EDA

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System information

```r
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.5      v purrr   0.3.4
## v tibble  3.1.5      v dplyr   1.0.7
## v tidyr   1.1.4      v stringr 1.4.0
## v readr   2.0.2      v forcats 0.5.1
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```r
library(readxl)
library(gtsummary)
library(survival)
library(survminer)
```

```
## Loading required package: ggpubr
```

```
##
## Attaching package: 'survminer'
```

```
## The following object is masked from 'package:survival':
##
##     myeloma
```

```r
library(sjPlot)
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

```
library(lemon)
```

```
##
## Attaching package: 'lemon'

## The following object is masked from 'package:purrr':
##
##     %||%

## The following objects are masked from 'package:ggplot2':
##
##     CoordCartesian, element_render
```

```
library(knitr)
```

```
os <- sessionInfo()$running

if (str_detect(os, "Ubuntu")) {
  path <- '~/Biostatistics_M215_Project/data/'
} else if (str_detect(os, "mac")) {
  path <- '~/Downloads/Biostat 215 Project/Biostatistics_M215_Project/Data/'
} else if(str_detect(os, "Windows")){
  path <- "C:/Users/alexc/Desktop/215/Biostatistics_M215_Project/data/"
}
```

Data clean and recode

```
endpoint = read_excel(paste0(path, 'endpoints.xls'))
endpoint_colnames = c('ID', 'Intervention Group',
                      'Vitality Status as of 6/1/2006',
                      'Breast Cancer Status as of 6/1/2006 or last prior contact',
                      'Other Cancer (invasive, not breast) Status as of 6/1/2006',
                      'Breast Cancer Contribute to Death',
                      'Year Breast Cancer Diagnosed', 'Cancer Grade',
                      'Dummy Variable for Cancer Grade 2',
                      'Dummy Variable for Cancer Grade 3',
                      'Dummy Variable for Unknown Cancer Grade',
                      'Cancer Stage, AJCC 6th',
                      'Dummy Variable for Stage 2 AJCC 6th',
                      'Dummy Variable for Stage 3 AJCC 6th',
                      'WHEL Clinical Site', 'Recurrence Flag',
                      'Years from Diagnosis to WHEL Study Entry',
                      'Years from Study Entry to Recurrence/New Primary, or to Censor',
                      'Years from Diagnosis to Recurrence/New Primary, or to Censor',
                      'Years from Diagnosis to Death or Censor')

colnames(endpoint) = endpoint_colnames

endpoint$'Intervention Group' = ifelse(endpoint$'Intervention Group' == 3, 'Intervention', 'Comparison')
```

```r
endpoint$`Vitality Status as of 6/1/2006` = ifelse(endpoint$`Vitality Status as of 6/1/2006` == 0, 'Dead

for (i in 1:nrow(endpoint)){
if (endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] == 0){
  endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] = 'No Evidence of Recurrence'
} else if(endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] == 1){
  endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] = 'Confirmed - New Primary Bre
}else if(endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] == 2){
  endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] = 'Confirmed - Local Recurren
}else if(endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] == 3){
  endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] = 'Confirmed - Regional Recur
}else{
  endpoint$`Breast Cancer Status as of 6/1/2006 or last prior contact`[i] = 'Confirmed - Distant Recurr
}

endpoint$`Other Cancer (invasive, not breast) Status as of 6/1/2006` = ifelse(endpoint$`Other Cancer (i

endpoint$`Breast Cancer Contribute to Death`[endpoint$`Breast Cancer Contribute to Death` == -1] = 'Not
endpoint$`Breast Cancer Contribute to Death`[endpoint$`Breast Cancer Contribute to Death` == 0] = 'Dead
endpoint$`Breast Cancer Contribute to Death`[endpoint$`Breast Cancer Contribute to Death` == 1] = 'Dead
endpoint$`Breast Cancer Contribute to Death`[endpoint$`Breast Cancer Contribute to Death` == 2] = 'Dead

endpoint$`Cancer Grade`[endpoint$`Cancer Grade` == 0] = 'Grade Not Applicable or Not Available'
endpoint$`Cancer Grade`[endpoint$`Cancer Grade` == 1] = 'Grade I, Well Differentiated'
endpoint$`Cancer Grade`[endpoint$`Cancer Grade` == 2] = 'Grade II, Moderately Differentiated'
endpoint$`Cancer Grade`[endpoint$`Cancer Grade` == 3] = 'Grade III, Poorly Differentiated'

endpoint$`Cancer Stage, AJCC 6th`[endpoint$`Cancer Stage, AJCC 6th` == 1] = 'Stage I'
endpoint$`Cancer Stage, AJCC 6th`[endpoint$`Cancer Stage, AJCC 6th` == 2] = 'Stage IIA'
endpoint$`Cancer Stage, AJCC 6th`[endpoint$`Cancer Stage, AJCC 6th` == 3] = 'Stage IIB'
endpoint$`Cancer Stage, AJCC 6th`[endpoint$`Cancer Stage, AJCC 6th` == 4] = 'Stage IIIA'
endpoint$`Cancer Stage, AJCC 6th`[endpoint$`Cancer Stage, AJCC 6th` == 5] = 'Stage IIIB'

endpoint$`WHEL Clinical Site`[endpoint$`WHEL Clinical Site` == 1] = 'Site A in California'
endpoint$`WHEL Clinical Site`[endpoint$`WHEL Clinical Site` == 3] = 'Site B in California'
endpoint$`WHEL Clinical Site`[endpoint$`WHEL Clinical Site` == 5] = 'Site C in California'
endpoint$`WHEL Clinical Site`[endpoint$`WHEL Clinical Site` == 7] = 'Site in Arizona'
endpoint$`WHEL Clinical Site`[endpoint$`WHEL Clinical Site` == 9] = 'Site D in California'
endpoint$`WHEL Clinical Site`[endpoint$`WHEL Clinical Site` == 11] = 'Site in Texas'
endpoint$`WHEL Clinical Site`[endpoint$`WHEL Clinical Site` == 13] = 'Site in Oregon'

endpoint$`Recurrence Flag`[endpoint$`Recurrence Flag` == 0] = 'No Invasive Breast Cancer Events'
endpoint$`Recurrence Flag`[endpoint$`Recurrence Flag` == 1] = 'Invasive Breast Cancer Event'
```

Summary table

```r
endpoint %>%
  tbl_summary(by = 'Intervention Group',
              include=-c(ID, `Year Breast Cancer Diagnosed`,
                         `Dummy Variable for Cancer Grade 2`,
                         `Dummy Variable for Cancer Grade 3`,
                         `Dummy Variable for Unknown Cancer Grade`,
                         `Dummy Variable for Stage 2 AJCC 6th`,
```

```
                      'Dummy Variable for Stage 3 AJCC 6th'),
           missing_text = "Missing") %>%
add_p()
```

Characteristic	Comparison, N = 1,551	Intervention, N = 1,537	p-value
Vitality Status as of 6/1/2006			0.8
Alive	1,391 (90%)	1,381 (90%)	
Dead	160 (10%)	155 (10%)	
Unknown	0 (0%)	1 (<0.1%)	
Breast Cancer Status as of 6/1/2006 or last prior contact			0.6
Confirmed – Distant Recurrence	189 (12%)	168 (11%)	
Confirmed – Local Recurrence	28 (1.8%)	35 (2.3%)	
Confirmed – New Primary Breast Cancer	35 (2.3%)	43 (2.8%)	
Confirmed – Regional Recurrence	10 (0.6%)	10 (0.7%)	
No Evidence of Recurrence	1,289 (83%)	1,281 (83%)	
Other Cancer (invasive, not breast) Status as of 6/1/2006			0.5
Confirmed Other Cancer	60 (3.9%)	58 (3.8%)	
No evidence of Disease	1,483 (96%)	1,472 (96%)	
Reported Other Cancer (not confirmed)	4 (0.3%)	1 (<0.1%)	
Missing	4	6	
Breast Cancer Contribute to Death			0.8
Dead from a cause other than Breast Cancer	25 (1.6%)	28 (1.8%)	
Dead from Breast Cancer	135 (8.7%)	126 (8.2%)	
Dead from Cancer, not confirmed breast but likely so	0 (0%)	1 (<0.1%)	
Not Dead	1,391 (90%)	1,382 (90%)	
Cancer Grade			>0.9
Grade I, Well Differentiated	245 (16%)	239 (16%)	
Grade II, Moderately Differentiated	620 (40%)	620 (40%)	
Grade III, Poorly Differentiated	557 (36%)	551 (36%)	
Grade Not Applicable or Not Available	129 (8.3%)	127 (8.3%)	
Cancer Stage, AJCC 6th			>0.9
Stage I	607 (39%)	584 (38%)	
Stage IIA	511 (33%)	515 (34%)	
Stage IIB	190 (12%)	194 (13%)	
Stage IIIA	185 (12%)	188 (12%)	
Stage IIIB	58 (3.7%)	56 (3.6%)	
WHEL Clinical Site			>0.9
Site A in California	258 (17%)	272 (18%)	
Site B in California	226 (15%)	210 (14%)	
Site C in California	267 (17%)	257 (17%)	
Site D in California	260 (17%)	256 (17%)	
Site in Arizona	242 (16%)	233 (15%)	
Site in Oregon	117 (7.5%)	116 (7.5%)	
Site in Texas	181 (12%)	193 (13%)	
Recurrence Flag			0.9
Invasive Breast Cancer Event	262 (17%)	256 (17%)	
No Invasive Breast Cancer Events	1,289 (83%)	1,281 (83%)	
Years from Diagnosis to WHEL Study Entry	1.76 (1.05, 2.81)	1.84 (1.04, 2.80)	0.8

Characteristic	Comparison, N = 1,551	Intervention, N = 1,537	p-value
Years from Study Entry to Recurrence/New Primary, or to Censor	7.12 (5.87, 8.44)	7.11 (5.83, 8.53)	>0.9
Years from Diagnosis to Recurrence/New Primary, or to Censor	8.97 (7.36, 10.64)	9.00 (7.35, 10.67)	0.8
Years from Diagnosis to Death or Censor	9.18 (7.76, 10.87)	9.28 (7.82, 10.89)	0.6

Plots and survival analysis tools

```
endpoint.data = read_excel(paste0(path, 'endpoints.xls'))
year4.data = read_excel(paste0(path, 'healthstaty4.xls'))

endpoint.data$recur_flag = as.factor(endpoint.data$recur_flag)

endpoint.data = read_excel(paste0(path, 'endpoints.xls'))
endpoint.km.fit <- survfit(Surv(yrsdx_endr, recur_flag) ~ 1, data = endpoint.data, )
print(endpoint.km.fit)
```

```
## Call: survfit(formula = Surv(yrsdx_endr, recur_flag) ~ 1, data = endpoint.data)
##
##          n events median 0.95LCL 0.95UCL
## [1,] 3088    518     NA      NA      NA
```

Intervention Effects on All-Cause Mortality by Baseline Demographic and Clinical Characteristics

Preprocessing

```
demo = read_excel("../Data/demographics.xls")
phbase = read_excel("../Data/phbase.xls")
nds = read_excel("../Data/ndsfoody4.xls")
medical = read_excel("../Data/Medical.xls")

# We need the following variables:

## Survival time
SurvTime = as.numeric(endpoint$'Years from Diagnosis to Death or Censor')
## Group and Status
Group = as_factor(endpoint$'Intervention Group')
Group = relevel(Group, ref = "Comparison")
a = as_factor(endpoint$'Vitality Status as of 6/1/2006')
Status = ifelse(a == "Alive", 0, 1)
## Age at randomization, y
AgeIdx = ifelse(demo$'age at rand' < 55, "<55", ">=55") # Age indicator (<=55 or not)
## Cancer stage at diagnosis
a = endpoint$'Cancer Stage, AJCC 6th'
CancerStage = as_factor(a)
## Hormone receptor status
a = medical$'Estr Recep'
b = medical$'Prog Recep'
```

```
HormoneRecep = ifelse(a==1 & b==1, "ER+/PR+",
                 ifelse(a==1 & b==0, "ER+/PR-",
                    ifelse(a==0 & b==1, "ER-/PR+",
                       ifelse(a==0 & b==0, "ER-/PR-", NA))))
## Time from Diag to Rand
a = endpoint$`Years from Diagnosis to WHEL Study Entry`
TimeDiagRand = as.numeric(ifelse(a <=1, 0,
                   ifelse(a <=2, 1,
                       ifelse(a <=3, 2, 3
                   )))) # Time from diagnosis to randomization
## Tumor differentiation
a = endpoint$`Cancer Grade`
TumorDiff = as_factor(a)
## No. of positive nodes (Number axillary lymph nodes positive)
a = medical$`Node Pos`
PosNodes = ifelse(a==0, 0,
             ifelse(a < 3, 1,
                 ifelse(a < 6, 2, 3)))
## Tumor size
a = medical$`Tumor Size`
TumorSize = ifelse(a < 2, 0,
             ifelse(a < 3, 1,
                 ifelse(a < 4, 2,
                     ifelse(a < 5, 3, 4))))
## Physical activity
a = phbase$`NEW METS`
PhysicalAct = ifelse(a <= 210, "<210",
                 ifelse(a <= 615, "211~615",
                     ifelse(a <= 1290, "616~1290", ">1290")))
## Energy intake
b = matrix(NA, nrow = length(a), ncol=1)
colnames(b) = "KCal"
b[endpoint$ID %in% nds$ID] = nds$Kcal
KCal = as_factor(ifelse(b <= 1430, "<1430",
           ifelse(b <= 1680, "1430~1680",
               ifelse(b <= 1980, "1681~1980",
                   ifelse(b > 1980, ">1980", NA)))))


##### PUT THEM TOGETHER #####
AllCauseMortalityData = data.frame(
  SurvTime, Group, Status, AgeIdx, CancerStage, HormoneRecep, TimeDiagRand,
      TumorDiff, PosNodes, TumorSize, PhysicalAct, KCal
)
############################
```

Universal and univariable Cox regression

```
coxph(Surv(SurvTime, Status) ~ ., data=AllCauseMortalityData) %>%
  tbl_regression()
```

Characteristic	log(HR)	95% CI	p-value
Group			
Comparison			
Intervention	-0.06	-0.58, 0.46	0.8
AgeIdx			
<55			
>=55	1.2	0.64, 1.8	<0.001
CancerStage			
Stage IIA			
Stage I	0.20	-0.61, 1.0	0.6
Stage IIB	0.01	-1.0, 1.0	>0.9
Stage IIIA	0.05	-1.5, 1.6	>0.9
Stage IIIB	0.56	-1.6, 2.8	0.6
HormoneRecep			
ER-/PR-			
ER-/PR+	0.15	-1.4, 1.7	0.8
ER+/PR-	0.03	-1.0, 1.1	>0.9
ER+/PR+	0.44	-0.32, 1.2	0.3
TimeDiagRand	-0.33	-0.61, -0.05	0.019
TumorDiff			
Grade Not Applicable or Not Available			
Grade II, Moderately Differentiated	0.53	-0.53, 1.6	0.3
Grade I, Well Differentiated	-0.23	-1.6, 1.1	0.7
Grade III, Poorly Differentiated	0.74	-0.36, 1.8	0.2
PosNodes	0.11	-0.51, 0.74	0.7
TumorSize	0.18	-0.11, 0.48	0.2
PhysicalAct			
<210			
>1290	-1.2	-2.1, -0.32	0.008
211~615	-0.16	-0.79, 0.47	0.6
616~1290	-0.62	-1.3, 0.10	0.091
KCal			
<1430			
1430~1680	-0.68	-1.4, 0.05	0.069
>1980	0.08	-0.66, 0.81	0.8
1681~1980	-0.68	-1.4, 0.07	0.077

```r
library(survival)
library(finalfit)
knit_print.data.frame <- lemon_print

dependent_os <- "Surv(SurvTime, Status)"
explanatory <- c("AgeIdx", "CancerStage", "HormoneRecep", "TimeDiagRand",
        "TumorDiff", "PosNodes", "TumorSize", "PhysicalAct", "KCal")
a = AllCauseMortalityData %>%
  filter(Group=="Intervention") %>%
  finalfit(dependent_os, explanatory)
kable(a)
```

	Dependent: Surv(SurvTime, Status)		all	HR (univariable)	HR (multivariable)
1	AgeIdx	<55	908 (100.0)	-	-
2		>=55	629 (100.0)	1.16 (0.85-1.59, p=0.348)	2.99 (1.30-6.87, p=0.010)
4	CancerStage	Stage IIA	515 (100.0)	-	-
3		Stage I	584 (100.0)	0.69 (0.43-1.09, p=0.110)	2.14 (0.61-7.46, p=0.232)
5		Stage IIB	194 (100.0)	2.13 (1.34-3.39, p=0.001)	1.20 (0.26-5.45, p=0.813)
6		Stage IIIA	188 (100.0)	2.51 (1.60-3.93, p<0.001)	0.84 (0.06-11.14, p=0.898)
7		Stage IIIB	56 (100.0)	3.58 (1.95-6.56, p<0.001)	1.25 (0.04-37.58, p=0.899)
8	HormoneRecep	ER-/PR-	299 (100.0)	-	-
9		ER-/PR+	52 (100.0)	0.97 (0.46-2.05, p=0.930)	0.83 (0.10-7.27, p=0.868)
10		ER+/PR-	198 (100.0)	0.81 (0.50-1.32, p=0.398)	0.80 (0.20-3.25, p=0.759)
11		ER+/PR+	958 (100.0)	0.52 (0.36-0.75, p<0.001)	1.07 (0.33-3.42, p=0.912)
22	TimeDiagRand	0	352 (100.0)	-	-
23		1	488 (100.0)	-	-
24		2	375 (100.0)	-	-
25		3	322 (100.0)	-	-
29	TumorDiff	Grade Not Applicable or Not Available	127 (100.0)	-	-
27		Grade II, Moderately Differentiated	620 (100.0)	1.49 (0.74-3.01, p=0.263)	3.09 (0.39-24.42, p=0.284)
26		Grade I, Well Differentiated	239 (100.0)	0.84 (0.36-1.96, p=0.680)	2.60 (0.28-24.05, p=0.400)
28		Grade III, Poorly Differentiated	551 (100.0)	2.26 (1.13-4.51, p=0.021)	3.20 (0.38-27.02, p=0.286)
20	PosNodes	Mean (SD)	0.7 (1.0)	1.61 (1.41-1.85, p<0.001)	1.04 (0.43-2.50, p=0.932)
30	TumorSize	Mean (SD)	0.9 (1.2)	1.36 (1.22-1.51, p<0.001)	1.64 (1.04-2.58, p=0.034)
16	PhysicalAct	<210	443 (100.0)	-	-
17		>1290	351 (100.0)	0.61 (0.38-0.99, p=0.047)	0.20 (0.04-0.94, p=0.041)
18		211~615	368 (100.0)	1.08 (0.72-1.61, p=0.717)	0.82 (0.31-2.17, p=0.694)
19		616~1290	375 (100.0)	0.84 (0.55-1.29, p=0.429)	0.73 (0.28-1.94, p=0.531)

	Dependent: Surv(SurvTime, Status)		all	HR (univariable)	HR (multivariable)
12	KCal	<1430	446 (100.0)	-	-
14		1430~1680	287 (100.0)	0.64 (0.24-1.68, p=0.365)	0.51 (0.18-1.46, p=0.209)
13		>1980	144 (100.0)	1.19 (0.45-3.13, p=0.725)	1.12 (0.41-3.07, p=0.818)
15		1681~1980	249 (100.0)	0.37 (0.10-1.28, p=0.116)	0.34 (0.09-1.24, p=0.102)
21	NA	NA	NA	0.70 (0.60-0.81, p<0.001)	0.64 (0.43-0.94, p=0.022)

Imputation

```r
library(miceRanger)
ImputedAll <- AllCauseMortalityData %>%
  miceRanger(
  m = 3,
  returnModels = TRUE,
  verbose = TRUE
)
```

```
##
## Process started at 2021-11-18 23:06:22
##
## dataset 1
## iteration 1   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 2   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 3   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 4   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 5   | HormoneRecep | PosNodes | TumorSize | KCal
##
## dataset 2
## iteration 1   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 2   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 3   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 4   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 5   | HormoneRecep | PosNodes | TumorSize | KCal
##
## dataset 3
## iteration 1   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 2   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 3   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 4   | HormoneRecep | PosNodes | TumorSize | KCal
## iteration 5   | HormoneRecep | PosNodes | TumorSize | KCal
```

Cox Regression for each variable

```r
ImputedData = as.data.frame(completeData(ImputedAll)[[3]])
for (item in explanatory) {
  len = ImputedData %>%
    select(item) %>%
    unique(.) %>%
    nrow(.)
  category = ImputedData %>%
      select(item) %>%
      unique(.)
  hi = item
  for (i in 1:len) {
    cat = category[i,]
    print(paste0("Explanatory: ", hi))
    print(paste0("Category: ", cat))
    idx = ImputedData[, hi] == cat

     cat(knitr::knit_print(tbl_regression(coxph(Surv(SurvTime, Status) ~ Group, data=ImputedData[idx, ])


  }
}
```

```
## [1] "Explanatory: AgeIdx"
## [1] "Category: <55"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |0.00        |-0.30, 0.30 |>0.9        |
##
## [1] "Explanatory: AgeIdx"
## [1] "Category: >=55"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |-0.05       |-0.37, 0.28 |0.8         |
##
## [1] "Explanatory: CancerStage"
## [1] "Category: Stage IIA"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
```

```
## |Intervention          |-0.20       |-0.61, 0.21 |0.3          |
##
## [1] "Explanatory: CancerStage"
## [1] "Category: Stage I"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |0.08        |-0.41, 0.56 |0.8         |
##
## [1] "Explanatory: CancerStage"
## [1] "Category: Stage IIB"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |0.41        |-0.15, 1.0  |0.2         |
##
## [1] "Explanatory: CancerStage"
## [1] "Category: Stage IIIA"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |0.03        |-0.44, 0.50 |0.9         |
##
## [1] "Explanatory: CancerStage"
## [1] "Category: Stage IIIB"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |-0.57       |-1.2, 0.09  |0.093       |
##
## [1] "Explanatory: HormoneRecep"
## [1] "Category: ER+/PR+"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |-0.09       |-0.40, 0.22 |0.6         |
##
## [1] "Explanatory: HormoneRecep"
## [1] "Category: ER-/PR-"
```

```
## 
## 
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:-----------------|:----------|:----------|:----------|
## |Group             |           |           |           |
## |Comparison        |           |           |           |
## |Intervention      |0.11       |-0.31, 0.54 |0.6       |
## 
## [1] "Explanatory: HormoneRecep"
## [1] "Category: ER-/PR+"
## 
## 
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:-----------------|:----------|:----------|:----------|
## |Group             |           |           |           |
## |Comparison        |           |           |           |
## |Intervention      |0.25       |-0.68, 1.2 |0.6        |
## 
## [1] "Explanatory: HormoneRecep"
## [1] "Category: ER+/PR-"
## 
## 
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:-----------------|:----------|:----------|:----------|
## |Group             |           |           |           |
## |Comparison        |           |           |           |
## |Intervention      |-0.07      |-0.64, 0.50 |0.8       |
## 
## [1] "Explanatory: TimeDiagRand"
## [1] "Category: 0"
## 
## 
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:-----------------|:----------|:----------|:----------|
## |Group             |           |           |           |
## |Comparison        |           |           |           |
## |Intervention      |-0.04      |-0.44, 0.37 |0.9       |
## 
## [1] "Explanatory: TimeDiagRand"
## [1] "Category: 1"
## 
## 
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:-----------------|:----------|:----------|:----------|
## |Group             |           |           |           |
## |Comparison        |           |           |           |
## |Intervention      |-0.10      |-0.48, 0.27 |0.6       |
## 
## [1] "Explanatory: TimeDiagRand"
## [1] "Category: 3"
## 
## 
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:-----------------|:----------|:----------|:----------|
```

```
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |-0.10      |-0.65, 0.44 |0.7        |
##
## [1] "Explanatory: TimeDiagRand"
## [1] "Category: 2"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |0.24       |-0.26, 0.74 |0.3        |
##
## [1] "Explanatory: TumorDiff"
## [1] "Category: Grade Not Applicable or Not Available"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |-0.47      |-1.3, 0.36 |0.3        |
##
## [1] "Explanatory: TumorDiff"
## [1] "Category: Grade II, Moderately Differentiated"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |-0.09      |-0.45, 0.26 |0.6        |
##
## [1] "Explanatory: TumorDiff"
## [1] "Category: Grade I, Well Differentiated"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |0.59       |-0.33, 1.5 |0.2        |
##
## [1] "Explanatory: TumorDiff"
## [1] "Category: Grade III, Poorly Differentiated"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |0.03       |-0.29, 0.35 |0.8        |
##
```

```
## [1] "Explanatory: PosNodes"
## [1] "Category: 1"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:-----------------|:----------|:-----------|:-----------|
## |Group             |           |            |            |
## |Comparison         |           |            |            |
## |Intervention       |0.20       |-0.27, 0.67 |0.4         |
##
## [1] "Explanatory: PosNodes"
## [1] "Category: 0"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:-----------------|:----------|:-----------|:-----------|
## |Group             |           |            |            |
## |Comparison         |           |            |            |
## |Intervention       |-0.12      |-0.47, 0.23 |0.5         |
##
## [1] "Explanatory: PosNodes"
## [1] "Category: 2"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:-----------------|:----------|:-----------|:-----------|
## |Group             |           |            |            |
## |Comparison         |           |            |            |
## |Intervention       |0.15       |-0.41, 0.71 |0.6         |
##
## [1] "Explanatory: PosNodes"
## [1] "Category: 3"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:-----------------|:----------|:-----------|:-----------|
## |Group             |           |            |            |
## |Comparison         |           |            |            |
## |Intervention       |-0.31      |-0.78, 0.16 |0.2         |
##
## [1] "Explanatory: TumorSize"
## [1] "Category: 0"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:-----------------|:----------|:-----------|:-----------|
## |Group             |           |            |            |
## |Comparison         |           |            |            |
## |Intervention       |-0.15      |-0.56, 0.25 |0.5         |
##
## [1] "Explanatory: TumorSize"
## [1] "Category: 1"
##
##
```

```
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |0.25       |-0.13, 0.63 |0.2        |
##
## [1] "Explanatory: TumorSize"
## [1] "Category: 2"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |-0.64      |-1.2, -0.03 |0.039      |
##
## [1] "Explanatory: TumorSize"
## [1] "Category: 3"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |-0.10      |-0.89, 0.68 |0.8        |
##
## [1] "Explanatory: TumorSize"
## [1] "Category: 4"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |0.20       |-0.40, 0.81 |0.5        |
##
## [1] "Explanatory: PhysicalAct"
## [1] "Category: <210"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
## |Intervention     |-0.15      |-0.54, 0.24 |0.4        |
##
## [1] "Explanatory: PhysicalAct"
## [1] "Category: >1290"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:----------------|:----------|:----------|:----------|
## |Group            |           |           |           |
## |Comparison       |           |           |           |
```

```
## |Intervention         |0.01        |-0.53, 0.56 |>0.9         |
##
## [1] "Explanatory: PhysicalAct"
## [1] "Category: 616~1290"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |0.03        |-0.43, 0.50 |0.9         |
##
## [1] "Explanatory: PhysicalAct"
## [1] "Category: 211~615"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |0.03        |-0.38, 0.45 |0.9         |
##
## [1] "Explanatory: KCal"
## [1] "Category: <1430"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |-0.11       |-0.46, 0.24 |0.5         |
##
## [1] "Explanatory: KCal"
## [1] "Category: >1980"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |-0.10       |-0.64, 0.45 |0.7         |
##
## [1] "Explanatory: KCal"
## [1] "Category: 1430~1680"
##
##
## |**Characteristic** |**log(HR)** |**95% CI**  |**p-value** |
## |:------------------|:-----------|:-----------|:-----------|
## |Group              |            |            |            |
## |Comparison         |            |            |            |
## |Intervention       |0.22        |-0.25, 0.68 |0.4         |
##
## [1] "Explanatory: KCal"
## [1] "Category: 1681~1980"
```

```
## 
## 
## |**Characteristic** |**log(HR)** |**95% CI**   |**p-value** |
## |:------------------|:----------|:-----------|:-----------|
## |Group              |           |            |            |
## |Comparison         |           |            |            |
## |Intervention       |-0.04      |-0.52, 0.44 |0.9         |
```