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N <- 700
Nsims <- 1000

maxFollow <- 84
cens.type <- "weibull"
##### Forest search criteria
hr.threshold <- 1.25 # Initital candidates
hr.consistency <- 1 # Candidates for many splits

pconsistency.threshold <- 0.9
stop.threshold <- 0.95

maxk <- 2
nmin.fs <- 60
pstop_futile <- 0.7

# Limit timing for forestsearch
max.minutes <- 3
m1.threshold <- Inf # Turning this off (Default)
# pconsistency.threshold<-0.70 # Minimum threshold (will choose max among
# subgroups satisfying)
fs.splits <- 400 # How many times to split for consistency
# vi is % factor is selected in cross-validation --> higher more important
vi.grf.min <- (-1) * 0.2 # This is default (to NOT exclude via VI)
# Null, turns off grf screening
d.min <- 10 # Min number of events for both arms (d0.min=d1.min=d.min)
# default=5

##### Virtual twins analysis Counter-factual difference
##### (C-E) >= vt.threshold Large values in favor of C
##### (control)
vt.threshold <- 0.225 # For VT delta
treat.threshold <- 0

maxdepth <- 2
n.min <- 60
ntree <- 1000

# GRF criteria
dmin.grf <- 12 # For GRF delta
# Note: For CRT this represents dmin.grf/2 RMS for control (-dmin.grf/2 for
# treatment)
frac.tau <- 0.6

# For forestsearch algorithm use same as GRF
frac.tau_fs <- 0.6
dmin.grf_fs <- 12
maxdepth_fs <- 2

label.analyses <- c("FS1", "GRF", "VT(24)", "VT#(24)", "VT(36)", "VT#(36)", "GRF.60")
# Classification table names
est_names <- c("$FS_{g}$", "$FS_{lg}$", "$GRF$", "$GRF_{60}$", "$VT(24)$", "{$VT}^{\backslash\#}(24)$",
               "$VT(36)$", "{$VT}^{\backslash\#}(36)$")

outcome.name <- c("y.sim")

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event.name <- c("event.sim")
id.name <- c("id")
treat.name <- c("treat")

cox.formula.sim <- as.formula(paste("Surv(y.sim,event.sim)~treat"))
cox.formula.adj.sim <- as.formula(paste("Surv(y.sim,event.sim)~treat+v1+v2+v3+v4+v5"))

get.FS <- TRUE
get.VT <- TRUE
get.GRF <- TRUE

fl_prefix <- paste0("oc_sims=", Nsims, "_")

out.loc <- paste0("results/", fl_prefix)

# m1 -censoring adjustment
muC.adj <- log(1.5)

# 0, 3, or 5
n_add_noise <- 3

mindex <- "m4a"
file.index <- "v0B-4cuts"

z1_frac <- 0.25

if (mindex == "m4a") {
  k.z3 <- 1
  k.treat <- 0.9
  pH_super <- 0.125 # non-NULL re-defines z1_frac
}

if (mindex == "m4aB") {
  k.z3 <- 1
  k.treat <- 0.9
  pH_super <- 0.2 # non-NULL re-defines z1_frac
}

if (mindex == "m4b") {
  k.z3 <- 1
  k.treat <- 1.25
  pH_super <- 0.3 # non-NULL re-defines z1_frac
}

if (mindex == "m4c") {
  k.z3 <- 1
  k.treat <- 1.5
  pH_super <- 0.3 # non-NULL re-defines z1_frac
}

model.index <- paste0(mindex, "-Noise=", "")
model.index <- paste0(model.index, n_add_noise, "")

if (is.null(pH_super)) {
  # pH_check<-with(gbsg,mean(pgr<=quantile(pgr,c(z3_frac),1,0) &

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# er<=quantile(er,z1_frac)))
pH_check <- with(gbsg, mean(meno == 0 & er <= quantile(er, z1_frac)))
cat("Underlying pH_super", c(pH_check), "\n")
}

# pH_super specified If pH_super then override z1_frac and find z1_frac to
# yield pH_super

if (!is.null(pH_super)) {
  # Approximate Z1 quantile to yield pH proportion
  z1_q <- uniroot(propH.obj4, c(0, 1), tol = 1e-04, pH.target = pH_super)$root
  # pH_check<-with(gbsg,mean(pgr<=quantile(pgr,c(z3_frac),1,0) &
  # er<=quantile(er,z1_q)))
  pH_check <- with(gbsg, mean(meno == 0 & er <= quantile(er, z1_q)))
  cat("pH", c(pH_check), "\n")
  rel_error <- (pH_super - pH_check)/pH_super
  if (abs(rel_error) >= 0.1)
    stop("pH_super approximation relative error exceeds 10%")
  z1_frac <- z1_q
  cat("Underlying pH_super", c(pH_check), "\n")
}

## pH 0.122449
## Underlying pH_super 0.122449

# Bootstrap on log(hr) scale converted to HR (est.loghr=TRUE & est.scale='hr')
est.loghr <- TRUE
est.scale <- "hr"
t.start.all <- proc.time()[3]

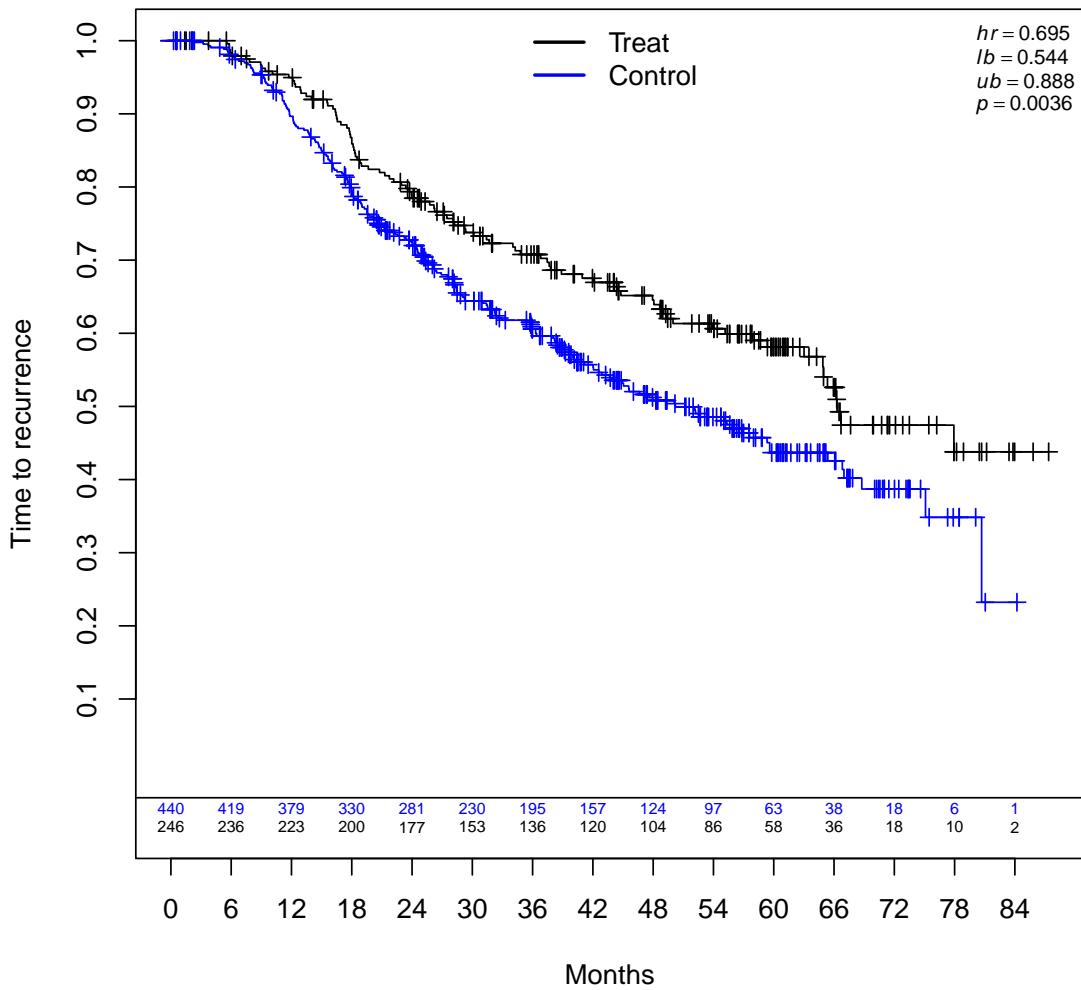
# Classification table names Note: within tab_tests (summary.VTFS) we rename so
# that denominator in ppu(hatH) is # hatH Manuscript section 3.2 will be
# updated accordingly

stat_names <- c("any(H)", "${sens}(\hat{H})${", "${sens}(\hat{H}^C){${", "${ppv}(\hat{H})${",
  "${ppv}(\hat{H}^C){${", "${avg}\sqrt{\hat{H}}\sqrt{${", "${min}\sqrt{\hat{H}}\sqrt{${",
  "${max}\sqrt{\hat{H}}\sqrt{${", "${avg}\sqrt{\hat{H}^C}\sqrt{${", "${min}\sqrt{\hat{H}^C}\sqrt{${",
  "${max}\sqrt{\hat{H}^C}\sqrt{${"

if (!get.FS) est_names <- est_names[-c(1:3)]


mod.harm <- "null"
this.dgm <- get.dgm4.OC(mod.harm = mod.harm, N = N, k.treat = k.treat, model.index = model.index,
  sol_tol = 10^-8, hrH.target = hrH.target, cens.type = cens.type, out.loc = out.loc,
  file.index = file.index, details = TRUE, parms_torand = FALSE)

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## Super-population empirical harm and non-harm hazard ratios= NA 0.701027
## Causal HR (empirical ITT)= 0.701027

dgm <- this.dgm$dgm
output.file <- this.dgm$out.file

if (!is.null(output.file) & !grepl(mod.harm, output.file)) stop("Wrong file name for mod.harm")

# Show first simulation ans1 <- oc_analyses_m4_FS4(1)

t.start <- proc.time()[3]
res <- foreach(sim = seq_len(Nsims), .options.future = list(seed = TRUE), .combine = "rbind",
    .errorhandling = "pass") %dofuture% {
    ans <- oc_analyses_m4FourCuts_FS4(sim)
    return(ans)
}

## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 49.01796 2

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##      leaf.node control.mean control.size control.se depth
## 1          2        3.60       62.00      3.60      1
## 2          3       -4.55       638.00     1.13      1
## 11         4       -5.51       312.00     1.65      2
## 4          7       -4.85       329.00     1.51      2
##      leaf.node control.mean control.size control.se depth
## 1          2        3.6        62.0       3.6       1
## GRF subgroup NOT found
## NO GRF cuts meeting delta(RMST): dmin.grf= 12
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## Default cuts included (1st 20)
## Categorical: z1 z2 z3 z4 z5 grade3
## # of candidate subgroup factors= 19
## [1] "size <= 29.4"    "size <= 25"      "size <= 20"      "size <= 35"
## [5] "noise1 <= 0"     "noise1 <= -0.6"   "noise1 <= 0.7"   "noise2 <= 0"
## [9] "noise2 <= -0.8"   "noise2 <= 0.7"    "noise3 <= 0"    "noise3 <= -0.7"
## [13] "noise3 <= 0.6"   "z1"                  "z2"                  "z3"
## [17] "z4"                 "z5"                  "grade3"
## Number of factors evaluated= 19
## Confounders per grf screening q15 q17 q9 q4 q18 q11 q6 q16 q7 q8 q13 q5 q14 q19 q3 q10 q12 q2 q1
##      Factors Labels VI(grf)
## 15          z2      q15  0.1377
## 17          z4      q17  0.0919
## 9  noise2 <= -0.8   q9  0.0693
## 4   size <= 35     q4  0.0627
## 18          z5      q18  0.0550
## 11  noise3 <= 0   q11  0.0539
## 6  noise1 <= -0.6   q6  0.0531
## 16          z3      q16  0.0512
## 7  noise1 <= 0.7   q7  0.0444
## 8  noise2 <= 0   q8  0.0433
## 13  noise3 <= 0.6   q13 0.0414
## 5  noise1 <= 0   q5  0.0398
## 14          z1      q14  0.0398
## 19          grade3  q19  0.0394
## 3   size <= 20     q3  0.0379
## 10  noise2 <= 0.7   q10 0.0367
## 12 noise3 <= -0.7   q12 0.0363
## 2   size <= 25     q2  0.0355
## 1   size <= 29.4    q1  0.0308
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 741
## Approximately 5% of max_count met: minutes 0.001583333
## Approximately 10% of max_count met: minutes 0.002766667
## Approximately 20% of max_count met: minutes 0.005583333
## Approximately 33% of max_count met: minutes 0.008633333
## Approximately 50% of max_count met: minutes 0.01268333
## Approximately 75% of max_count met: minutes 0.02088333
## Approximately 90% of max_count met: minutes 0.02435
## # of subgroups evaluated based on (up to) maxk-factor combinations 741
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 43 52

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## # of subgroups with sample size less than criteria 80
## # of subgroups meeting all criteria = 645
## # of subgroups fitted (Cox model estimable) = 645
## *Subgroup Searching Minutes= 0.02645
## Number of subgroups meeting HR threshold 2
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 2
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##   n  E d1  HR L(HR) q15.0 q15.1
## 1 82 31 19 1.49  0.72    0    0
## 2 86 41 24 1.31  0.70    0    0
## Consistency 0.7075
## Consistency 0.6075
## Subgroup Consistency Minutes= 0.0473
## NO subgroup found (FS)
## Minutes forestsearch overall= 0.09438333
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 49.01796 2
##   leaf.node control.mean control.size control.se depth
## 1      2      3.60      62.00      3.60      1
## 2      3     -4.55      638.00     1.13      1
## 11     4     -5.51      312.00     1.65      2
## 4      7     -4.85      329.00     1.51      2
##   leaf.node control.mean control.size control.se depth
## 1      2      3.6       62.0       3.6       1
## GRF subgroup NOT found
## NO GRF cuts meeting delta(RMST): dmin.grf= 12
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## CV lambda = 0.02580757
## 10 x 1 sparse Matrix of class "dgCMatrix"
##           s0
## z1      0.07626064
## z2      .
## z3      .
## z4      0.48897013
## z5     -0.75595164
## size    .
## grade3 .
## noise1 -0.04100400
## noise2 .
## noise3 .
## Cox-LASSO selected: z1 z4 z5 noise1
## Cox-LASSO not selected: z2 z3 size grade3 noise2 noise3
## Default cuts included from Lasso:
## Categorical after Lasso: z1 z4 z5
## # of candidate subgroup factors= 16
## [1] "size <= 29.4"    "size <= 25"      "size <= 20"      "size <= 35"
## [5] "noise1 <= 0"     "noise1 <= -0.6"   "noise1 <= 0.7"   "noise2 <= 0"
## [9] "noise2 <= -0.8"   "noise2 <= 0.7"    "noise3 <= 0"    "noise3 <= -0.7"
## [13] "noise3 <= 0.6"   "z1"          "z4"          "z5"
## Number of factors evaluated= 16
## Confounders per grf screening q15 q9 q4 q11 q16 q6 q7 q14 q13 q5 q8 q3 q10 q12 q2 q1
## Factors Labels VI(grf)

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## 15          z4    q15  0.1139
## 9  noise2 <= -0.8      q9  0.0900
## 4   size <= 35       q4  0.0852
## 11 noise3 <= 0       q11 0.0731
## 16          z5    q16  0.0727
## 6  noise1 <= -0.6      q6  0.0708
## 7  noise1 <= 0.7       q7  0.0644
## 14          z1    q14  0.0575
## 13 noise3 <= 0.6      q13 0.0533
## 5  noise1 <= 0       q5  0.0527
## 8  noise2 <= 0       q8  0.0504
## 3   size <= 20       q3  0.0473
## 10 noise2 <= 0.7      q10 0.0440
## 12 noise3 <= -0.7      q12 0.0427
## 2   size <= 25       q2  0.0412
## 1   size <= 29.4      q1  0.0409
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 528
## Approximately 5% of max_count met: minutes 0.001183333
## Approximately 10% of max_count met: minutes 0.002166667
## Approximately 20% of max_count met: minutes 0.004266667
## Approximately 33% of max_count met: minutes 0.008583333
## Approximately 50% of max_count met: minutes 0.01176667
## Approximately 75% of max_count met: minutes 0.01616667
## Approximately 90% of max_count met: minutes 0.01898333
## # of subgroups evaluated based on (up to) maxk-factor combinations 528
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 37 44
## # of subgroups with sample size less than criteria 66
## # of subgroups meeting all criteria = 447
## # of subgroups fitted (Cox model estimable) = 447
## *Subgroup Searching Minutes== 0.02043333
## Number of subgroups meeting HR threshold 2
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 2
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##     n E d1  HR L(HR) q15.0 q15.1
## 1 82 31 19 1.49  0.72      1    0
## 2 86 41 24 1.31  0.70      0    0
## Consistency 0.7075
## Consistency 0.6075
## Subgroup Consistency Minutes= 0.04835
## NO subgroup found (FS)
## Minutes forestsearch overall= 0.07856667
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 50.12699 2
##   leaf.node control.mean control.size control.se depth
## 1      2      -4.36     459.00     1.29    1
## 2      3      2.60     241.00     1.72    1
## 3      4      -7.35     128.00     2.28    2
## 4      5      3.23     201.00     2.01    2
## 5      6      -6.77     245.00     1.60    2
## 6      7      4.56     126.00     2.59    2
##   leaf.node control.mean control.size control.se depth

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## 6      7      4.56      126.00      2.59      2
## GRF subgroup NOT found
## NO GRF cuts meeting delta(RMST): dmin.grf= 12
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## Default cuts included (1st 20)
## Categorical: z1 z2 z3 z4 z5 grade3
## # of candidate subgroup factors= 19
## [1] "size <= 29.9"    "size <= 25"      "size <= 21"      "size <= 35"
## [5] "noise1 <= 0"     "noise1 <= -0.7"   "noise1 <= 0.7"   "noise2 <= 0"
## [9] "noise2 <= -0.7"   "noise2 <= 0.7"    "noise3 <= -0.1"   "noise3 <= -0.7"
## [13] "noise3 <= 0.6"   "z1"           "z2"           "z3"
## [17] "z4"             "z5"           "grade3"
## Number of factors evaluated= 19
## Confounders per grf screening q3 q8 q10 q18 q13 q16 q17 q9 q11 q7 q1 q5 q6 q15 q12 q14 q19 q4 q2
##          Factors Labels VI(grf)
## 3      size <= 21      q3  0.1597
## 8      noise2 <= 0     q8  0.1198
## 10     noise2 <= 0.7   q10 0.0546
## 18     z5              q18 0.0524
## 13     noise3 <= 0.6   q13 0.0491
## 16     z3              q16 0.0468
## 17     z4              q17 0.0467
## 9      noise2 <= -0.7  q9  0.0452
## 11     noise3 <= -0.1  q11 0.0443
## 7      noise1 <= 0.7   q7  0.0439
## 1      size <= 29.9   q1  0.0434
## 5      noise1 <= 0     q5  0.0431
## 6      noise1 <= -0.7  q6  0.0393
## 15     z2              q15 0.0392
## 12     noise3 <= -0.7  q12 0.0383
## 14     z1              q14 0.0366
## 19     grade3          q19 0.0346
## 4      size <= 35     q4  0.0335
## 2      size <= 25     q2  0.0294
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 741
## Approximately 5% of max_count met: minutes 0.003216667
## Approximately 10% of max_count met: minutes 0.005333333
## Approximately 20% of max_count met: minutes 0.00825
## Approximately 33% of max_count met: minutes 0.01231667
## Approximately 50% of max_count met: minutes 0.01861667
## Approximately 75% of max_count met: minutes 0.0278
## Approximately 90% of max_count met: minutes 0.03295
## # of subgroups evaluated based on (up to) maxk-factor combinations 741
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 43 49
## # of subgroups with sample size less than criteria 79
## # of subgroups meeting all criteria = 646
## # of subgroups fitted (Cox model estimable) = 646
## *Subgroup Searching Minutes=* 0.03643333
## Number of subgroups meeting HR threshold 7
## Subgroup candidate(s) found (FS)

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## # of candidate subgroups (meeting HR criteria) = 7
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##   n E d1  HR L(HR) q3.0 q3.1 q8.0 q8.1 q10.0 q10.1 q18.0
## 1 79 49 28 1.53  0.87  0  0  0  0  0  0  0  0
## 2 87 50 30 1.48  0.84  0  0  0  0  0  0  0  0
## 3 76 43 25 1.43  0.78  0  0  0  0  0  0  0  0
## 4 64 40 22 1.34  0.72  0  0  0  0  0  0  0  0
## 5 67 29 15 1.33  0.64  0  0  0  0  0  0  0  0
## 6 92 41 24 1.27  0.68  0  0  0  0  0  0  0  0
## 7 88 55 26 1.27  0.75  0  0  0  0  0  0  0  0
## Consistency 0.84
## Consistency 0.8225
## Consistency 0.7575
## Consistency 0.6425
## Subgroup Consistency Minutes= 0.1292333
## NO subgroup found (FS)
## Minutes forestsearch overall= 0.1765667
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 50.12699 2
##   leaf.node control.mean control.size control.se depth
## 1      2       -4.36     459.00      1.29      1
## 2      3        2.60     241.00      1.72      1
## 3      4       -7.35     128.00      2.28      2
## 4      5        3.23     201.00      2.01      2
## 5      6       -6.77     245.00      1.60      2
## 6      7        4.56     126.00      2.59      2
##   leaf.node control.mean control.size control.se depth
## 6      7        4.56     126.00      2.59      2
## GRF subgroup NOT found
## NO GRF cuts meeting delta(RMST): dmin.grf= 12
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## CV lambda = 0.01780769
## 10 x 1 sparse Matrix of class "dgCMatrix"
##           s0
## z1    0.105679641
## z2   -0.169523647
## z3    .
## z4    0.667886949
## z5   -0.744553046
## size  0.003116163
## grade3 .
## noise1 0.007443155
## noise2 -0.024801079
## noise3 .
## Cox-LASSO selected: z1 z2 z4 z5 size noise1 noise2
## Cox-LASSO not selected: z3 grade3 noise3
## Default cuts included from Lasso:
## Categorical after Lasso: z1 z2 z4 z5
## # of candidate subgroup factors= 17
## [1] "size <= 29.9"   "size <= 25"     "size <= 21"     "size <= 35"
## [5] "noise1 <= 0"    "noise1 <= -0.7"  "noise1 <= 0.7"   "noise2 <= 0"
## [9] "noise2 <= -0.7" "noise2 <= 0.7"   "noise3 <= -0.1"  "noise3 <= -0.7"
## [13] "noise3 <= 0.6"  "z1"          "z2"          "z4"

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## [17] "z5"
## Number of factors evaluated= 17
## Confounders per grf screening q3 q8 q15 q10 q16 q17 q11 q13 q7 q9 q4 q1 q5 q12 q6 q14 q2
##          Factors Labels VI(grf)
## 3      size <= 21      q3  0.1679
## 8      noise2 <= 0      q8  0.1240
## 15      z2      q15  0.0590
## 10     noise2 <= 0.7    q10 0.0588
## 16      z4      q16  0.0576
## 17      z5      q17  0.0529
## 11     noise3 <= -0.1   q11 0.0528
## 13     noise3 <= 0.6    q13 0.0513
## 7      noise1 <= 0.7    q7  0.0477
## 9      noise2 <= -0.7   q9  0.0476
## 4      size <= 35      q4  0.0473
## 1      size <= 29.9    q1  0.0468
## 5      noise1 <= 0      q5  0.0447
## 12     noise3 <= -0.7   q12 0.0419
## 6      noise1 <= -0.7   q6  0.0360
## 14      z1      q14  0.0340
## 2      size <= 25      q2  0.0295
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 595
## Approximately 5% of max_count met: minutes 0.00185
## Approximately 10% of max_count met: minutes 0.00325
## Approximately 20% of max_count met: minutes 0.0055
## Approximately 33% of max_count met: minutes 0.009216667
## Approximately 50% of max_count met: minutes 0.01408333
## Approximately 75% of max_count met: minutes 0.02113333
## Approximately 90% of max_count met: minutes 0.02525
## # of subgroups evaluated based on (up to) maxk-factor combinations 595
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 38 43
## # of subgroups with sample size less than criteria 67
## # of subgroups meeting all criteria = 513
## # of subgroups fitted (Cox model estimable) = 513
## *Subgroup Searching Minutes= 0.02758333
## Number of subgroups meeting HR threshold 4
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 4
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##   n E d1  HR L(HR) q3.0 q3.1 q8.0 q8.1
## 1 87 50 30 1.48  0.84    0    0    0    0
## 2 76 43 25 1.43  0.78    0    0    0    0
## 3 92 41 24 1.27  0.68    0    0    0    0
## 4 88 55 26 1.27  0.75    0    0    0    0
## Consistency 0.8225
## Consistency 0.7575
## Consistency 0.485
## Subgroup Consistency Minutes= 0.09458333
## NO subgroup found (FS)
## Minutes forestsearch overall= 0.1348167
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 48.57937 2

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```

##   leaf.node control.mean control.size control.se depth
## 1      2      -5.39     624.00      1.16    1
## 2      3       2.54      76.00      2.98    1
## 3      4       7.16      84.00      2.84    2
## 4      5      -9.55     106.00      2.68    2
## 5      6      -6.03     496.00      1.30    2
##   leaf.node control.mean control.size control.se depth
## 3      4       7.16      84.00      2.84    2
## GRF subgroup found
## All splits
## [1] "size <= 20"      "z2 <= 0"        "noise2 <= 2.01"
## Terminating node at max.diff (sg.harm.id)
## [1] "z2 <= 0"
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## Default cuts included (1st 20)
## Categorical: z1 z2 z3 z4 z5 grade3
## Factors per GRF: size <= 20 z2 <= 0 noise2 <= 2.01
## Initial GRF cuts included size <= 20 z2 <= 0 noise2 <= 2.01
## # of candidate subgroup factors= 21
## [1] "size <= 20"      "noise2 <= 2.01" "size <= 28.8"  "size <= 25"
## [5] "size <= 35"      "noise1 <= -0.1" "noise1 <= 0"   "noise1 <= -0.7"
## [9] "noise1 <= 0.6"   "noise2 <= 0"   "noise2 <= -0.7" "noise2 <= 0.7"
## [13] "noise3 <= 0"   "noise3 <= -0.7" "noise3 <= 0.7"  "z1"
## [17] "z2"              "z3"          "z4"          "z5"
## [21] "grade3"
## Number of factors evaluated= 21
## Confounders per grf screening q17 q5 q1 q10 q20 q19 q21 q6 q12 q13 q11 q4 q15 q8 q18 q16 q9 q7 q14 q
## Factors Labels VI(grf)
## 17      z2      q17  0.2606
## 5      size <= 35      q5  0.1052
## 1      size <= 20      q1  0.0750
## 10     noise2 <= 0     q10 0.0698
## 20      z5      q20  0.0491
## 19      z4      q19  0.0410
## 21      grade3     q21  0.0361
## 6      noise1 <= -0.1   q6  0.0335
## 12     noise2 <= 0.7   q12 0.0335
## 13     noise3 <= 0     q13 0.0332
## 11     noise2 <= -0.7   q11 0.0311
## 4      size <= 25      q4  0.0299
## 15     noise3 <= 0.7   q15 0.0280
## 8      noise1 <= -0.7   q8  0.0277
## 18      z3      q18  0.0274
## 16      z1      q16  0.0264
## 9      noise1 <= 0.6   q9  0.0263
## 7      noise1 <= 0     q7  0.0229
## 14     noise3 <= -0.7   q14 0.0221
## 3      size <= 28.8    q3  0.0214
## 2      noise2 <= 2.01    q2  0.0000
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 903
## Approximately 5% of max_count met: minutes 0.002616667
## Approximately 10% of max_count met: minutes 0.004883333
## Approximately 20% of max_count met: minutes 0.00835

```

```

## Approximately 33% of max_count met: minutes 0.0136
## Approximately 50% of max_count met: minutes 0.02156667
## Approximately 75% of max_count met: minutes 0.03251667
## Approximately 90% of max_count met: minutes 0.03778333
## # of subgroups evaluated based on (up to) maxk-factor combinations 903
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 88 94
## # of subgroups with sample size less than criteria 127
## # of subgroups meeting all criteria = 751
## # of subgroups fitted (Cox model estimable) = 751
## *Subgroup Searching Minutes=* 0.04118333
## Number of subgroups meeting HR threshold 3
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 3
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##      n   E d1    HR L(HR) q17.0 q17.1 q5.0
## 1  84  40 25 1.91  1.00      1      0      0
## 2  94  45 26 1.35  0.75      0      0      0
## 3 107  53 29 1.30  0.76      0      0      0
## Consistency 0.9675
## # of splits= 400
## Model, % Consistency Met= !{z2} {size <= 20} 0.9675
## SG focus= hr
## Subgroup Consistency Minutes= 0.02925
## Subgroup found (FS)
## Minutes forestsearch overall= 0.08085
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 48.57937 2
##   leaf.node control.mean control.size control.se depth
## 1       2        -5.39     624.00      1.16      1
## 2       3         2.54     76.00      2.98      1
## 3       4         7.16     84.00      2.84      2
## 4       5        -9.55    106.00      2.68      2
## 5       6        -6.03    496.00      1.30      2
##   leaf.node control.mean control.size control.se depth
## 3       4         7.16     84.00      2.84      2
## GRF subgroup found
## All splits
## [1] "size <= 20"      "z2 <= 0"          "noise2 <= 2.01"
## Terminating node at max.diff (sg.harm.id)
## [1] "z2 <= 0"
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## CV lambda = 0.01021808
## 10 x 1 sparse Matrix of class "dgCMatrix"
##           s0
## z1      0.2367628139
## z2     -0.3644157075
## z3      0.3140225180
## z4      0.6820163198
## z5     -0.7625133927
## size   -0.0007834897

```

```

## grade3 .
## noise1 -0.0079284172
## noise2 .
## noise3 0.0313928596
## Cox-LASSO selected: z1 z2 z3 z4 z5 size noise1 noise3
## Cox-LASSO not selected: grade3 noise2
## Default cuts included from Lasso:
## Categorical after Lasso: z1 z2 z3 z4 z5
## Factors per GRF: size <= 20 z2 <= 0 noise2 <= 2.01
## Initial GRF cuts included size <= 20 z2 <= 0 noise2 <= 2.01
## Factors included per GRF (not in lasso) size <= 20 noise2 <= 2.01
## # of candidate subgroup factors= 20
## [1] "size <= 20"      "noise2 <= 2.01" "size <= 28.8"    "size <= 25"
## [5] "size <= 35"      "noise1 <= -0.1" "noise1 <= 0"     "noise1 <= -0.7"
## [9] "noise1 <= 0.6"   "noise2 <= 0"   "noise2 <= -0.7" "noise2 <= 0.7"
## [13] "noise3 <= 0"    "noise3 <= -0.7" "noise3 <= 0.7"   "z1"
## [17] "z2"              "z3"          "z4"          "z5"
## Number of factors evaluated= 20
## Confounders per grf screening q17 q5 q1 q10 q19 q20 q13 q18 q8 q12 q16 q6 q15 q4 q11 q9 q7 q3 q14 q2
##          Factors Labels VI(grf)
## 17          z2    q17  0.2639
## 5           size <= 35   q5  0.1081
## 1           size <= 20   q1  0.0783
## 10          noise2 <= 0  q10 0.0722
## 19          z4    q19  0.0478
## 20          z5    q20  0.0466
## 13          noise3 <= 0  q13 0.0346
## 18          z3    q18  0.0341
## 8           noise1 <= -0.7 q8  0.0339
## 12          noise2 <= 0.7 q12 0.0337
## 16          z1    q16  0.0320
## 6           noise1 <= -0.1 q6  0.0318
## 15          noise3 <= 0.7 q15 0.0287
## 4            size <= 25   q4  0.0286
## 11          noise2 <= -0.7 q11 0.0283
## 9            noise1 <= 0.6 q9  0.0255
## 7            noise1 <= 0  q7  0.0245
## 3            size <= 28.8 q3  0.0238
## 14          noise3 <= -0.7 q14 0.0236
## 2            noise2 <= 2.01 q2  0.0000
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 820
## Approximately 5% of max_count met: minutes 0.005266667
## Approximately 10% of max_count met: minutes 0.006966667
## Approximately 20% of max_count met: minutes 0.009933333
## Approximately 33% of max_count met: minutes 0.01471667
## Approximately 50% of max_count met: minutes 0.02146667
## Approximately 75% of max_count met: minutes 0.03015
## Approximately 90% of max_count met: minutes 0.03498333
## # of subgroups evaluated based on (up to) maxk-factor combinations 820
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 84 89
## # of subgroups with sample size less than criteria 115
## # of subgroups meeting all criteria = 680

```

```

## # of subgroups fitted (Cox model estimable) = 680
## *Subgroup Searching Minutes= 0.03788333
## Number of subgroups meeting HR threshold 3
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 3
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##      n   E d1    HR L(HR) q17.0 q17.1 q5.0
## 1  84 40 25 1.91  1.00     1     0     0
## 2  94 45 26 1.35  0.75     0     0     0
## 3 107 53 29 1.30  0.76     0     0     0
## Consistency 0.9675
## # of splits= 400
## Model, % Consistency Met= !{z2} {size <= 20} 0.9675
## SG focus= hr
## Subgroup Consistency Minutes= 0.03061667
## Subgroup found (FS)
## Minutes forestsearch overall= 0.08091667

t.now <- proc.time()[3]
t.min <- (t.now - t.start)/60

print(table(res$analysis))

##
##      FS1     FSlg      GRF    GRF.60    VT(24)    VT(36)    VT#(24)    VT#(36)
##      1000     1000     1000     1000     1000     1000     1000     1000

check <- c(c(table(res$analysis)) - Nsims)
if (all(check != 0)) stop("All analyses not complete")

dgm_alt <- dgm
outres <- out.results(res = res, dgm = dgm, output.file = output.file, t.min = t.min,
                      out_analysis = "FS1")

## [1] "results/oc_sims=1000_m4a-Noise=3_N=700_null_ktreat=0.9_v0B-4cuts.Rdata"
##      sim sizeH_true propH_true sizeHc_true propHc_true any.H size.H size.Hc
##      <int>     <num>     <num>     <int>     <num> <num> <num> <int>
## 1:    1       0       0       700       1     0     0     700
## 2:    1       0       0       700       1     0     0     700
## 3:    1       0       0       700       1     1     69     631
## 4:    1       0       0       700       1     0     0     700
## 5:    1       0       0       700       1     0     0     700
## 6:    1       0       0       700       1     0     0     700
##      ppv      npv specificity sensitivity found.1 found.2 found.both
##      <lgcl>     <num>     <num>     <num> <int> <int>     <num>
## 1:    NA 1.0000000      1      NA     0     0     0
## 2:    NA 1.0000000      1      NA     0     0     0
## 3:    NA 0.9014286      1      0      NA     NA     NA
## 4:    NA 1.0000000      1      NA     NA     NA     NA
## 5:    NA 1.0000000      1      NA     0     0     0
## 6:    NA 1.0000000      1      NA     0     0     0
##      found.a13 hr.H.true hr.Hc.true hr.H.hat hr.Hc.hat    b1.H    b2.H    b1.Hc
##      <num> <lgcl>     <num>     <num>     <num> <lgcl> <lgcl>     <num>
## 1:      0     NA 0.6155054      NA 0.6155054     NA     NA 0.00000000
## 2:      0     NA 0.6155054      NA 0.6155054     NA     NA 0.00000000
## 3:     NA     NA 0.6155054  2.406676 0.5325424     NA     NA -0.08296298

```

```

## 4:      NA      NA  0.6155054      NA  0.6155054      NA      NA  0.00000000
## 5:      0      NA  0.6155054      NA  0.6155054      NA      NA  0.00000000
## 6:      0      NA  0.6155054      NA  0.6155054      NA      NA  0.00000000
##      b2.Hc    p.cens analysis   taumax   hr.itt    l.itt    u.itt
## <num>    <num>  <char>    <num>    <num>    <num>    <num>
## 1: -0.08552157 0.4642857     FS1 81.69660 0.6155054 0.5014207 0.755547
## 2: -0.08552157 0.4642857     FS1g 49.01796 0.6155054 0.5014207 0.755547
## 3: -0.16848455 0.4642857     GRF 81.69660 0.6155054 0.5014207 0.755547
## 4: -0.08552157 0.4642857     GRF.60 49.01796 0.6155054 0.5014207 0.755547
## 5: -0.08552157 0.4642857     VT(24) 81.69660 0.6155054 0.5014207 0.755547
## 6: -0.08552157 0.4642857     VT#(24) 81.69660 0.6155054 0.5014207 0.755547
##      hr.adj.itt l.adj.itt u.adj.itt l.H.true u.H.true l.Hc.true u.Hc.true
## <num>    <num>    <num>    <lgcl>    <lgcl>    <num>    <num>
## 1: 0.5906047 0.480604 0.7257825      NA      NA 0.5014207 0.755547
## 2: 0.5906047 0.480604 0.7257825      NA      NA 0.5014207 0.755547
## 3: 0.5906047 0.480604 0.7257825      NA      NA 0.5014207 0.755547
## 4: 0.5906047 0.480604 0.7257825      NA      NA 0.5014207 0.755547
## 5: 0.5906047 0.480604 0.7257825      NA      NA 0.5014207 0.755547
## 6: 0.5906047 0.480604 0.7257825      NA      NA 0.5014207 0.755547
##      l.H.hat u.H.hat l.Hc.hat u.Hc.hat
## <num>    <num>    <num>    <num>
## 1:      NA      NA 0.5014207 0.7555470
## 2:      NA      NA 0.5014207 0.7555470
## 3: 1.043941 5.548289 0.4297038 0.6599928
## 4:      NA      NA 0.5014207 0.7555470
## 5:      NA      NA 0.5014207 0.7555470
## 6:      NA      NA 0.5014207 0.7555470
## Subgroup HRs: H, H^c, Causal= NA 0.701027 0.701027
## Simulations= 1000
## Avg censoring= 0.4613314
## Min,Max,Avg tau.max= 72.81026 83.95272 81.68616
## P(H) approximation at causal(Hrc), n=60, approx= 0.701027 0.03392115
## P(H) approximation at plim(Hrc), n=60, approx= 0.7071011 0.03573494
## Minutes,hours 11.7869 0.1964483
##          FS1    FS1g    GRF   GRF.60   VT(24)  VT#(24)  VT(36)  VT#(36)
## any.H      0.250   0.230   0.620   0.280    0.040    0.020    0.070    0.030
## sensH      NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN
## sensHc     0.970   0.970   0.920   0.970    1.000    1.000    0.990    1.000
## ppH        0.000   0.000   0.000   0.000    0.000    0.000    0.000    0.000
## ppHc       1.000   1.000   1.000   1.000    1.000    1.000    1.000    1.000
## Avg(#H)    90.000  92.000  94.000  80.000   81.000   77.000   76.000   77.000
## minH       61.000  61.000  60.000  60.000   61.000   61.000   61.000   61.000
## maxH      249.000 249.000 222.000 149.000  119.000  120.000  114.000 106.000
## Avg(#Hc)   677.000 679.000 642.000 677.000  697.000  698.000  695.000 698.000
## minHc      451.000 451.000 478.000 551.000  581.000  580.000  586.000 594.000
## maxHc     700.000 700.000 700.000 700.000  700.000  700.000  700.000 700.000
## hat(H*)      NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN
## hat(hat[H]) 1.868   1.871   1.698   1.569    1.257    1.364    1.428    1.582
## hat(Hc*)     0.756   0.758   0.725   0.721    0.731    0.732    0.730    0.761
## hat(hat[Hc]) 0.669   0.670   0.641   0.655    0.683    0.679    0.679    0.697
## hat(H*)all    NaN     NaN     NaN     NaN     NaN     NaN     NaN     NaN
## hat(Hc*)all   0.707   0.707   0.707   0.707    0.707    0.707    0.707    0.707
## hat(ITT)all   0.707   0.707   0.707   0.707    0.707    0.707    0.707    0.707
## hat(ITTadj)all 0.666   0.666   0.666   0.666    0.666    0.666    0.666    0.666

```

```

missC <- tab_tests(res = res)

pA <- as.character(round(outres$pAnyH.approx2, 4))
tabsim_missC <- get_tabsim(missC = missC, pA = pA, est_names = est_names, stat_names = stat_names,
    mod.harm = mod.harm, Nsims = Nsims)

```

Table 1: Average classification rates: $\text{avg}|\hat{H}|$, $\text{min}|\hat{H}|$, and $\text{max}|\hat{H}|$, denote the average, minimum, and maximum of the number of subjects in the estimated subgroup \hat{H} (analogously for \hat{H}^c). Note that under the null $\text{sens}(\hat{H})$ is undefined and $\text{ppv}(\hat{H}) = 0$.

	FS_g	FS_{lg}	GRF	GRF_{60}	$VT(24)$	$VT^{\#}(24)$	$VT(36)$	$VT^{\#}(36)$
Finding H								
$\text{any}(H)$	0.25	0.23	0.62	0.28	0.04	0.02	0.07	0.03
$\text{sens}(\hat{H})$
$\text{sens}(\hat{H}^c)$	0.97	0.97	0.92	0.97	1	1	0.99	1
$\text{ppv}(\hat{H})$	0	0	0	0	0	0	0	0
$\text{ppv}(\hat{H}^c)$	1	1	1	1	1	1	1	1
Size of H and H-complement								
$\text{avg} \hat{H} $	90	92	94	80	81	77	76	77
$\text{min} \hat{H} $	61	61	60	60	61	61	61	61
$\text{max} \hat{H} $	249	249	222	149	119	120	114	106
$\text{avg} \hat{H}^c $	677	679	642	677	697	698	695	698
$\text{min} \hat{H}^c $	451	451	478	551	581	580	586	594
$\text{max} \hat{H}^c $	700	700	700	700	700	700	700	700

Note: Number of simulations= 1000 .

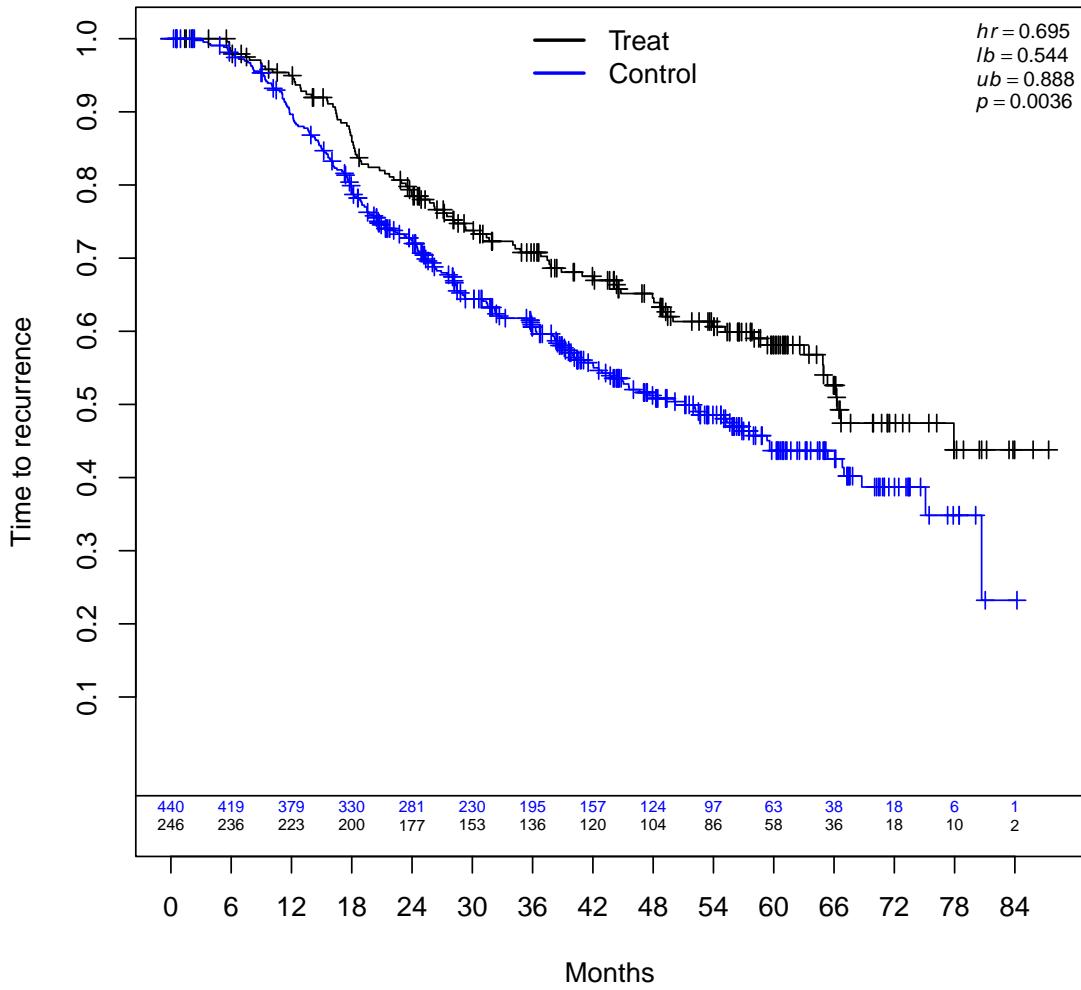
Note: Probability approximation= 0.0357 .

```

mod.harm <- "alt"
hrH.target <- 2

this.dgm <- get.dgm4.OC(mod.harm = mod.harm, N = N, k.treat = k.treat, model.index = model.index,
    sol_tol = 10^-8, hrH.target = hrH.target, cens.type = cens.type, out.loc = out.loc,
    file.index = file.index, details = TRUE, parms_torand = FALSE)

```



```

## Super-population empirical harm and non-harm hazard ratios= 2.000007 0.6466405
## Causal HR (empirical ITT)= 0.7057463

dgm <- this.dgm$dgm
output.file <- this.dgm$out.file

if (!is.null(output.file) & !grepl(mod.harm, output.file)) stop("Wrong file name for mod.harm")

# Show first simulation ans1 <- oc_analyses_m4_FS4(2)

t.start <- proc.time()[3]
res <- foreach(sim = seq_len(Nsims), .options.future = list(seed = TRUE), .combine = "rbind",
    .errorhandling = "pass") %dofuture% {
    ans <- oc_analyses_m4FourCuts_FS4(sim)
    return(ans)
}

## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 48.86072 2

```

```

##   leaf.node control.mean control.size control.se depth
## 1      2      -4.37     509.00      1.23      1
## 2      3       2.51     191.00      2.28      1
## 3      4       2.18      95.00      2.92      2
## 4      5      -5.87     414.00      1.34      2
## 5      6       5.96     146.00      2.61      2
##   leaf.node control.mean control.size control.se depth
## 5      6       5.96     146.00      2.61      2
## GRF subgroup NOT found
## NO GRF cuts meeting delta(RMST): dmin.grf= 12
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## Default cuts included (1st 20)
## Categorical: z1 z2 z3 z4 z5 grade3
## # of candidate subgroup factors= 19
## [1] "size <= 29.4"    "size <= 25"      "size <= 20"      "size <= 35"
## [5] "noise1 <= 0"     "noise1 <= -0.6"  "noise1 <= 0.7"   "noise2 <= 0"
## [9] "noise2 <= -0.8"  "noise2 <= 0.7"   "noise3 <= 0"    "noise3 <= -0.7"
## [13] "noise3 <= 0.6"   "z1"           "z2"           "z3"
## [17] "z4"             "z5"           "grade3"
## Number of factors evaluated= 19
## Confounders per grf screening q15 q16 q14 q9 q18 q17 q11 q10 q4 q6 q7 q2 q5 q3 q8 q19 q13 q12 q1
##          Factors Labels VI(grf)
## 15      z2     q15  0.2269
## 16      z3     q16  0.1570
## 14      z1     q14  0.1369
## 9  noise2 <= -0.8   q9  0.0487
## 18      z5     q18  0.0394
## 17      z4     q17  0.0369
## 11  noise3 <= 0   q11  0.0346
## 10  noise2 <= 0.7  q10  0.0345
## 4   size <= 35    q4   0.0323
## 6  noise1 <= -0.6  q6   0.0322
## 7  noise1 <= 0.7  q7   0.0280
## 2   size <= 25    q2   0.0270
## 5  noise1 <= 0   q5   0.0255
## 3   size <= 20    q3   0.0253
## 8  noise2 <= 0   q8   0.0245
## 19     grade3   q19  0.0245
## 13  noise3 <= 0.6 q13  0.0233
## 12 noise3 <= -0.7 q12  0.0216
## 1   size <= 29.4  q1   0.0207
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 741
## Approximately 5% of max_count met: minutes 0.003666667
## Approximately 10% of max_count met: minutes 0.0048
## Approximately 20% of max_count met: minutes 0.007433333
## Approximately 33% of max_count met: minutes 0.01061667
## Approximately 50% of max_count met: minutes 0.014666667
## Approximately 75% of max_count met: minutes 0.020666667
## Approximately 90% of max_count met: minutes 0.024333333
## # of subgroups evaluated based on (up to) maxk-factor combinations 741
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10

```

```

## # of subgroups with events less than criteria: control, experimental 43 51
## # of subgroups with sample size less than criteria 80
## # of subgroups meeting all criteria = 645
## # of subgroups fitted (Cox model estimable) = 645
## *Subgroup Searching Minutes= 0.02648333
## Number of subgroups meeting HR threshold 12
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 12
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##   n  E d1    HR L(HR) q15.0 q15.1 q16.0 q16.1 q14.0 q14.1 q9.0 q9.1 q18.0
## 1  95 78 44 1.74  1.11    0    0    0    1    0    1    0    0    0    0
## 2  79 47 26 1.54  0.87    0    0    0    1    0    0    0    0    1    0
## 3  82 31 19 1.50  0.73    0    0    0    0    0    0    0    0    1    0
## 4  74 39 18 1.49  0.79    0    0    0    1    0    0    0    0    0    0
## 5 122 95 52 1.48  0.98    0    1    0    0    0    0    1    0    0    0
## 6 100 80 41 1.47  0.94    0    0    0    0    0    0    1    0    0    1
## 7  77 55 30 1.41  0.83    0    0    0    0    0    0    1    0    0    0
## 8  86 41 24 1.37  0.73    0    0    0    0    0    0    0    0    1    0
## 9  93 53 30 1.34  0.78    0    1    0    0    0    0    0    0    1    0
## 10 90 64 32 1.31  0.80    0    0    0    0    0    0    1    0    0    0
##   q18.1
## 1   0
## 2   0
## 3   0
## 4   0
## 5   0
## 6   0
## 7   0
## 8   0
## 9   0
## 10  0
## Consistency 0.9675
## # of splits= 400
## Model, % Consistency Met= {z3} {z1} 0.9675
## SG focus= hr
## Subgroup Consistency Minutes= 0.023
## Subgroup found (FS)
## Minutes forestsearch overall= 0.05888333
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 48.86072 2
##   leaf.node control.mean control.size control.se depth
## 1       2      -4.37     509.00      1.23      1
## 2       3       2.51     191.00      2.28      1
## 3       4       2.18      95.00      2.92      2
## 4       5      -5.87     414.00      1.34      2
## 5       6       5.96     146.00      2.61      2
##   leaf.node control.mean control.size control.se depth
## 5       6       5.96     146.00      2.61      2
## GRF subgroup NOT found
## NO GRF cuts meeting delta(RMST): dmin.grf= 12
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## CV lambda = 0.02852468
## 10 x 1 sparse Matrix of class "dgCMatrix"

```

```

##          s0
## z1      0.29461175
## z2      .
## z3      0.02987702
## z4      0.42856317
## z5     -0.72819804
## size   .
## grade3 .
## noise1 -0.03160709
## noise2 .
## noise3 .
## Cox-LASSO selected: z1 z3 z4 z5 noise1
## Cox-LASSO not selected: z2 size grade3 noise2 noise3
## Default cuts included from Lasso:
## Categorical after Lasso: z1 z3 z4 z5
## # of candidate subgroup factors= 17
## [1] "size <= 29.4"    "size <= 25"      "size <= 20"      "size <= 35"
## [5] "noise1 <= 0"     "noise1 <= -0.6"  "noise1 <= 0.7"   "noise2 <= 0"
## [9] "noise2 <= -0.8"  "noise2 <= 0.7"   "noise3 <= 0"    "noise3 <= -0.7"
## [13] "noise3 <= 0.6"   "z1"           "z3"           "z4"
## [17] "z5"
## Number of factors evaluated= 17
## Confounders per grf screening q15 q14 q9 q16 q17 q4 q10 q6 q7 q11 q5 q12 q3 q8 q13 q2 q1
##          Factors Labels VI(grf)
## 15        z3    q15  0.2778
## 14        z1    q14  0.1716
## 9  noise2 <= -0.8   q9  0.0569
## 16        z4    q16  0.0492
## 17        z5    q17  0.0485
## 4   size <= 35     q4  0.0380
## 10 noise2 <= 0.7   q10 0.0371
## 6  noise1 <= -0.6   q6  0.0357
## 7  noise1 <= 0.7   q7  0.0357
## 11 noise3 <= 0    q11 0.0353
## 5  noise1 <= 0    q5  0.0344
## 12 noise3 <= -0.7  q12 0.0335
## 3   size <= 20     q3  0.0325
## 8  noise2 <= 0    q8  0.0315
## 13 noise3 <= 0.6   q13 0.0285
## 2   size <= 25     q2  0.0282
## 1   size <= 29.4   q1  0.0256
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 595
## Approximately 5% of max_count met: minutes 0.001266667
## Approximately 10% of max_count met: minutes 0.005
## Approximately 20% of max_count met: minutes 0.007466667
## Approximately 33% of max_count met: minutes 0.01018333
## Approximately 50% of max_count met: minutes 0.01326667
## Approximately 75% of max_count met: minutes 0.01756667
## Approximately 90% of max_count met: minutes 0.02058333
## # of subgroups evaluated based on (up to) maxk-factor combinations 595
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 38 44
## # of subgroups with sample size less than criteria 67

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```

## # of subgroups meeting all criteria = 513
## # of subgroups fitted (Cox model estimable) = 513
## *Subgroup Searching Minutes= 0.02226667
## Number of subgroups meeting HR threshold 10
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 10
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##      n E d1   HR L(HR) q15.0 q15.1 q14.0 q14.1 q9.0 q9.1 q16.0 q16.1 q17.0
## 1  95 78 44 1.74  1.11    0     1     0     1     0     0     0     0     0     0
## 2  79 47 26 1.54  0.87    0     1     0     0     0     0     1     0     0     0
## 3  82 31 19 1.50  0.73    0     0     0     0     0     0     1     1     0     0
## 4  74 39 18 1.49  0.79    0     1     0     0     0     0     0     0     0     0
## 5 100 80 41 1.47  0.94    0     0     0     0     1     0     0     0     0     1
## 6  77 55 30 1.41  0.83    0     0     0     0     1     0     0     0     0     0
## 7  86 41 24 1.37  0.73    0     0     0     0     0     0     1     0     0     0
## 8  90 64 32 1.31  0.80    0     0     0     0     1     0     0     0     0     0
## 9  67 39 21 1.30  0.69    0     1     0     0     0     0     0     0     0     0
## 10 146 84 48 1.27  0.83    0     1     0     0     0     0     0     0     0     0
##      q17.1
## 1      0
## 2      0
## 3      0
## 4      0
## 5      0
## 6      0
## 7      0
## 8      0
## 9      0
## 10     0
## Consistency 0.9675
## # of splits= 400
## Model, % Consistency Met= {z3} {z1} 0.9675
## SG focus= hr
## Subgroup Consistency Minutes= 0.0233
## Subgroup found (FS)
## Minutes forestsearch overall= 0.0537
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 49.01446 2
##      leaf.node control.mean control.size control.se depth
## 1      2       -3.08      459.00      1.26      1
## 2      3        3.39      241.00      1.71      1
## 3      4       -5.79      269.00      1.72      2
## 4      5        3.84      128.00      2.48      2
## 5      6       -2.67      215.00      1.48      2
## 6      7       11.83       88.00      3.06      2
##      leaf.node control.mean control.size control.se depth
## 6      7       11.83       88.00      3.06      2
## GRF subgroup found
## All splits
## [1] "z3 <= 0"          "noise2 <= 0.42" "z1 <= 0"
## Terminating node at max.diff (sg.harm.id)
## [1] "z1 <= 0"
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3

```

```

## Default cuts included (1st 20)
## Categorical: z1 z2 z3 z4 z5 grade3
## Factors per GRF: z3 <= 0 noise2 <= 0.42 z1 <= 0
## Initial GRF cuts included z3 <= 0 noise2 <= 0.42 z1 <= 0
## # of candidate subgroup factors= 20
## [1] "noise2 <= 0.42" "size <= 29.9" "size <= 25" "size <= 21"
## [5] "size <= 35" "noise1 <= 0" "noise1 <= -0.7" "noise1 <= 0.7"
## [9] "noise2 <= 0" "noise2 <= -0.7" "noise2 <= 0.7" "noise3 <= -0.1"
## [13] "noise3 <= -0.7" "noise3 <= 0.6" "z1" "z2"
## [17] "z3" "z4" "z5" "grade3"
## Number of factors evaluated= 20
## Confounders per grf screening q1 q4 q15 q17 q9 q16 q18 q19 q12 q6 q14 q13 q5 q2 q10 q7 q8 q20 q11 q3
## Factors Labels VI(grf)
## 1 noise2 <= 0.42 q1 0.1664
## 4 size <= 21 q4 0.1202
## 15 z1 q15 0.1194
## 17 z3 q17 0.0819
## 9 noise2 <= 0 q9 0.0592
## 16 z2 q16 0.0472
## 18 z4 q18 0.0468
## 19 z5 q19 0.0392
## 12 noise3 <= -0.1 q12 0.0342
## 6 noise1 <= 0 q6 0.0317
## 14 noise3 <= 0.6 q14 0.0309
## 13 noise3 <= -0.7 q13 0.0304
## 5 size <= 35 q5 0.0295
## 2 size <= 29.9 q2 0.0276
## 10 noise2 <= -0.7 q10 0.0274
## 7 noise1 <= -0.7 q7 0.0229
## 8 noise1 <= 0.7 q8 0.0229
## 20 grade3 q20 0.0225
## 11 noise2 <= 0.7 q11 0.0224
## 3 size <= 25 q3 0.0172
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 820
## Approximately 5% of max_count met: minutes 0.002466667
## Approximately 10% of max_count met: minutes 0.004483333
## Approximately 20% of max_count met: minutes 0.009116667
## Approximately 33% of max_count met: minutes 0.01438333
## Approximately 50% of max_count met: minutes 0.02226667
## Approximately 75% of max_count met: minutes 0.03403333
## Approximately 90% of max_count met: minutes 0.03906667
## # of subgroups evaluated based on (up to) maxk-factor combinations 820
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 50 50
## # of subgroups with sample size less than criteria 90
## # of subgroups meeting all criteria = 711
## # of subgroups fitted (Cox model estimable) = 711
## *Subgroup Searching Minutes=* 0.0425
## Number of subgroups meeting HR threshold 49
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 49
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
## n E d1 HR L(HR) q1.0 q1.1 q4.0 q4.1 q15.0 q15.1 q17.0 q17.1 q9.0 q9.1

```

```

## 1   88 63 35 3.59  2.13    0   0   0   0   0   1   0   1   0   0
## 2   61 34 18 2.29  1.16    1   0   0   0   0   0   1   0   0   0
## 3  117 78 42 2.03  1.29    0   0   0   0   0   0   1   0   0   0
## 4   88 56 29 1.87  1.11    0   0   0   0   0   0   1   0   0   0
## 5   91 54 25 1.82  1.07    0   0   0   0   0   0   1   0   0   1
## 6   71 46 26 1.77  0.98    0   0   0   0   0   0   0   0   1   0
## 7  131 82 40 1.67  1.08    0   0   0   0   0   0   1   0   0   0
## 8   67 31 17 1.62  0.80    0   0   0   0   0   0   0   0   1   0
## 9   89 59 28 1.61  0.96    0   0   0   0   0   0   1   0   0   0
## 10  64 39 22 1.58  0.84    0   0   0   0   0   0   0   0   0   0
## Consistency 1
## # of splits= 400
## Model, % Consistency Met= {z1} {z3} 1
## SG focus= hr
## Subgroup Consistency Minutes= 0.0332
## Subgroup found (FS)
## Minutes forestsearch overall= 0.09083333
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 49.01446 2
##   leaf.node control.mean control.size control.se depth
## 1       2      -3.08     459.00     1.26     1
## 2       3       3.39     241.00     1.71     1
## 3       4      -5.79     269.00     1.72     2
## 4       5       3.84     128.00     2.48     2
## 5       6      -2.67     215.00     1.48     2
## 6       7      11.83      88.00     3.06     2
##   leaf.node control.mean control.size control.se depth
## 6       7      11.83      88.00     3.06     2
## GRF subgroup found
## All splits
## [1] "z3 <= 0"      "noise2 <= 0.42" "z1 <= 0"
## Terminating node at max.diff (sg.harm.id)
## [1] "z1 <= 0"
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## CV lambda = 0.01795345
## 10 x 1 sparse Matrix of class "dgCMatrix"
##   s0
## z1    0.288629433
## z2   -0.101509769
## z3    .
## z4    0.603912320
## z5   -0.848116791
## size   0.002801471
## grade3 .
## noise1 .
## noise2 -0.028733702
## noise3 .
## Cox-LASSO selected: z1 z2 z4 z5 size noise2
## Cox-LASSO not selected: z3 grade3 noise1 noise3
## Default cuts included from Lasso:
## Categorical after Lasso: z1 z2 z4 z5
## Factors per GRF: z3 <= 0 noise2 <= 0.42 z1 <= 0
## Initial GRF cuts included z3 <= 0 noise2 <= 0.42 z1 <= 0

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## Factors included per GRF (not in lasso) z3 <= 0 noise2 <= 0.42
## # of candidate subgroup factors= 19
## [1] "noise2 <= 0.42" "size <= 29.9"   "size <= 25"      "size <= 21"
## [5] "size <= 35"       "noise1 <= 0"     "noise1 <= -0.7" "noise1 <= 0.7"
## [9] "noise2 <= 0"       "noise2 <= -0.7" "noise2 <= 0.7"   "noise3 <= -0.1"
## [13] "noise3 <= -0.7" "noise3 <= 0.6"  "z1"           "z2"
## [17] "z4"              "z5"            "z3 <= 0"
## Number of factors evaluated= 19
## Confounders per grf screening q1 q4 q15 q19 q9 q16 q17 q18 q12 q6 q13 q5 q14 q10 q2 q7 q11 q3 q8
##          Factors Labels VI(grf)
## 1  noise2 <= 0.42    q1  0.1825
## 4   size <= 21      q4  0.1256
## 15      z1      q15  0.1219
## 19      z3 <= 0    q19  0.0848
## 9   noise2 <= 0    q9  0.0627
## 16      z2      q16  0.0491
## 17      z4      q17  0.0475
## 18      z5      q18  0.0374
## 12 noise3 <= -0.1 q12  0.0360
## 6   noise1 <= 0    q6  0.0313
## 13 noise3 <= -0.7 q13  0.0278
## 5   size <= 35     q5  0.0268
## 14 noise3 <= 0.6  q14  0.0268
## 10 noise2 <= -0.7 q10  0.0267
## 2   size <= 29.9   q2  0.0262
## 7   noise1 <= -0.7 q7  0.0242
## 11 noise2 <= 0.7  q11  0.0222
## 3   size <= 25     q3  0.0207
## 8   noise1 <= 0.7  q8  0.0199
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 741
## Approximately 5% of max_count met: minutes 0.002033333
## Approximately 10% of max_count met: minutes 0.003516667
## Approximately 20% of max_count met: minutes 0.00735
## Approximately 33% of max_count met: minutes 0.01145
## Approximately 50% of max_count met: minutes 0.01766667
## Approximately 75% of max_count met: minutes 0.02745
## Approximately 90% of max_count met: minutes 0.03273333
## # of subgroups evaluated based on (up to) maxk-factor combinations 741
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 47 48
## # of subgroups with sample size less than criteria 79
## # of subgroups meeting all criteria = 643
## # of subgroups fitted (Cox model estimable) = 643
## *Subgroup Searching Minutes=* 0.03628333
## Number of subgroups meeting HR threshold 41
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 41
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##      n E d1  HR L(HR) q1.0 q1.1 q4.0 q4.1 q15.0 q15.1 q19.0 q19.1 q9.0 q9.1
## 1  88 63 35 3.59  2.13   0   0   0   0   0   1   1   0   0   0
## 2  61 34 18 2.29  1.16   1   0   0   0   0   1   0   0   0   0
## 3 117 78 42 2.03  1.29   0   0   0   0   0   1   0   0   0   0
## 4  88 56 29 1.87  1.11   0   0   0   0   0   1   0   0   0   0

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## 5   91 54 25 1.82  1.07   0   0   0   0   1   0   0   1   0
## 6  131 82 40 1.67  1.08   0   0   0   0   0   1   0   0   0
## 7   67 31 17 1.62  0.80   0   0   0   0   0   0   1   0   0
## 8   89 59 28 1.61  0.96   0   0   0   0   0   1   0   0   0
## 9   85 48 25 1.58  0.90   0   0   0   0   0   1   0   0   0
## 10  136 94 46 1.58  1.05   0   0   0   0   0   1   0   0   0
## Consistency 1
## # of splits= 400
## Model, % Consistency Met= {z1} !{z3 <= 0} 1
## SG focus= hr
## Subgroup Consistency Minutes= 0.03243333
## Subgroup found (FS)
## Minutes forestsearch overall= 0.08161667
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 50.23146 2
##   leaf.node control.mean control.size control.se depth
## 1       2      -4.79     624.00      1.22    1
## 2       3       4.69      76.00      3.24    1
## 3       4       3.35     107.00      2.75    2
## 4       5      -6.89     294.00      1.78    2
## 5       6      -7.73     211.00      1.92    2
## 6       7       7.61      88.00      3.67    2
##   leaf.node control.mean control.size control.se depth
## 6       7       7.61      88.00      3.67    2
## GRF subgroup found
## All splits
## [1] "z3 <= 0"    "size <= 20" "z1 <= 0"
## Terminating node at max.diff (sg.harm.id)
## [1] "z1 <= 0"
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## Default cuts included (1st 20)
## Categorical: z1 z2 z3 z4 z5 grade3
## Factors per GRF: z3 <= 0 size <= 20 z1 <= 0
## Initial GRF cuts included z3 <= 0 size <= 20 z1 <= 0
## # of candidate subgroup factors= 20
## [1] "size <= 20"    "size <= 28.8"   "size <= 25"    "size <= 35"
## [5] "noise1 <= -0.1" "noise1 <= 0"   "noise1 <= -0.7" "noise1 <= 0.6"
## [9] "noise2 <= 0"    "noise2 <= -0.7" "noise2 <= 0.7"  "noise3 <= 0"
## [13] "noise3 <= -0.7" "noise3 <= 0.7" "z1"           "z2"
## [17] "z3"            "z4"           "z5"           "grade3"
## Number of factors evaluated= 20
## Confounders per grf screening q15 q16 q4 q9 q1 q18 q20 q19 q17 q11 q12 q14 q10 q13 q5 q6 q7 q3 q2 q8
##          Factors Labels VI(grf)
## 15          z1    q15  0.1329
## 16          z2    q16  0.1036
## 4   size <= 35   q4  0.0781
## 9   noise2 <= 0   q9  0.0779
## 1   size <= 20   q1  0.0771
## 18          z4    q18  0.0727
## 20          grade3 q20  0.0569
## 19          z5    q19  0.0549
## 17          z3    q17  0.0432
## 11 noise2 <= 0.7 q11  0.0342

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## 12 noise3 <= 0 q12 0.0327
## 14 noise3 <= 0.7 q14 0.0301
## 10 noise2 <= -0.7 q10 0.0300
## 13 noise3 <= -0.7 q13 0.0284
## 5 noise1 <= -0.1 q5 0.0269
## 6 noise1 <= 0 q6 0.0263
## 7 noise1 <= -0.7 q7 0.0250
## 3 size <= 25 q3 0.0239
## 2 size <= 28.8 q2 0.0229
## 8 noise1 <= 0.6 q8 0.0223
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 820
## Approximately 5% of max_count met: minutes 0.002366667
## Approximately 10% of max_count met: minutes 0.00455
## Approximately 20% of max_count met: minutes 0.008833333
## Approximately 33% of max_count met: minutes 0.014
## Approximately 50% of max_count met: minutes 0.02038333
## Approximately 75% of max_count met: minutes 0.0303
## Approximately 90% of max_count met: minutes 0.03633333
## # of subgroups evaluated based on (up to) maxk-factor combinations 820
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 46 50
## # of subgroups with sample size less than criteria 85
## # of subgroups meeting all criteria = 716
## # of subgroups fitted (Cox model estimable) = 716
## *Subgroup Searching Minutes== 0.04
## Number of subgroups meeting HR threshold 7
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 7
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##   n E d1 HR L(HR) q15.0 q15.1 q16.0 q16.1 q4.0 q4.1 q9.0
## 1 88 68 36 1.85 1.14 0 1 0 0 0 0 0
## 2 84 41 25 1.78 0.95 0 0 1 0 0 0 0
## 3 94 47 27 1.36 0.76 0 0 0 0 0 0 0
## 4 87 65 33 1.32 0.81 0 1 0 0 0 0 0
## 5 97 69 33 1.30 0.80 0 1 0 0 0 0 0
## 6 90 65 31 1.29 0.79 0 1 0 0 0 0 0
## 7 76 48 25 1.29 0.73 0 1 0 0 0 0 0
## Consistency 0.975
## # of splits= 400
## Model, % Consistency Met= {z1} {z3} 0.975
## SG focus= hr
## Subgroup Consistency Minutes= 0.02941667
## Subgroup found (FS)
## Minutes forestsearch overall= 0.07913333
## FS: GRF stage for cut selection with dmin,tau= 12 0.6
## tau, maxdepth= 50.23146 2
##   leaf.node control.mean control.size control.se depth
## 1 2 -4.79 624.00 1.22 1
## 2 3 4.69 76.00 3.24 1
## 3 4 3.35 107.00 2.75 2
## 4 5 -6.89 294.00 1.78 2
## 5 6 -7.73 211.00 1.92 2
## 6 7 7.61 88.00 3.67 2

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##   leaf.node control.mean control.size control.se depth
## 6      7      7.61     88.00      3.67      2
## GRF subgroup found
## All splits
## [1] "z3 <= 0"    "size <= 20" "z1 <= 0"
## Terminating node at max.diff (sg.harm.id)
## [1] "z1 <= 0"
## # of continuous/categorical characteristics 4 6
## Continuous characteristics: size noise1 noise2 noise3
## Categorical characteristics: z1 z2 z3 z4 z5 grade3
## CV lambda = 0.01062779
## 10 x 1 sparse Matrix of class "dgCMatrix"
##           s0
## z1      4.225374e-01
## z2     -4.079322e-01
## z3      4.325252e-01
## z4      6.323497e-01
## z5     -7.482728e-01
## size    .
## grade3 .
## noise1 -2.601877e-03
## noise2 .
## noise3  6.779728e-05
## Cox-LASSO selected: z1 z2 z3 z4 z5 noise1 noise3
## Cox-LASSO not selected: size grade3 noise2
## Default cuts included from Lasso:
## Categorical after Lasso: z1 z2 z3 z4 z5
## Factors per GRF: z3 <= 0 size <= 20 z1 <= 0
## Initial GRF cuts included z3 <= 0 size <= 20 z1 <= 0
## Factors included per GRF (not in lasso) size <= 20
## # of candidate subgroup factors= 19
## [1] "size <= 20"    "size <= 28.8"   "size <= 25"    "size <= 35"
## [5] "noise1 <= -0.1" "noise1 <= 0"   "noise1 <= -0.7" "noise1 <= 0.6"
## [9] "noise2 <= 0"    "noise2 <= -0.7" "noise2 <= 0.7"  "noise3 <= 0"
## [13] "noise3 <= -0.7" "noise3 <= 0.7" "z1"          "z2"
## [17] "z3"            "z4"          "z5"
## Number of factors evaluated= 19
## Confounders per grf screening q15 q16 q9 q4 q1 q18 q19 q17 q12 q11 q7 q14 q5 q10 q8 q3 q6 q13 q2
##          Factors Labels VI(grf)
## 15      z1    q15  0.1402
## 16      z2    q16  0.1024
## 9      noise2 <= 0    q9  0.0870
## 4      size <= 35   q4  0.0806
## 1      size <= 20   q1  0.0804
## 18      z4    q18  0.0719
## 19      z5    q19  0.0560
## 17      z3    q17  0.0532
## 12      noise3 <= 0  q12 0.0386
## 11      noise2 <= 0.7 q11 0.0372
## 7      noise1 <= -0.7 q7  0.0323
## 14      noise3 <= 0.7 q14 0.0320
## 5      noise1 <= -0.1 q5  0.0309
## 10      noise2 <= -0.7 q10 0.0303
## 8      noise1 <= 0.6  q8  0.0266
## 3      size <= 25   q3  0.0262

```

```

## 6      noise1 <= 0      q6  0.0261
## 13 noise3 <= -0.7     q13 0.0249
## 2    size <= 28.8      q2   0.0231
## Number of possible configurations (<= maxk): maxk, # <= maxk 2 741
## Approximately 5% of max_count met: minutes 0.002016667
## Approximately 10% of max_count met: minutes 0.004483333
## Approximately 20% of max_count met: minutes 0.007866667
## Approximately 33% of max_count met: minutes 0.01268333
## Approximately 50% of max_count met: minutes 0.0176
## Approximately 75% of max_count met: minutes 0.02611667
## Approximately 90% of max_count met: minutes 0.03043333
## # of subgroups evaluated based on (up to) maxk-factor combinations 741
## % of all-possible combinations (<= maxk) 100
## k.max= 2
## Events criteria for control,exp= 10 10
## # of subgroups with events less than criteria: control, experimental 44 47
## # of subgroups with sample size less than criteria 75
## # of subgroups meeting all criteria = 647
## # of subgroups fitted (Cox model estimable) = 647
## *Subgroup Searching Minutes=* 0.03316667
## Number of subgroups meeting HR threshold 7
## Subgroup candidate(s) found (FS)
## # of candidate subgroups (meeting HR criteria) = 7
## SGs (1st 10) meeting screening thresholds sorted by sg_focus= hr
##   n E d1   HR L(HR) q15.0 q15.1 q16.0 q16.1 q9.0 q9.1 q4.0
## 1 88 68 36 1.85  1.14    0     1     0     0     0     0     0
## 2 84 41 25 1.78  0.95    0     0     1     0     0     0     0
## 3 94 47 27 1.36  0.76    0     0     0     0     0     1     0
## 4 87 65 33 1.32  0.81    0     1     0     0     0     0     0
## 5 97 69 33 1.30  0.80    0     1     0     0     0     0     0
## 6 90 65 31 1.29  0.79    0     1     0     0     0     0     0
## 7 76 48 25 1.29  0.73    0     1     0     0     0     0     0
## Consistency 0.975
## # of splits= 400
## Model, % Consistency Met= {z1} {z3} 0.975
## SG focus= hr
## Subgroup Consistency Minutes= 0.02848333
## Subgroup found (FS)
## Minutes forestsearch overall= 0.07608333

t.now <- proc.time()[3]
t.min <- (t.now - t.start)/60

print(table(res$analysis))

##
##      FS1     FSlg      GRF    GRF.60    VT(24)    VT(36)    VT#(24)    VT#(36)
##      1000     1000     1000     1000     1000     1000     1000     1000

check <- c(c(table(res$analysis)) - Nsims)
if (all(check != 0)) stop("All analyses not complete")

dgm_alt <- dgm

outres <- out.results(res = res, dgm = dgm, output.file = output.file, t.min = t.min,

```

```

out_analysis = "FS1"

## [1] "results/oc_sims=1000_m4a-Noise=3_N=700_alt_ktreat=0.9_hrH=2_v0B-4cuts.Rdata"
##   sim sizeH_true propH_true sizeHc_true propHc_true any.H size.H size.Hc
##   <int>    <num>    <num>    <int>    <num> <num> <num> <int>
## 1:    1      95  0.1357143     605  0.8642857     1     95    605
## 2:    1      95  0.1357143     605  0.8642857     1     95    605
## 3:    1      95  0.1357143     605  0.8642857     1     95    605
## 4:    1      95  0.1357143     605  0.8642857     0     0    700
## 5:    1      95  0.1357143     605  0.8642857     0     0    700
## 6:    1      95  0.1357143     605  0.8642857     0     0    700
##   ppv npv specificity sensitivity found.1 found.2 found.both found.a13
##   <num> <num>    <num>    <num> <num> <num> <num> <num>
## 1:    1     1  1.0000000     1     0     0     0     0
## 2:    1     1  1.0000000     1     0     0     0     0
## 3:    1     1  1.0000000     1     NA    NA    NA    NA
## 4:    0     1  0.8642857     0     NA    NA    NA    0
## 5:    0     1  0.8642857     0     0     0     0    0
## 6:    0     1  0.8642857     0     0     0     0    0
##   hr.H.true hr.Hc.true hr.H.hat hr.Hc.hat b1.H      b2.H      b1.Hc
##   <num>    <num>    <num>    <num> <num>    <num>    <num>
## 1:  1.74466  0.5577464  1.74466  0.5577464     0 -0.2553474 0.0000000
## 2:  1.74466  0.5577464  1.74466  0.5577464     0 -0.2553474 0.0000000
## 3:  1.74466  0.5577464  1.74466  0.5577464     0 -0.2553474 0.0000000
## 4:  1.74466  0.5577464        NA  0.6688550     NA      NA 0.1111086
## 5:  1.74466  0.5577464        NA  0.6688550     NA      NA 0.1111086
## 6:  1.74466  0.5577464        NA  0.6688550     NA      NA 0.1111086
##   b2.Hc p.cens analysis taumax hr.itt l.itt u.itt
##   <num> <num>  <char>  <num> <num> <num> <num>
## 1: -0.08889407 0.4514286    FS1 81.43453 0.668855 0.5464683 0.8186513
## 2: -0.08889407 0.4514286   FS1g 48.86072 0.668855 0.5464683 0.8186513
## 3: -0.08889407 0.4514286    GRF 81.43453 0.668855 0.5464683 0.8186513
## 4:  0.02221450 0.4514286    GRF.60 48.86072 0.668855 0.5464683 0.8186513
## 5:  0.02221450 0.4514286    VT(24) 81.43453 0.668855 0.5464683 0.8186513
## 6:  0.02221450 0.4514286   VT#(24) 81.43453 0.668855 0.5464683 0.8186513
##   hr.adj.itt l.adj.itt u.adj.itt l.H.true u.H.true l.Hc.true u.Hc.true
##   <num>    <num>    <num>    <num> <num>    <num>    <num>
## 1:  0.6827343 0.5565269  0.8375626  1.105971 2.752186 0.4437854 0.7009717
## 2:  0.6827343 0.5565269  0.8375626  1.105971 2.752186 0.4437854 0.7009717
## 3:  0.6827343 0.5565269  0.8375626  1.105971 2.752186 0.4437854 0.7009717
## 4:  0.6827343 0.5565269  0.8375626  1.105971 2.752186 0.4437854 0.7009717
## 5:  0.6827343 0.5565269  0.8375626  1.105971 2.752186 0.4437854 0.7009717
## 6:  0.6827343 0.5565269  0.8375626  1.105971 2.752186 0.4437854 0.7009717
##   l.H.hat u.H.hat l.Hc.hat u.Hc.hat
##   <num> <num> <num> <num>
## 1: 1.105971 2.752186 0.4437854 0.7009717
## 2: 1.105971 2.752186 0.4437854 0.7009717
## 3: 1.105971 2.752186 0.4437854 0.7009717
## 4:      NA      NA 0.5464683 0.8186513
## 5:      NA      NA 0.5464683 0.8186513
## 6:      NA      NA 0.5464683 0.8186513
## Subgroup HRs: H, H^c, Causal= 2.000007 0.6466405 0.7057463
## Simulations= 1000
## Avg censoring= 0.44999
## Min,Max,Avg tau.max= 74.465 83.95939 81.60594

```

```

## P(H) approximation at causal(H) , n(sg)=60, approx= 2.000007 60 0.8283003
## P(H) approximation at causal(H) , Avg(n(sg)), approx= 2.000007 89 0.8998777
## P(H) approximation at plim(H), Avg(n(sg)), approx= 2.127636 89 0.9289428
## Minutes,hours 9.55805 0.1593008
##          FS1      FSlg      GRF   GRF.60   VT(24) VT#(24)   VT(36) VT#(36)
## any.H     0.940    0.880    0.950    0.720    0.470    0.520    0.420    0.550
## sensH     0.810    0.720    0.670    0.520    0.390    0.460    0.350    0.510
## sensHc    0.980    0.970    0.930    0.960    0.990    0.990    0.990    0.990
## ppH       0.810    0.710    0.590    0.470    0.370    0.450    0.340    0.500
## ppHc      0.970    0.960    0.950    0.940    0.920    0.930    0.920    0.940
## Avg(#H)   88.000   92.000   107.000  102.000  92.000   92.000   91.000   92.000
## minH      61.000   61.000   60.000   60.000   60.000   60.000   60.000   60.000
## maxH      196.000  258.000  327.000  236.000  171.000  153.000  155.000  175.000
## Avg(#Hc)  617.000  619.000  598.000  627.000  656.000  652.000  662.000  649.000
## minHc     504.000  442.000  373.000  464.000  529.000  547.000  545.000  525.000
## maxHc     700.000  700.000  700.000  700.000  700.000  700.000  700.000  700.000
## hat(H*)   2.176    2.199    2.151    2.220    2.359    2.370    2.406    2.369
## hat(hat[H]) 2.241    2.178    1.980    1.941    2.137    2.225    2.240    2.307
## hat(Hc*)   0.653    0.654    0.652    0.646    0.650    0.652    0.651    0.651
## hat(hat[Hc]) 0.653    0.654    0.641    0.646    0.659    0.657    0.658    0.651
## hat(H*)all  2.128    2.128    2.128    2.128    2.128    2.128    2.128    2.128
## hat(Hc*)all 0.651    0.651    0.651    0.651    0.651    0.651    0.651    0.651
## hat(ITT)all 0.754    0.754    0.754    0.754    0.754    0.754    0.754    0.754
## hat(ITTadj)all 0.742    0.742    0.742    0.742    0.742    0.742    0.742    0.742

missC <- tab_tests(res = res)

pA <- as.character(round(outres$pAnyH.approx2, 4))

tabsim_missC <- get_tabsim(missC = missC, pA = pA, est_names = est_names, stat_names = stat_names,
                           mod.harm = mod.harm, Nsims = Nsims)

```

Table 2: Average classification rates: $avg|\hat{H}|$, $min|\hat{H}|$, and $max|\hat{H}|$, denote the average, minimum, and maximum of the number of subjects in the estimated subgroup \hat{H} (analogously for \hat{H}^c). Note that under the null $sens(\hat{H})$ is undefined and $ppv(\hat{H}) = 0$.

	FS_g	FS_{lg}	GRF	GRF_{60}	$VT(24)$	$VT^{\#}(24)$	$VT(36)$	$VT^{\#}(36)$
Finding H								
any(H)	0.94	0.88	0.95	0.72	0.47	0.52	0.42	0.55
$sens(\hat{H})$	0.81	0.72	0.67	0.52	0.39	0.46	0.35	0.51
$sens(\hat{H}^c)$	0.98	0.97	0.93	0.96	0.99	0.99	0.99	0.99
$ppv(\hat{H})$	0.81	0.71	0.59	0.47	0.37	0.45	0.34	0.5
$ppv(\hat{H}^c)$	0.97	0.96	0.95	0.94	0.92	0.93	0.92	0.94
Size of H and H-complement								
$avg \hat{H} $	88	92	107	102	92	92	91	92
$min \hat{H} $	61	61	60	60	60	60	60	60
$max \hat{H} $	196	258	327	236	171	153	155	175
$avg \hat{H}^c $	617	619	598	627	656	652	662	649
$min \hat{H}^c $	504	442	373	464	529	547	545	525
$max \hat{H}^c $	700	700	700	700	700	700	700	700

Note: Number of simulations= 1000 .

Note: Probability approximation= 0.8999 .

```

t.done <- proc.time()[3]
t.min <- (t.done - t.start.all)/60
cat("Minutes and hours to finish", c(t.min, t.min/60), "\n")

## Minutes and hours to finish 21.65837 0.3609728

cat("Minutes and hours per 10,000 to finish", (10000/Nsims) * c(t.min, t.min/60),
    "\n")

## Minutes and hours per 10,000 to finish 216.5837 3.609728

# cat('Machine=',c(Sys.info()[[4]]),'\n') cat('Number of
# cores=',c(detectCores(logical = FALSE)), '\n')
require(benchmarkme)
my_system <- get_cpu()
my_ram <- get_ram()
cat("Running on system:", c(my_system$model_name), "\n")

## Running on system: AMD Ryzen Threadripper PRO 5995WX 64-Cores

cat("with number of cores and cpu/GB=", c(my_system$no_of_cores, round(c(my_ram)/10^9,
    0)), "\n")

## with number of cores and cpu/GB= 128 270

```