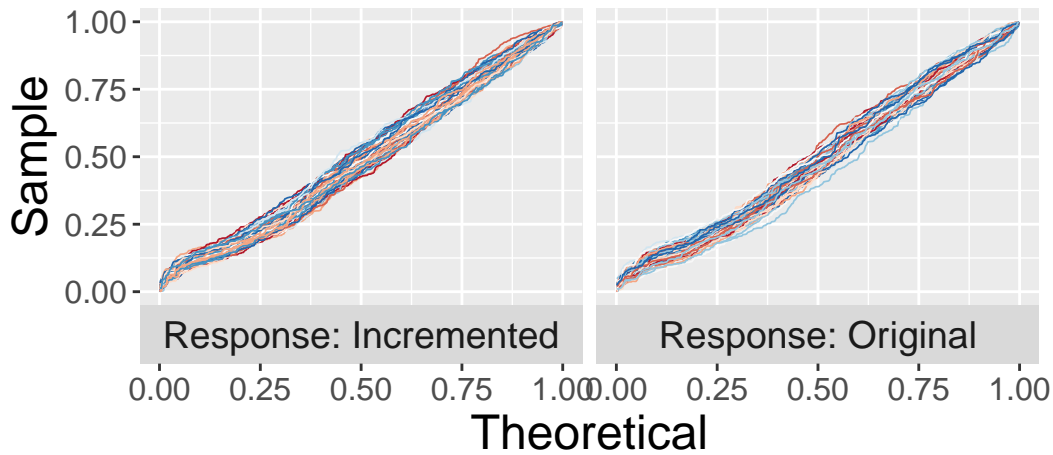


Figure 6: Figure 7(a) of the main paper

A pdf copy of this figure is saved in the folder GBM_real_data with the name qqplot_both.pdf.

```
ggsave(gg_freq_oc_hr,filename =paste0(output_dir,"gg_freq_oc_hr2.pdf"),
       width=8.67,height=4.2,units = "in",bg = "white")
ggarrange(gg_hists+theme(text = element_text(size=12)),gg.HR+theme(text = element_text(size=12)),
         ncol = 2, common.legend = TRUE, legend = "bottom", widths=c(1,1.1) )
```

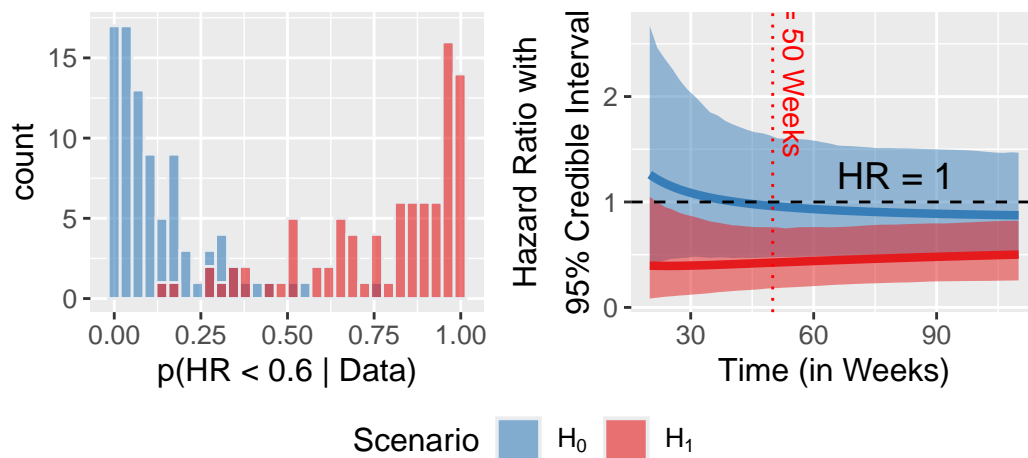


Figure 7: Figure 7(b) of the main paper

A pdf copy of this figure is saved in the folder GBM_real_data with the name gg_freq_oc_hr2.pdf.