

# Sensitivity analysis (E-values)

Gustaf Forsberg

## E-values calculation

Due to a bug when running large chunks of code, this analysis is run separately.

Here, E-values for each hazard ratio are calculated, quantifying the minimum strength of association that an unmeasured confounder would need to have with both the exposure and the outcome to explain away the observed association.

```
library(EValue)
ev_Hospital_C2      <- evalues.HR(3.85, 1.98, 7.48, rare = FALSE)
ev_Hospital_C1     <- evalues.HR(2.38, 1.16, 4.89, rare = FALSE)
ev_Hospital_A1    <- evalues.HR(2.52, 1.31, 4.83, rare = FALSE)
ev_Hospital_B1   <- evalues.HR(3.62, 1.92, 6.82, rare = FALSE)
ev_Hospital_B3    <- evalues.HR(5.06, 2.56, 10.02, rare = FALSE)
ev_Hospital_C3   <- evalues.HR(4.75, 1.53, 14.74, rare = FALSE)

print(list(
  Hospital_C2      = ev_Hospital_C2,
  Hospital_C1     = ev_Hospital_C1,
  Hospital_A1    = ev_Hospital_A1,
  Hospital_B1   = ev_Hospital_B1,
  Hospital_B3    = ev_Hospital_B3,
  Hospital_C3   = ev_Hospital_C3
))
```

```
$Hospital_C2
      point   lower  upper
RR      2.497777 1.601533 3.795855
E-values 4.431972 2.583050    NA
```

```
$Hospital_C1
      point   lower  upper
```

```
RR      1.814636 1.108326 2.913869
E-values 3.030476 1.454824      NA
```

```
$Hospital_A1
```

```
      point  lower  upper
RR      1.885943 1.205641 2.891037
E-values 3.178552 1.703567      NA
```

```
$Hospital_B1
```

```
      point  lower  upper
RR      2.399235 1.568245 3.587795
E-values 4.231472 2.512250      NA
```

```
$Hospital_B3
```

```
      point  lower  upper
RR      2.977861 1.906032 4.518236
E-values 5.404750 3.220157      NA
```

```
$Hospital_C3
```

```
      point  lower  upper
RR      2.860387 1.34200 5.630971
E-values 5.167209 2.01947      NA
```

```
library(pacman)
p_load(readxl, dplyr, survival, survminer, ggplot2, scales)

my_data <- read_excel("descriptive_mort_v3.xlsx", sheet = "Blad3") |>
  mutate(
    Sjukhus = factor(
      Sjukhus, levels = 1:7,
      labels = c("Hospital B2", "Hospital C2", "Hospital C1",
                 "Hospital A1", "Hospital B1", "Hospital B3", "Hospital C3")
    ),
    Sjukvardsregion = factor(Sjukvardsregion, levels = 1:3,
                             labels = c("Region 1", "Region 2", "Region 3")),
    BMI = as.numeric(BMI),
    time90 = pmin(Tid_censur_event, 90),
    event90 = ifelse(Tid_censur_event > 90, 0, Ninety_day_mortality)
  )
```

```

km_fit <- survfit(Surv(time90, event90) ~ Sjukhus, data = my_data)

okabe_ito <- c("#0072B2", "#E69F00", "#009E73", "#D55E00", "#CC79A7", "#56B4E9", "#F0E442")

km_plot <- ggsurvplot(
  fit = km_fit, data = my_data,
  conf.int = FALSE,
  pval = TRUE,
  pval.size = 5,
  pval.coord = c(10, 0.62),
  risk.table = FALSE,
  break.time.by = 10,
  xlim = c(0, 90),
  ylim = c(0.5, 1),
  xlab = "Time (days)",
  ylab = "Survival probability",
  legend.title = NULL,
  legend.labs = levels(my_data$Sjukhus),
  palette = okabe_ito,
  ggtheme = theme_classic(base_size = 16)
)

```

Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.  
 i Please use `linewidth` instead.  
 i The deprecated feature was likely used in the ggpubr package.  
 Please report the issue at <<https://github.com/kassambara/ggpubr/issues>>.

```

km_plot$plot <- km_plot$plot +
  coord_cartesian(ylim = c(0.5, 1)) +
  theme(
    text = element_text(family = "Helvetica"),
    axis.title = element_text(size = 18),
    axis.text = element_text(size = 14),
    legend.position = "right",
    legend.text = element_text(size = 14),
    legend.key.width = unit(1.2, "cm"),
    legend.key.height = unit(0.8, "cm"),
    plot.title = element_text(size = 18, face = "bold", hjust = 0.0),
    plot.margin = margin(10, 20, 10, 10)
  )

```

Coordinate system already present.

i Adding new coordinate system, which will replace the existing one.

```
ggsave("km_plot.jpg", km_plot$plot, width = 180, height = 140, units = "mm", dpi = 300)
```

Ignoring unknown labels:

\* fill : "strata"

\* linetype : "1"

```
ggsave("km_plot.tiff", km_plot$plot, width = 180, height = 140, units = "mm",  
       dpi = 600, device = "tiff", compression = "lzw")
```

Ignoring unknown labels:

\* fill : "strata"

\* linetype : "1"