Number of Resistances and Simple Plots

20.04.2022

Bibliotheken laden, Hilfsfunktion

```r
library(ggplot2)        # moderne plots

debug <- T              # debug printout
debug <- F              # kein debug printout
Log <- function(string) {
  if(debug){print(string)}
}
```

MY Schicht Festlegen

Nur die letzte Zeile zählt!

```r
Schicht <- "GT8000"     # Greater Than 8000
Schicht <- "U"          # Un-stratisfied
Schicht <- "LE8000"     # Less than or Equal to 8000
```

Resistenzen.Rmd erzeugte Resistenzen[Schicht].csv, das einlesen

Und evtl. ansehen

```r
FileIn <- paste( "Resistenzen",Schicht,".csv" , sep="" )  # Fileout ist nur N davorgehängt
Resistenzen <- read.csv(FileIn)

# csv schreiben fügt vorne Index-Spalte an; diese entfernen :
Resistenzen[,1] <- NULL

if(debug){View(Resistenzen)}
```

Resistenzen pro Betrieb

Resistenzen pro Betrieb in neuer Tabelle "NResistenzen" zählen, Multirestenz dokumentieren und als NResistenzen.csv ausschreiben

```r
ResRow  <- nrow(Resistenzen)  # Zeilen Resistenzen : 4 pro Betrieb
NResRow <- ResRow/4           # Zeilen NResistenzen : 1 pro Betrieb

maxcol <- match("WM.group",names(Resistenzen)) - 1
#NAntib  <- 15                       # wir untersuchen 15 Antibiotika (wird von Resistenzen.Rmd so aus 2 Excel files ein

NResistenzen <- Resistenzen[0,]                      # header wie"Resistenzen"
for(line in 1:NResRow){                              # 1 bis 60, aber 30 fehlt
  i <- (line - 1)*4 + 1
  NResistenzen[line,] <- Resistenzen[(line - 1)*4 + 1,]  # WM.group etc. kopieren
  NResistenzen[line,2:maxcol] <- 0                       # aber Antibiotika auf 0 setzen : hier später Resistenzen
}
for(col in 2:maxcol){
  NResistenzen[,col] <-  as.numeric(NResistenzen[,col])  # muss immer noch in type double konvertieren
}
```

```r
if(debug){View(NResistenzen)}

# für jedes Antibiotikum Resistenzen über die 4 Proben zählen, also mögliche Werte 0-4 :
for(i in 1:ResRow){                              # Liniennummer (Betriebe in 4er Gruppen) für dataframe Resistenzen
  Log(paste("i=",i))

  line <- floor((i-1)/4)+1                       # Liniennummer für dataframe NResistenzen

  for(j in 2:maxcol){                            # Spaltennummer: Antibiotikum
    if(substr(Resistenzen[i,j],1,1)==">"){       # wenn Resistenz
      Log(paste("  NResistenzen[",line,j,"]=",NResistenzen[line,j],typeof(NResistenzen[line,j]) ))
      NResistenzen[line,j] <- NResistenzen[line,j] + 1   # gef. Resistenz zählen
} } }

NResistenzen$NRes   <- rep(0,NResRow)  # neue Spalte, zählt für jeden Betrieb Resistenzen über Antibiotika; erstma
NResistenzen$MultiR <- rep(F,NResRow)  # neue Spalte, dokumentiert für jeden Betrieb Multiresistenz; erstmal False

#print(paste("maxcol =",maxcol))
for(line in 1:NResRow){                 # 1 bis 60, aber 30 fehlt
  for(col in 2:(maxcol)){
    if(NResistenzen[line,col] > 0){
      NResistenzen[line,"NRes"] <- NResistenzen[line,"NRes"]+1   # Resistenz zählen
    }
  }
  if(NResistenzen[line,"NRes"] >= 3){  # Multiresistenz heisst mind. 3 Resistenzen
    NResistenzen[line,"MultiR"] <- T
  }
}
if(debug){View(NResistenzen)}
write.csv(NResistenzen, paste( "N", FileIn , sep="" ))
```

Funktion für die Grafik

```r
graphisch2 <- function(gruppe, join, antibiotikum) {
  group <- Resistenzen[,gruppe ]
  antib      <- Resistenzen[,antibiotikum ]
  dir.create(paste("plots_",Schicht,sep=""))              # directory for the plot files

  X <- c()
  Y <- c()
  for(i in 1:ResRow){                             # Liniennummer für dataframe Resistenzen
    x <- as.numeric(group[i])                     # [,na.rm=TRUE) hilft nicht weil's "NA" ist, nicht NA]
    if(substr(antib[i],1,1) == ">"){              # wenn Resistenz

      pos <- match(x,X)
      if(is.na(pos)){
        X <- c(X,x)      # faster: pre-allocate+assign,
        Y <- c(Y,1)      # in this way vector copied in every iteration
      } else {
        Y[pos] <- Y[pos] + 1
      }
    }
  }

  df <- data.frame(X,Y)
  ylab <- paste(antibiotikum,"- Resistances")

  if( gruppe == "WM.group" ){xlab <- "Wastemilk Group"}
  if( gruppe == "OLS.group"){xlab <- "Other LiveStock Group"}
  if( gruppe == "IAC.group"){xlab <- "Ill Animals in Calving Box Group"}
  ### Neue binäre hier dazufügen ###
```

```r
  if( gruppe == "HSC.group"){xlab <- "Husbandry System Calves Group"}
  ### Neue nominale hier dazufügen ###

  if( gruppe == "MY"        ){xlab <- "meanMY/cow"}
  if( gruppe == "SCC"       ){xlab <- "mean SCC/11mo"}
  if( gruppe == "CBC"       ){xlab <- "calvingbox_clean"}
  if( gruppe == "DIA"       ){xlab <- "IN_diarrhea<30d"}
  ### Neue numerische hier dazufügen ###

  xlab1 <- paste(xlab, "   (MY group", Schicht,")")

  min <- min(as.numeric(Resistenzen[,gruppe]), na.rm=T)
  max <- max(as.numeric(Resistenzen[,gruppe]), na.rm=T)


  puffer <- (max - min)/20
  min <- min - puffer          # links und rechts 5% freier Platz
  max <- max + puffer

  print( ggplot(df, aes(X, Y)) +
    geom_point() +
    xlim(min,max) +
    xlab(xlab1) + ylab(ylab)  +
    ggtitle(paste("Number of", ylab, join,xlab))
  )
  ggsave(paste("plots_",Schicht,"/plot_", Schicht,"_",gruppe,"_",antibiotikum,".png", sep=""))
}
```

Plot Anzahl der Resistenzen für verschiedene Antibiotika, numerische Variablen

- MERO, AMI, TGC, TAZ COL, keine Resistenzen
- FOT , AZI nur eine (die AZI-CBC und AZI-IAC plots sind korrekterweise leer: Diese Resistenz hat NA für CBC und IAC)

```r
#   NA warnings interessieren nicht

numerisch <- c("MY","SCC","CBC","DIA")     # untersuchte numerische Variablen  ### neue numerische hier hinzufügen
for( group in numerisch) {

  for( antib in c("AMP","CIP","AZI","GEN","FOT","CHL","NAL","TET","TMP","SMX") ){

    graphisch2(group,"for given",antib)
    print("")
  }
  print("----------------------------------------------------------")
}
```

```
## Saving 6.5 x 4.5 in image
```

Number of AMP – Resistances for given meanMY/cow


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of CIP – Resistances for given meanMY/cow
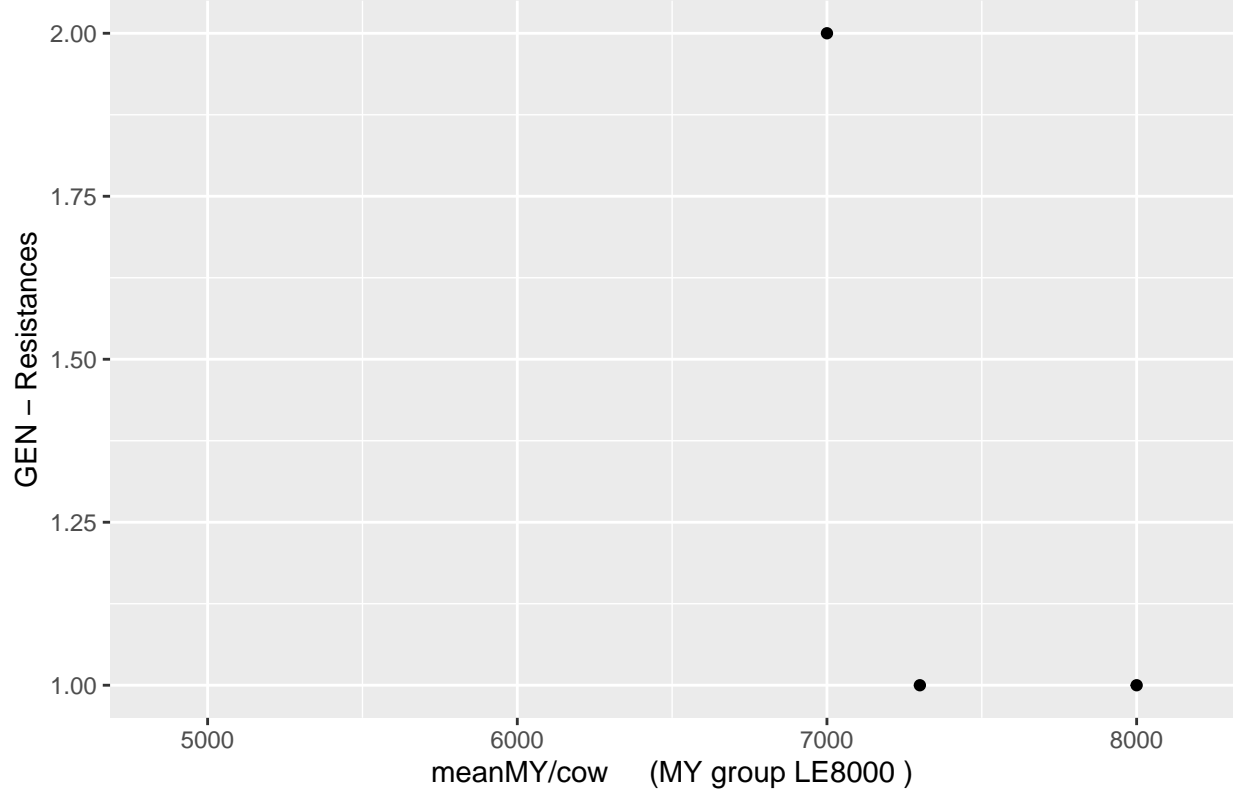


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

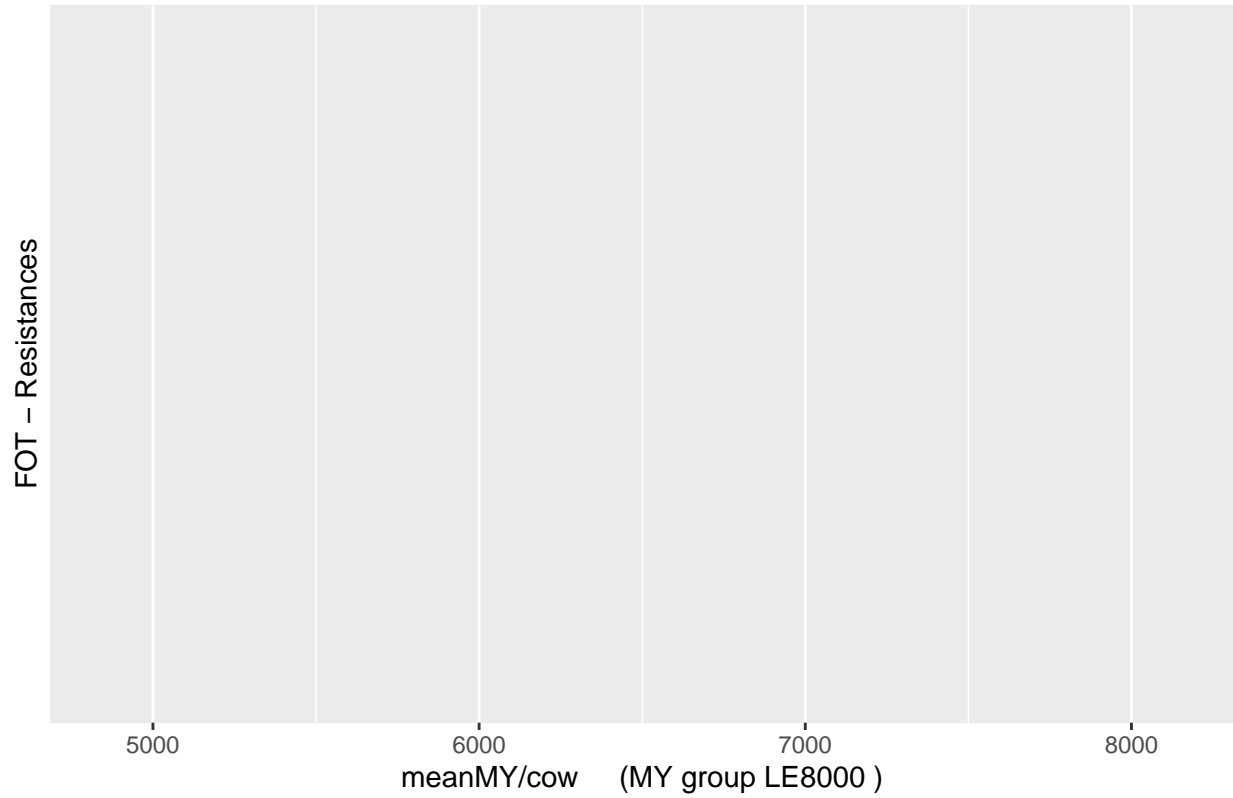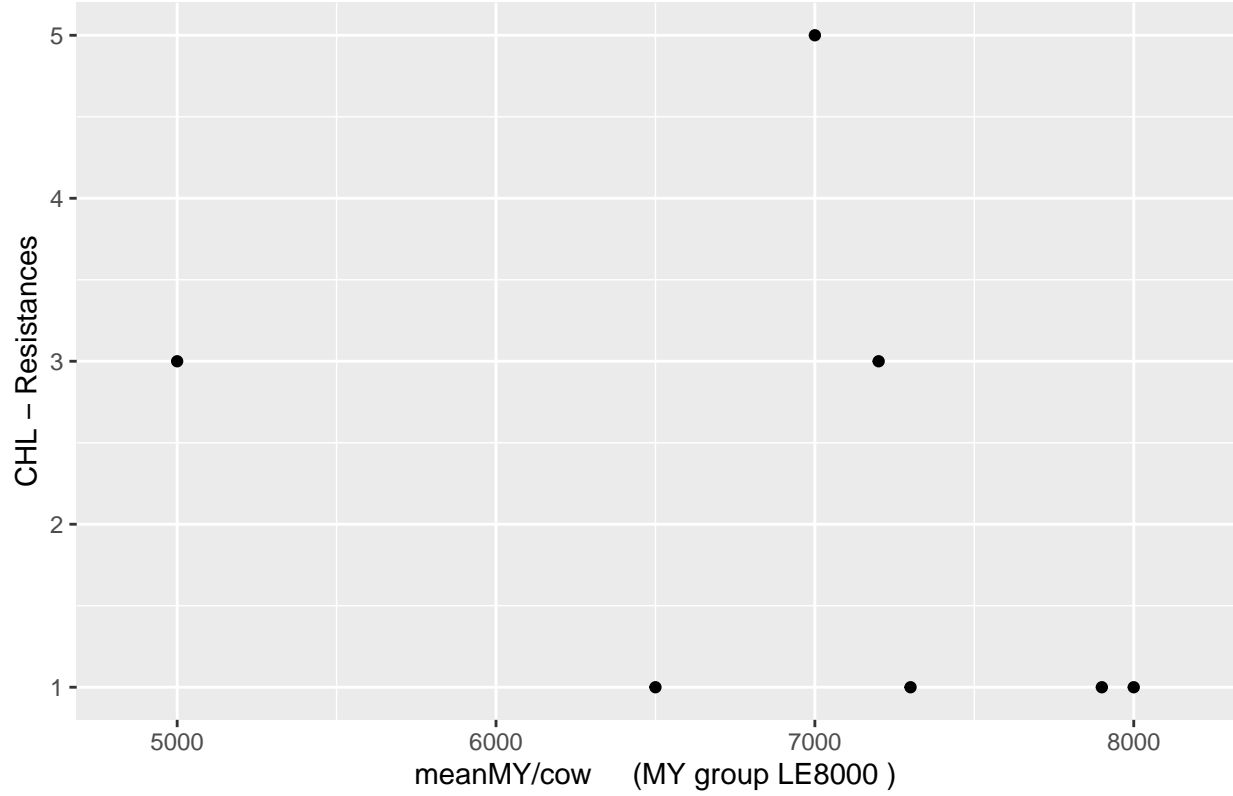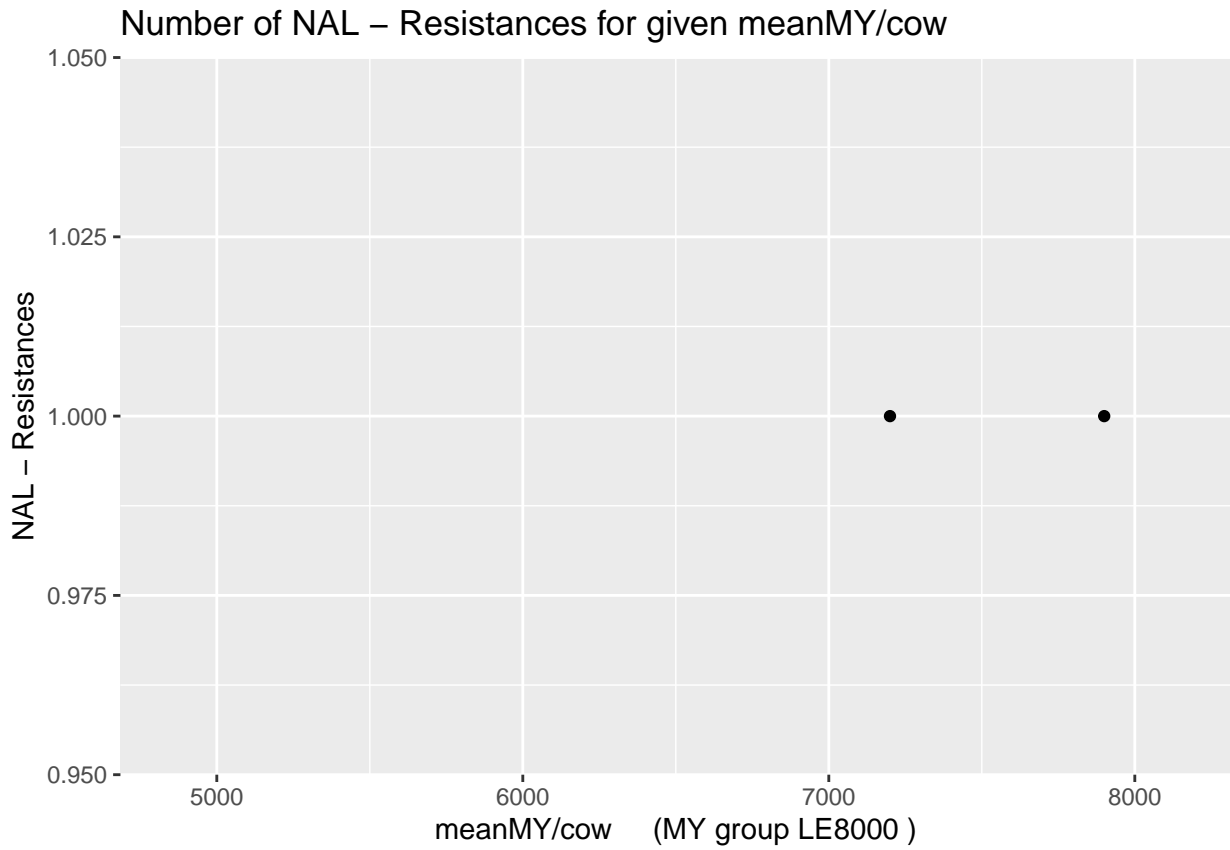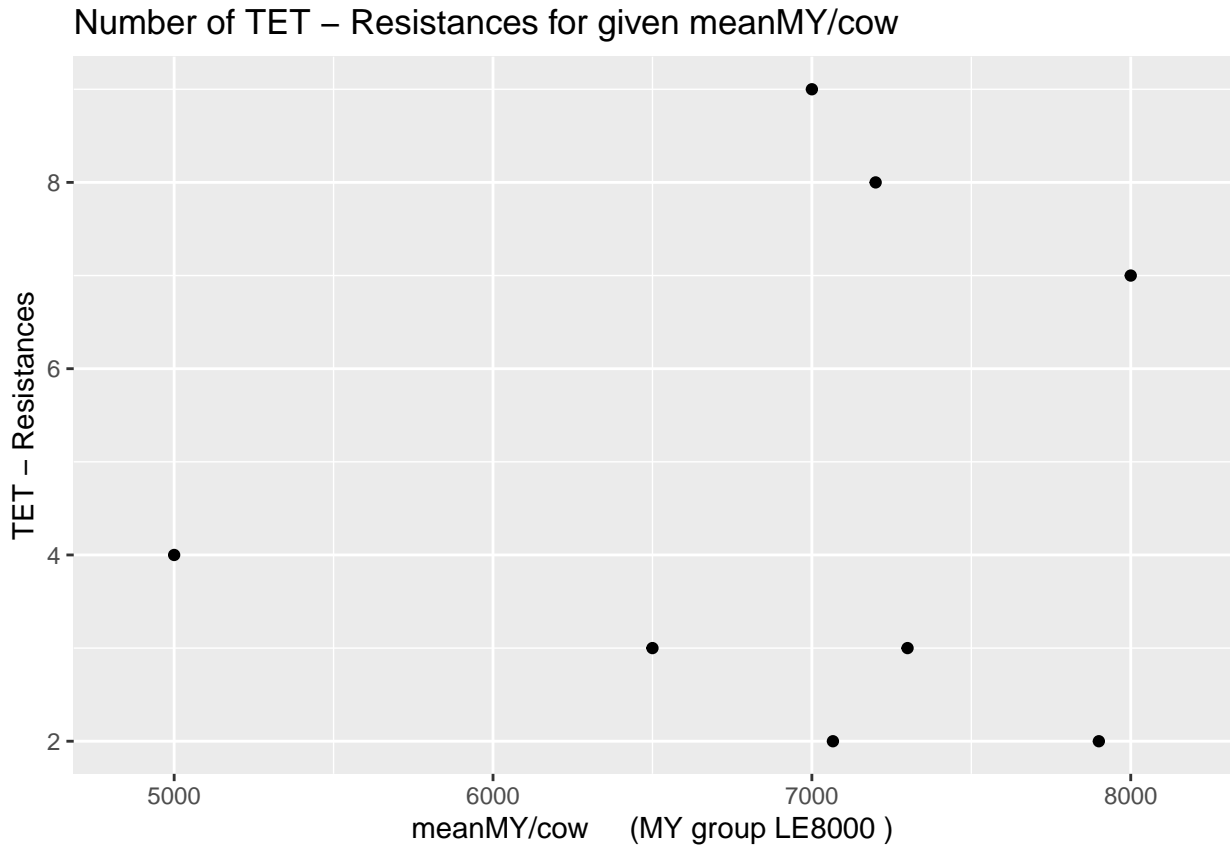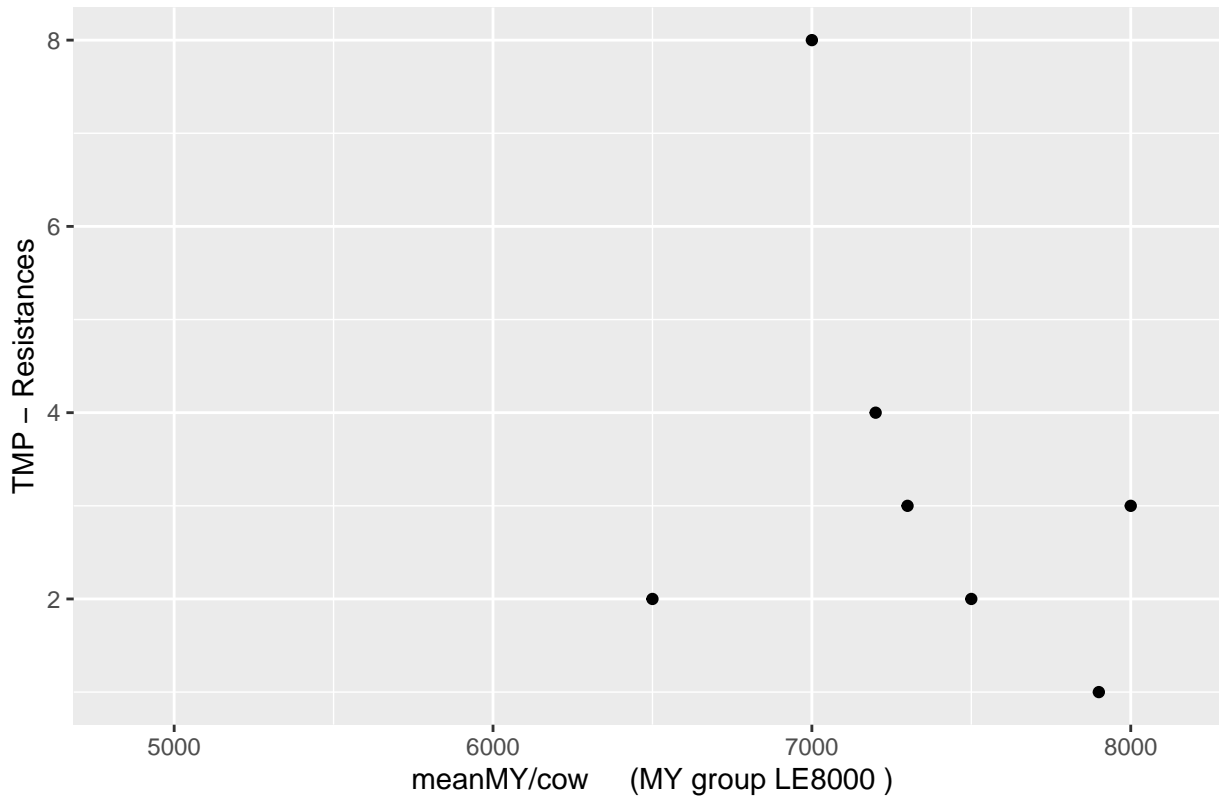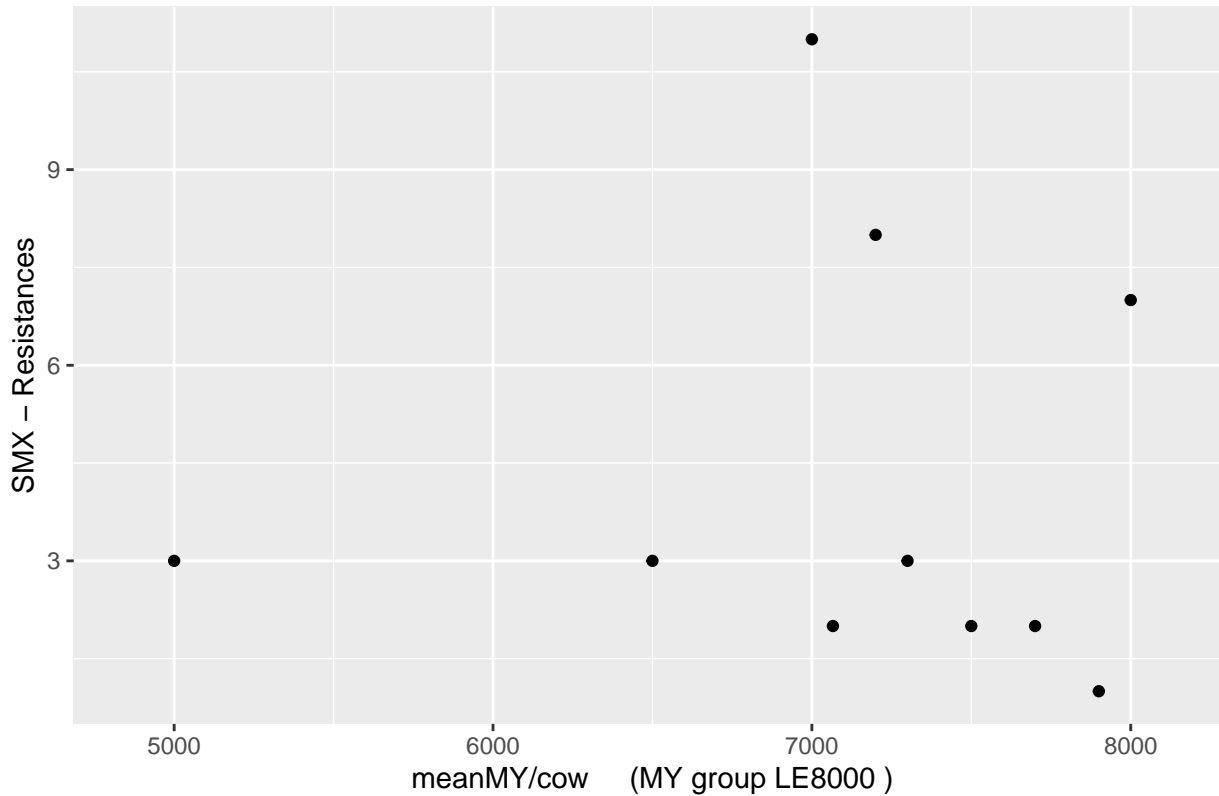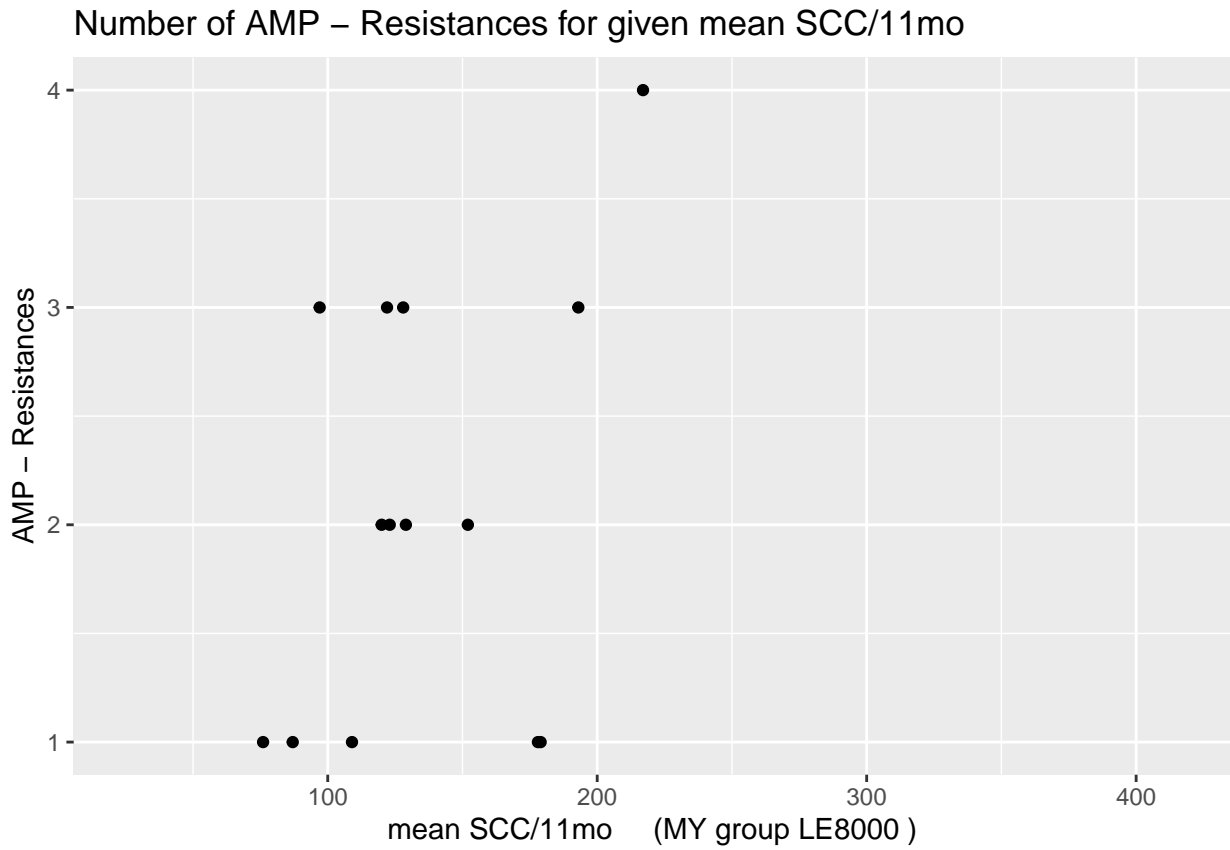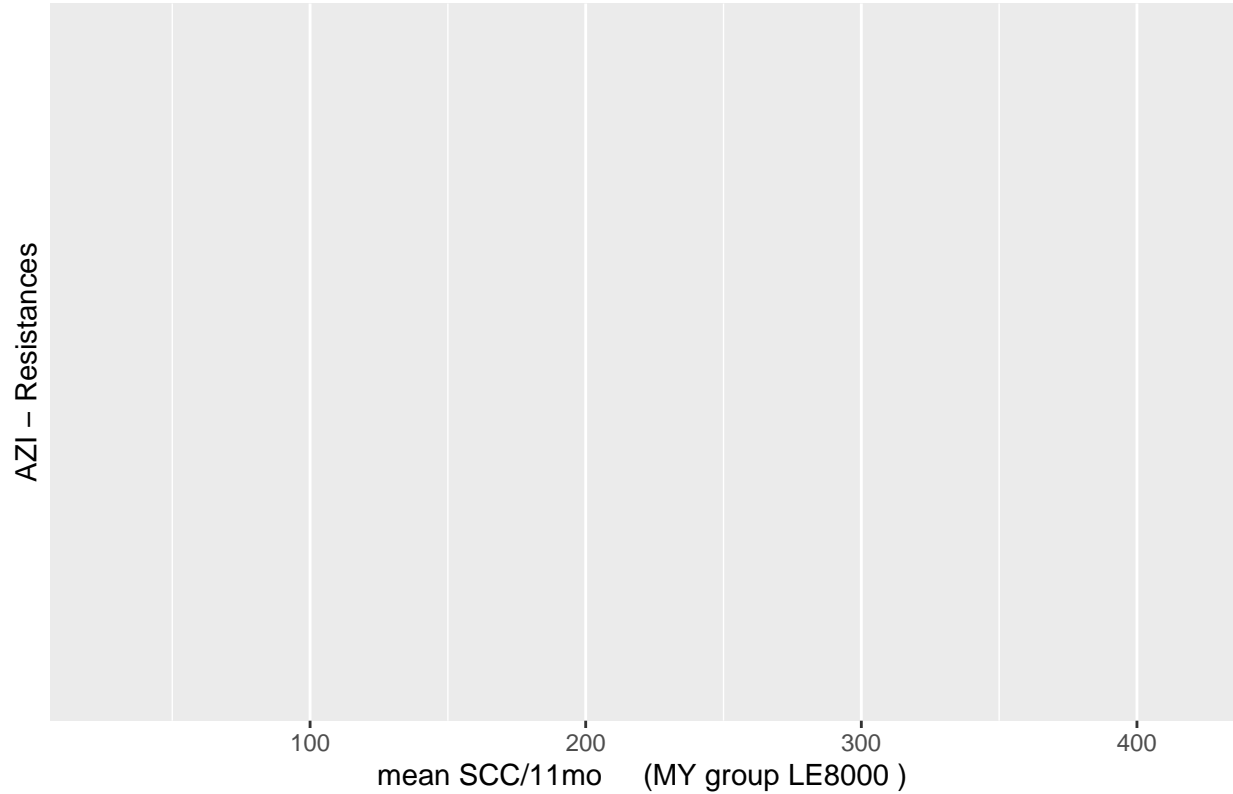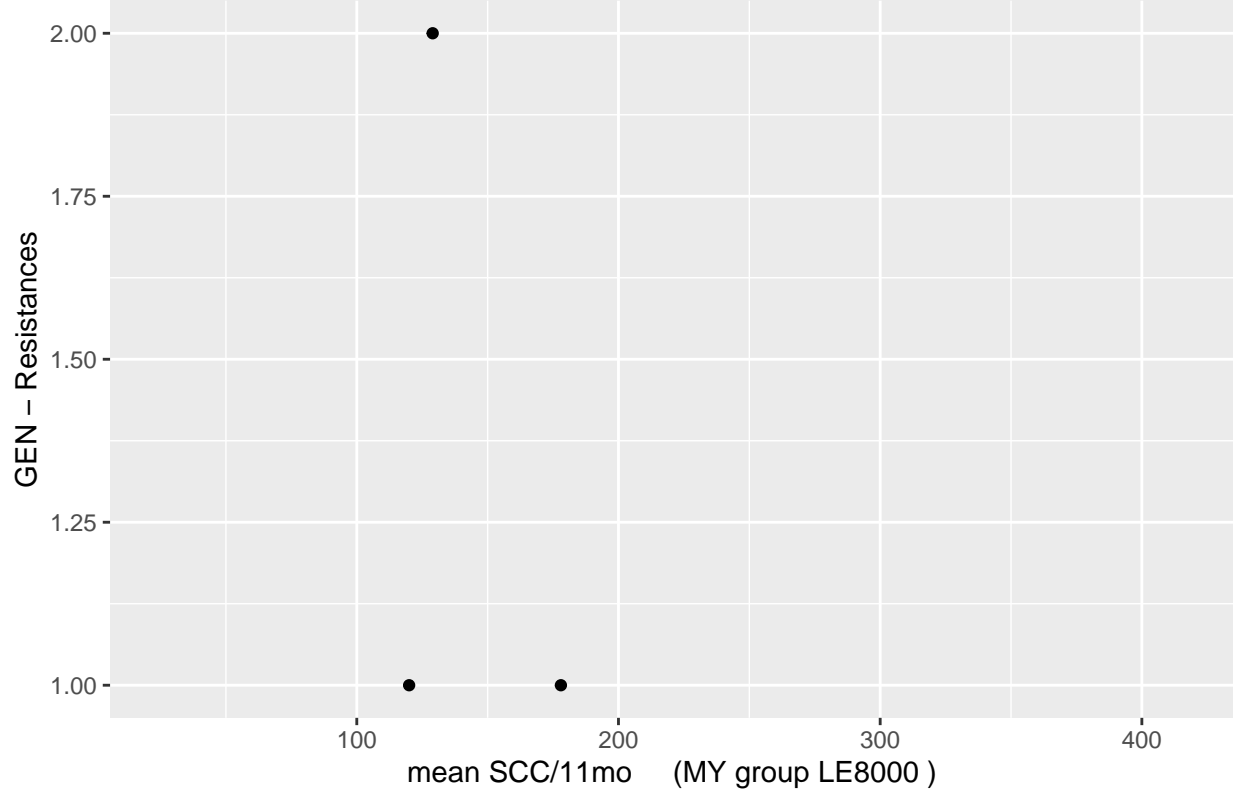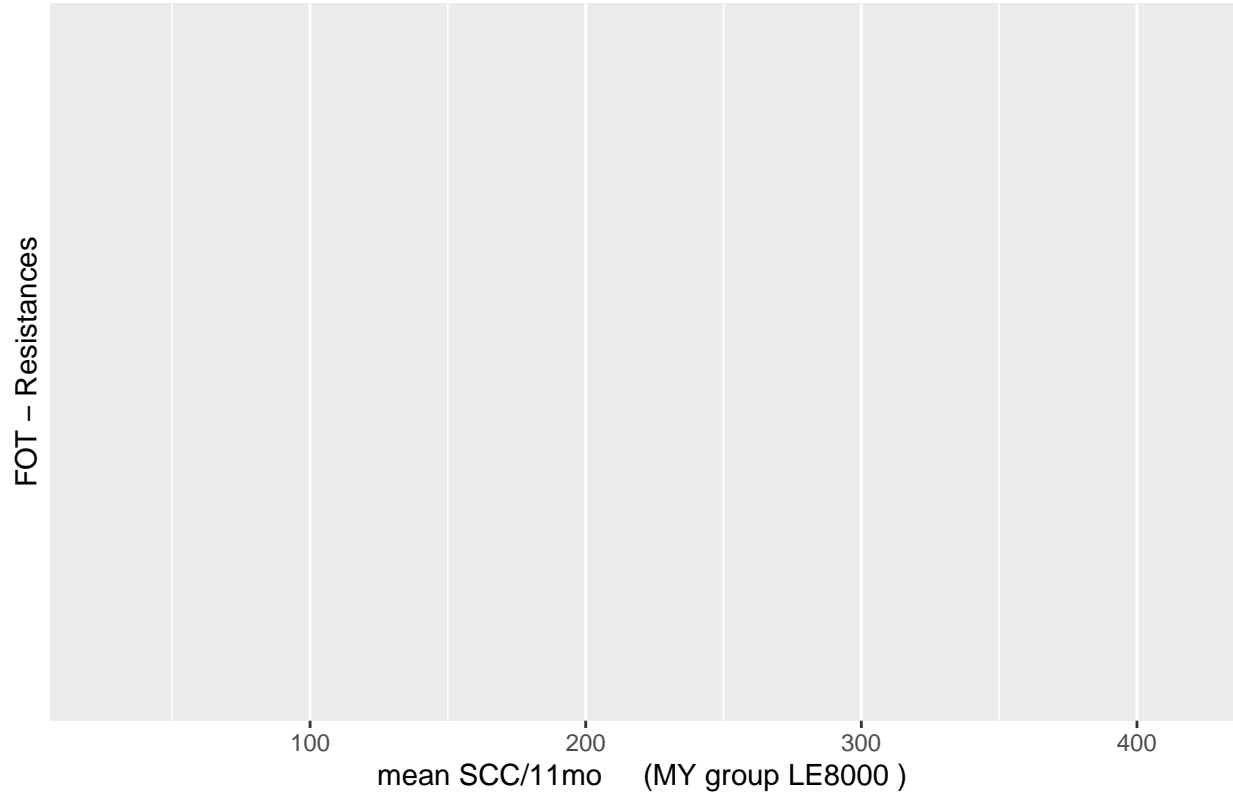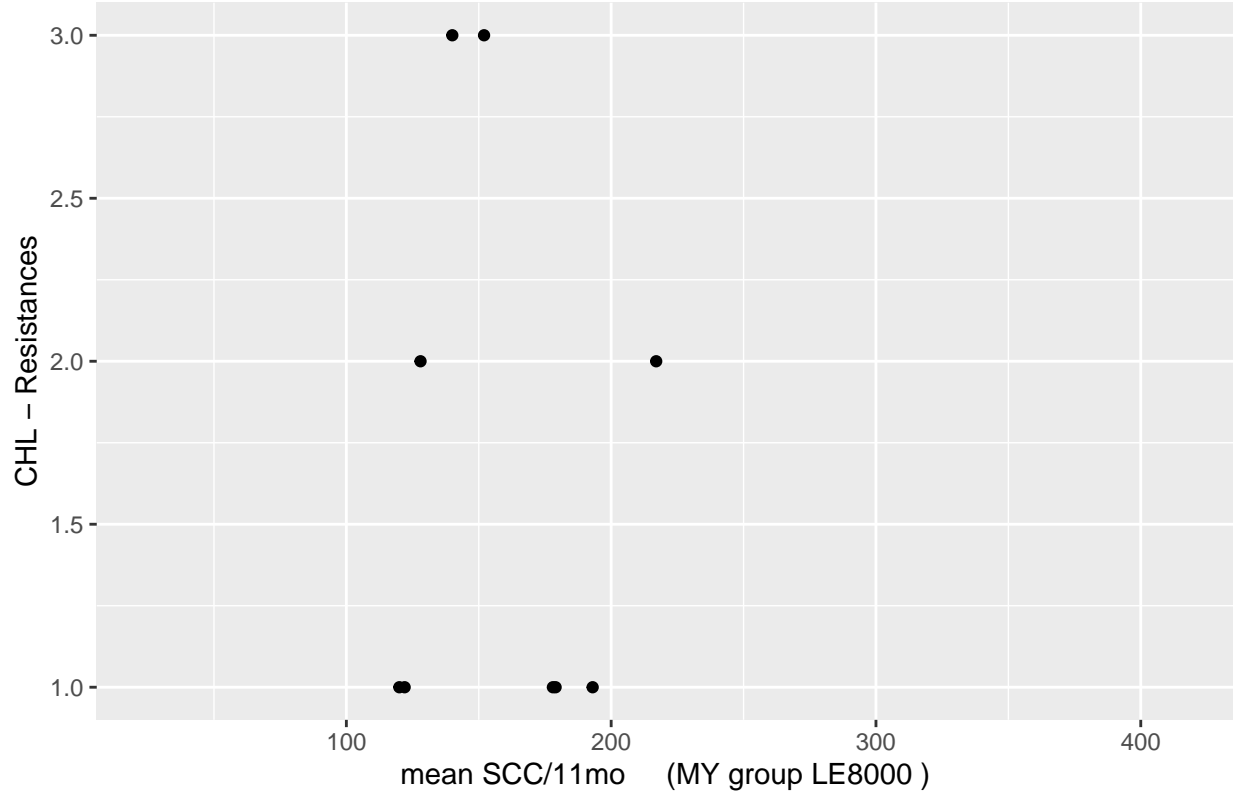# Number of AZI – Resistances for given meanMY/cow

meanMY/cow   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of GEN – Resistances for given meanMY/cow

meanMY/cow   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given meanMY/cow

FOT – Resistances

meanMY/cow   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given meanMY/cow

CHL – Resistances

meanMY/cow   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of NAL – Resistances for given meanMY/cow

NAL – Resistances

meanMY/cow   (MY group LE8000)

```
## [1] ""
## Saving 6.5 x 4.5 in image
```

Number of TET – Resistances for given meanMY/cow

TET – Resistances
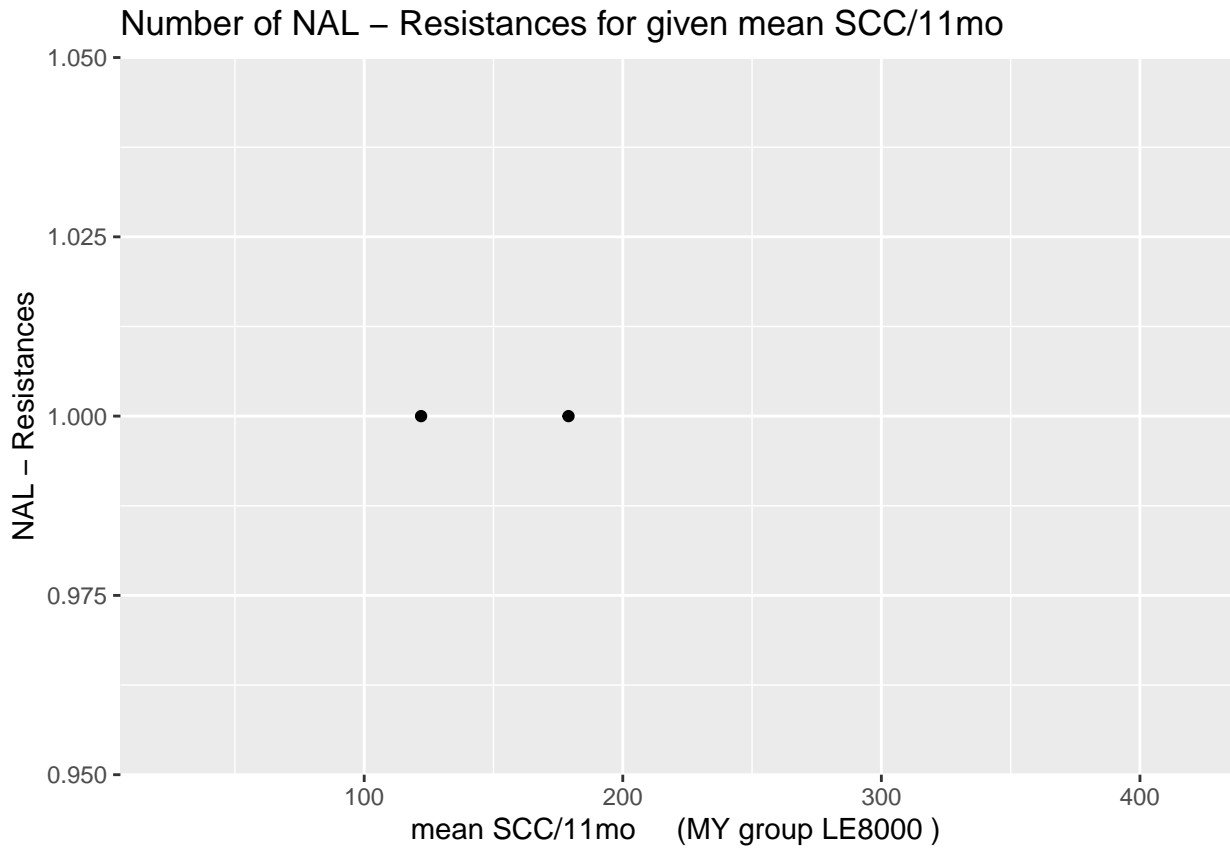
meanMY/cow   (MY group LE8000)

```
## [1] ""
## Saving 6.5 x 4.5 in image
```

Number of TMP – Resistances for given meanMY/cow


```
## [1] ""
```
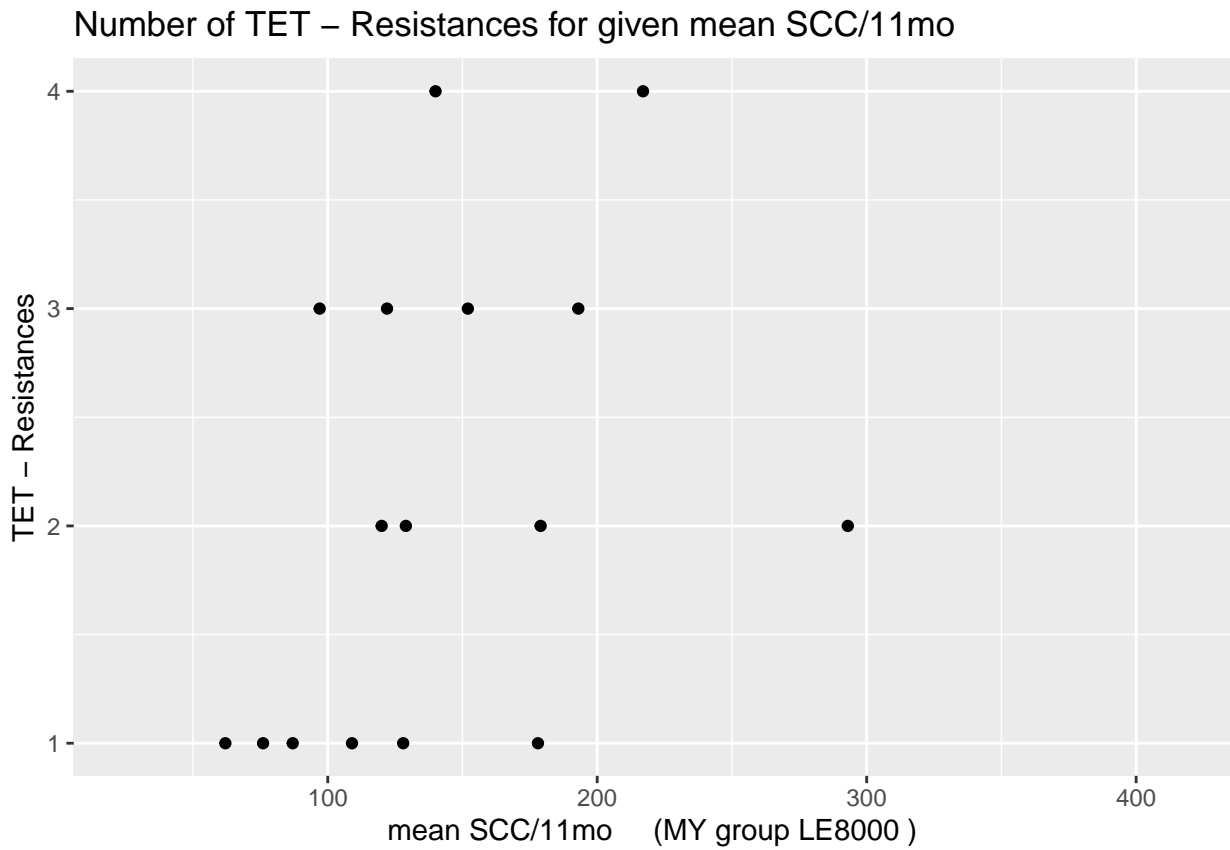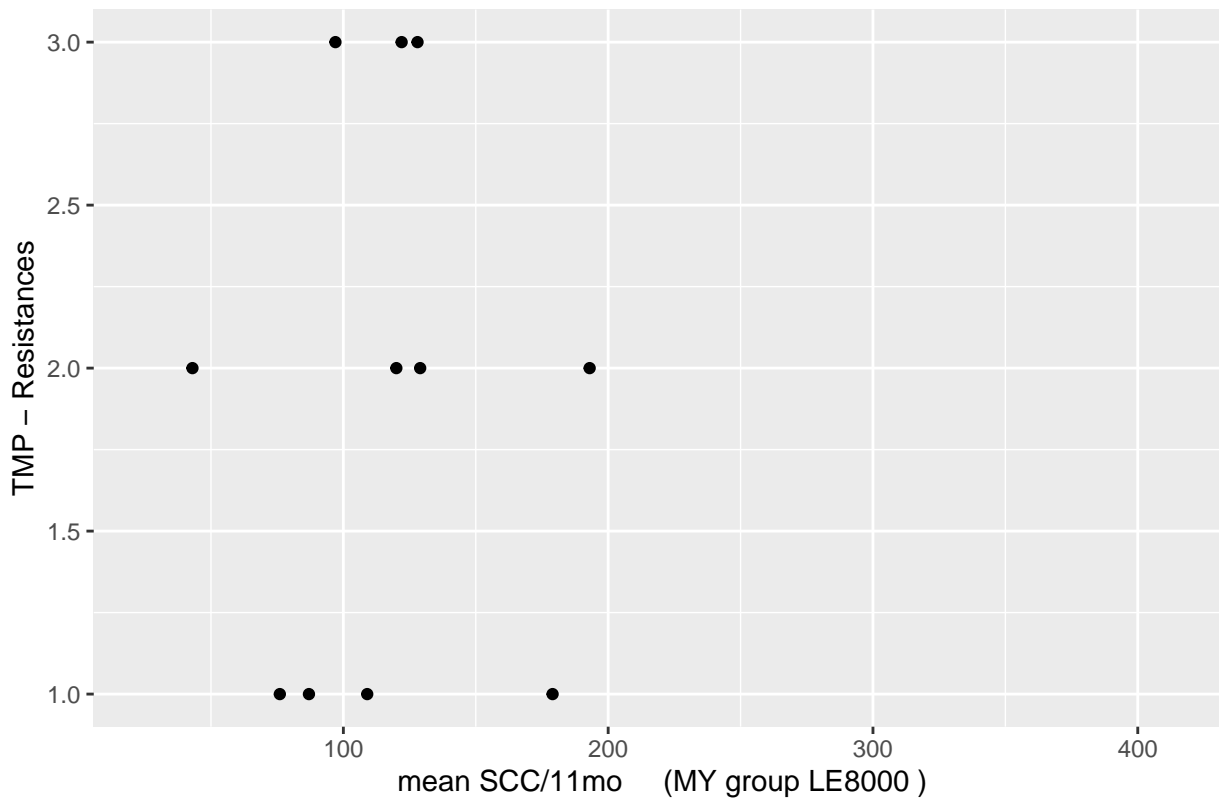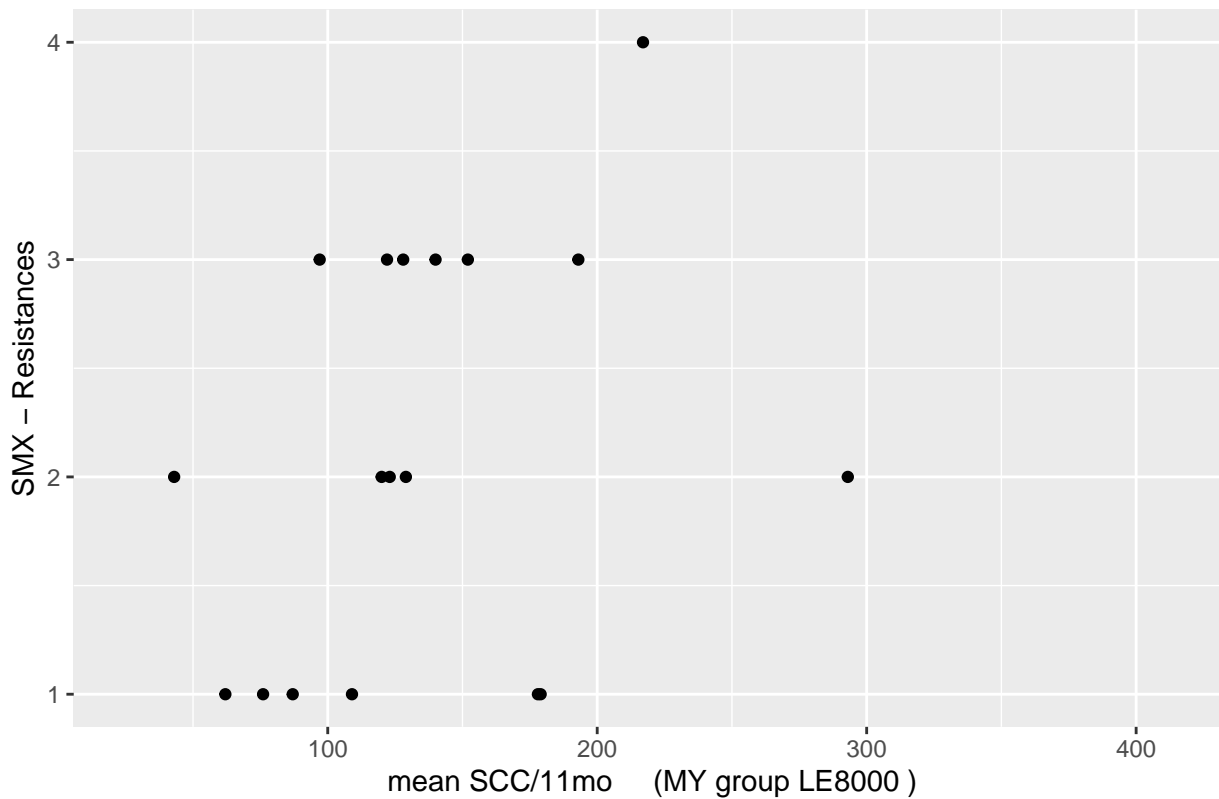
```
## Saving 6.5 x 4.5 in image
```

Number of SMX – Resistances for given meanMY/cow


```
## [1] ""
## [1] "----------------------------------------------------------"
```

```
## Saving 6.5 x 4.5 in image
```

Number of AMP – Resistances for given mean SCC/11mo


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

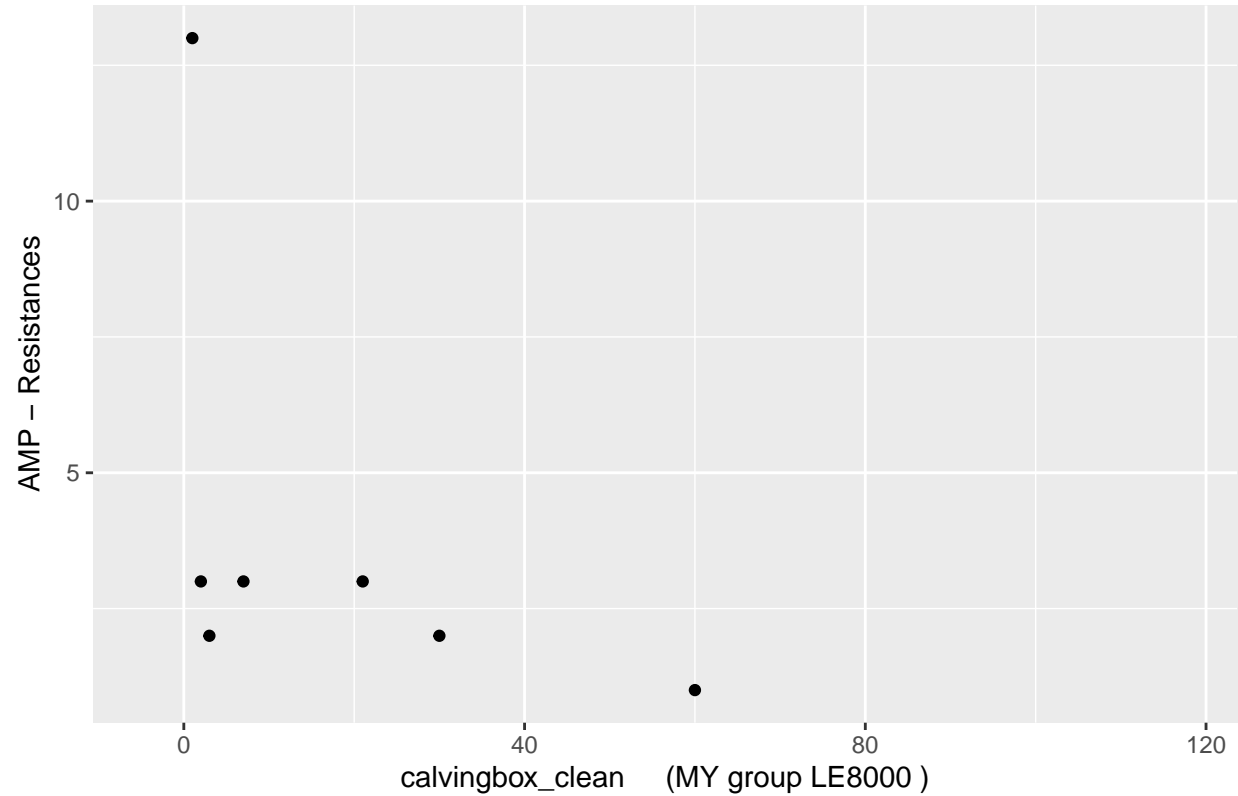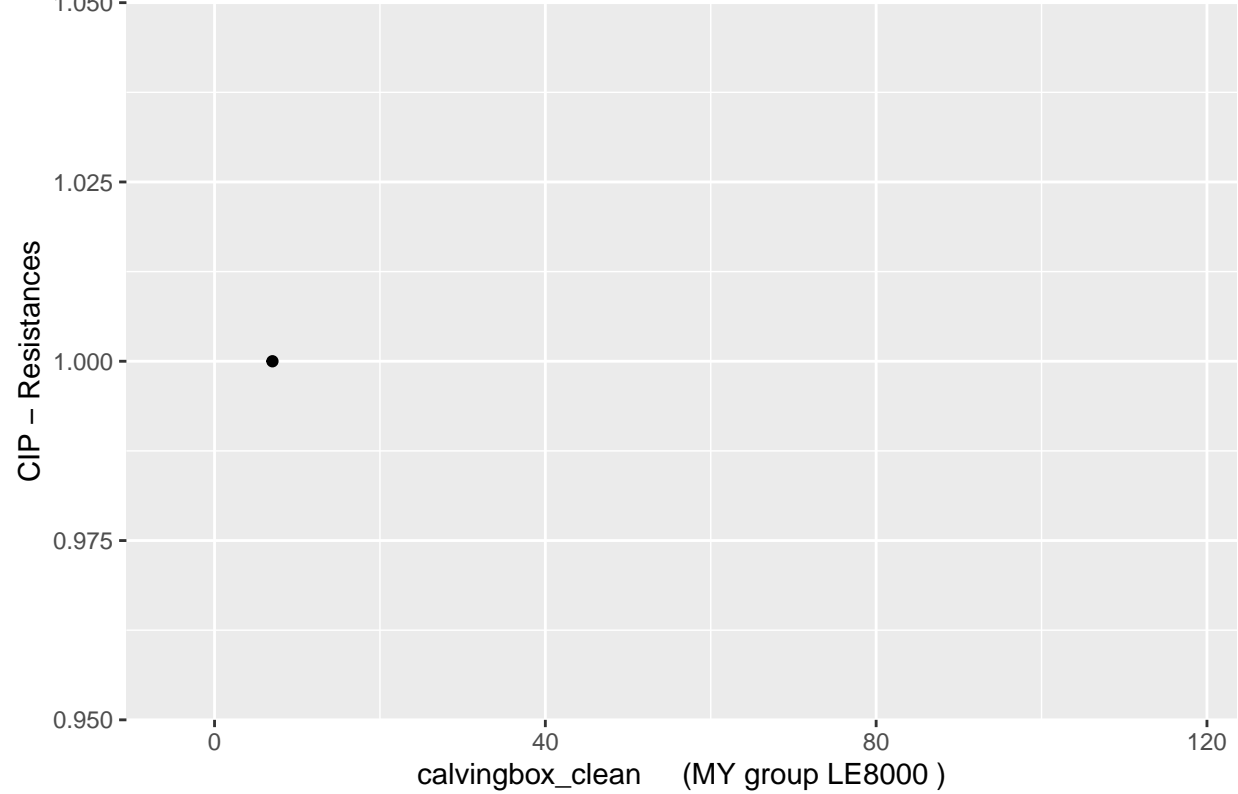## Number of CIP – Resistances for given mean SCC/11mo


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of AZI – Resistances for given mean SCC/11mo

mean SCC/11mo   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of GEN – Resistances for given mean SCC/11mo

mean SCC/11mo   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given mean SCC/11mo


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given mean SCC/11mo


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of NAL – Resistances for given mean SCC/11mo

[1] ""

Saving 6.5 x 4.5 in image

Number of TET – Resistances for given mean SCC/11mo
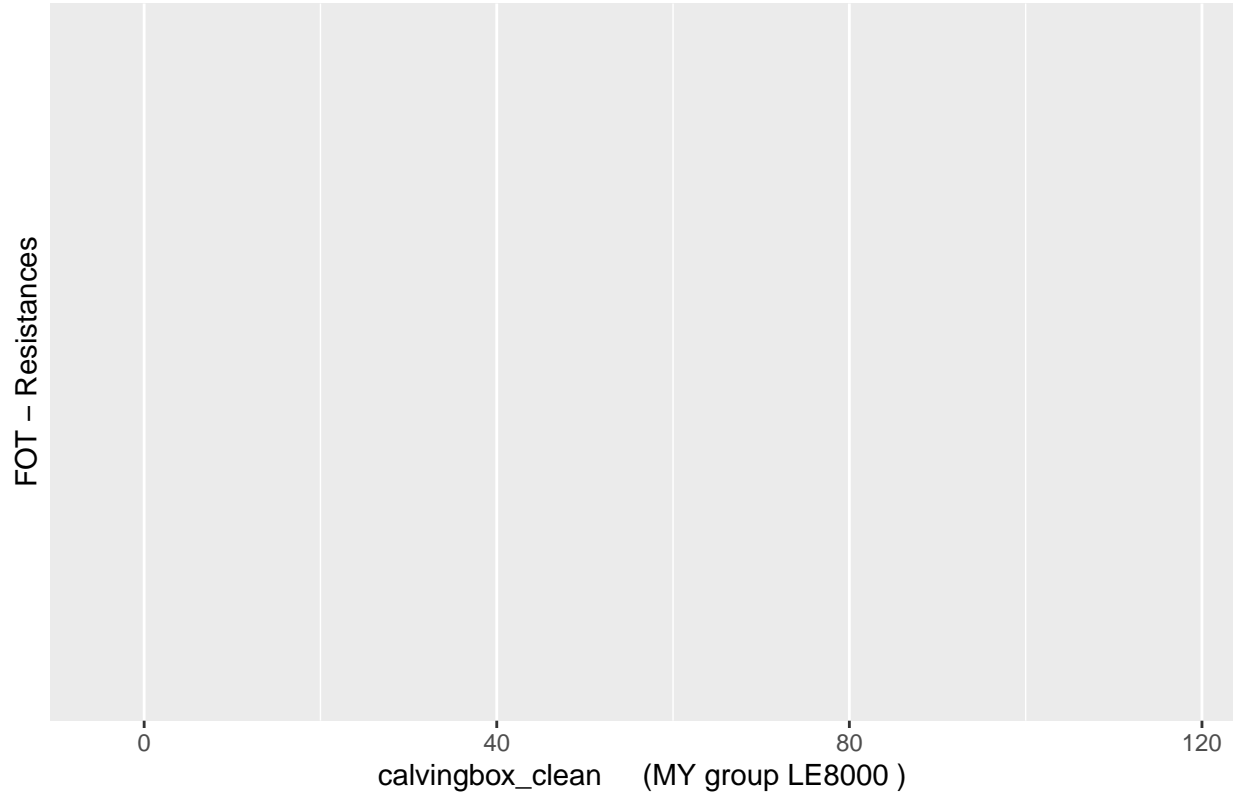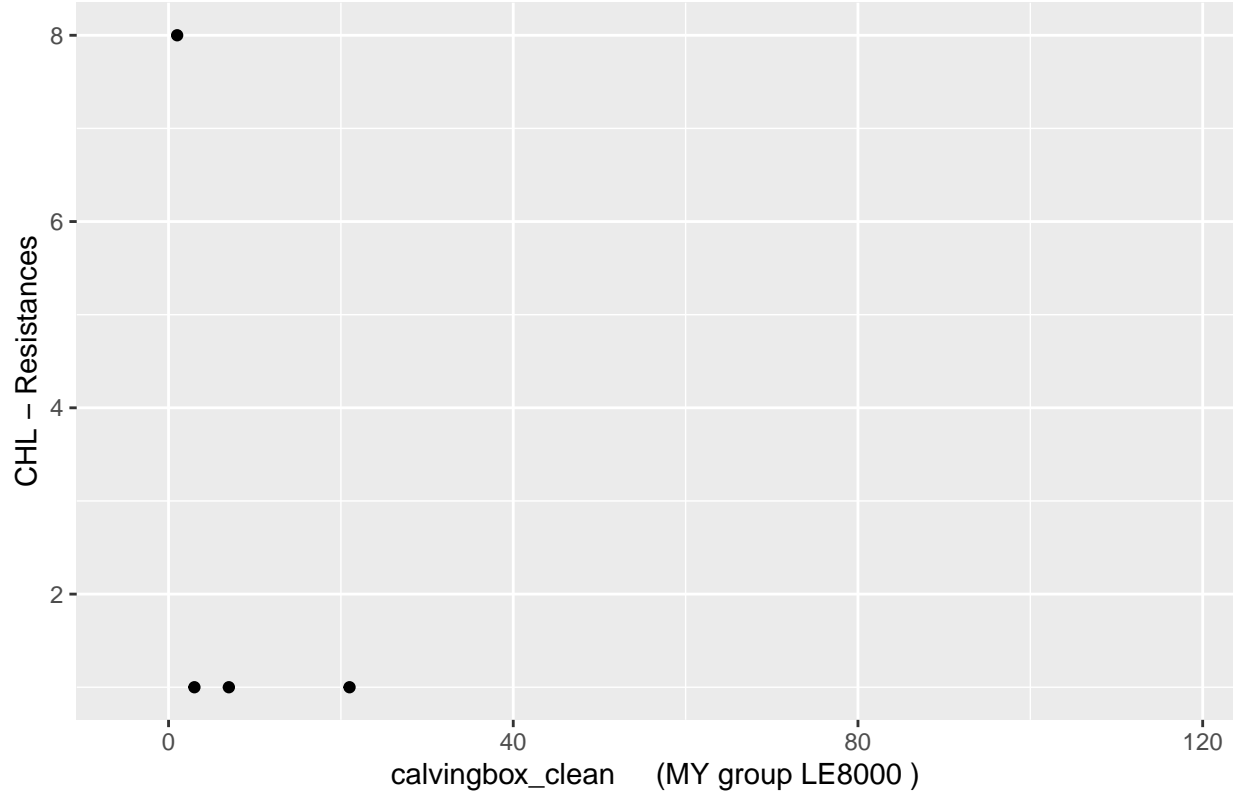

[1] ""

Saving 6.5 x 4.5 in image

Number of TMP – Resistances for given mean SCC/11mo


```
## [1] ""
## Saving 6.5 x 4.5 in image
```

Number of SMX – Resistances for given mean SCC/11mo


```
## [1] ""
## [1] "------------------------------------------------------------"
## Saving 6.5 x 4.5 in image
```

Number of AMP – Resistances for given calvingbox_clean


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```
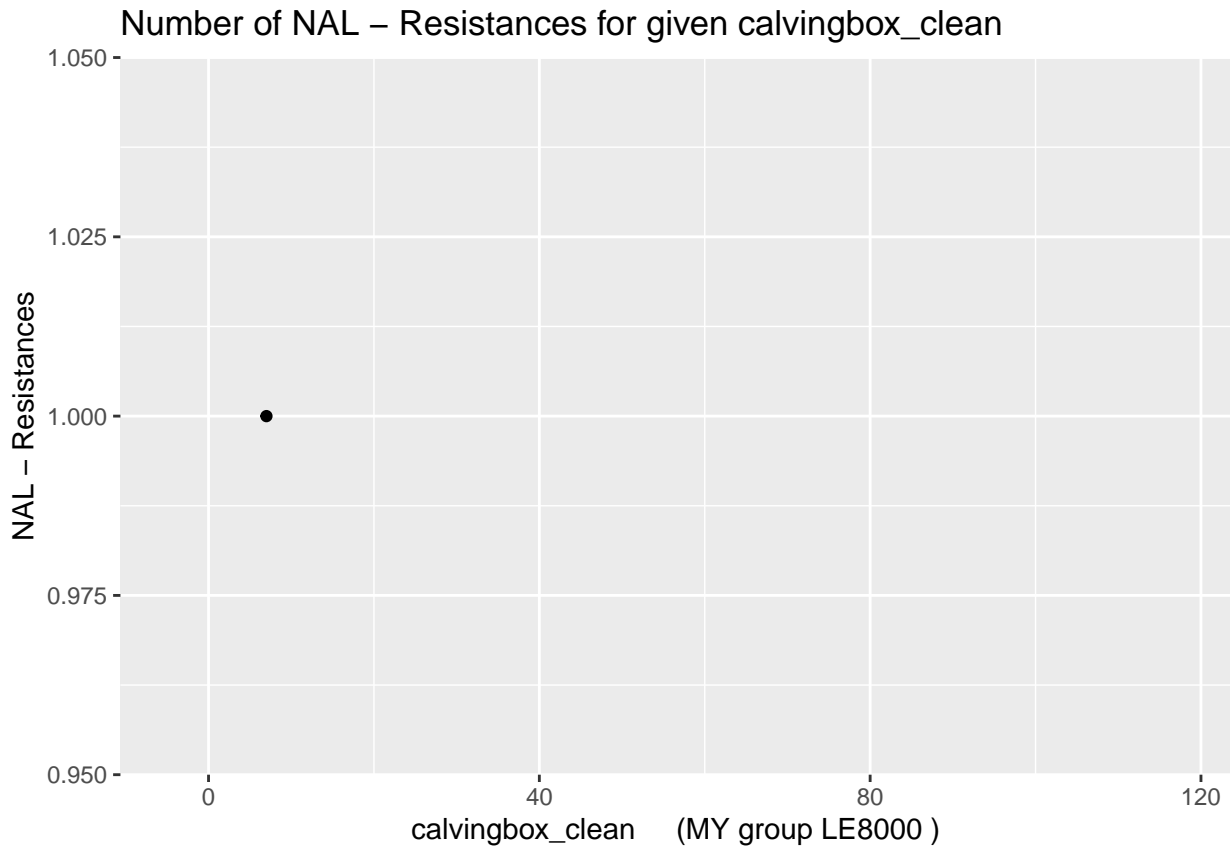
Number of CIP – Resistances for given calvingbox_clean


```
## [1] ""
```
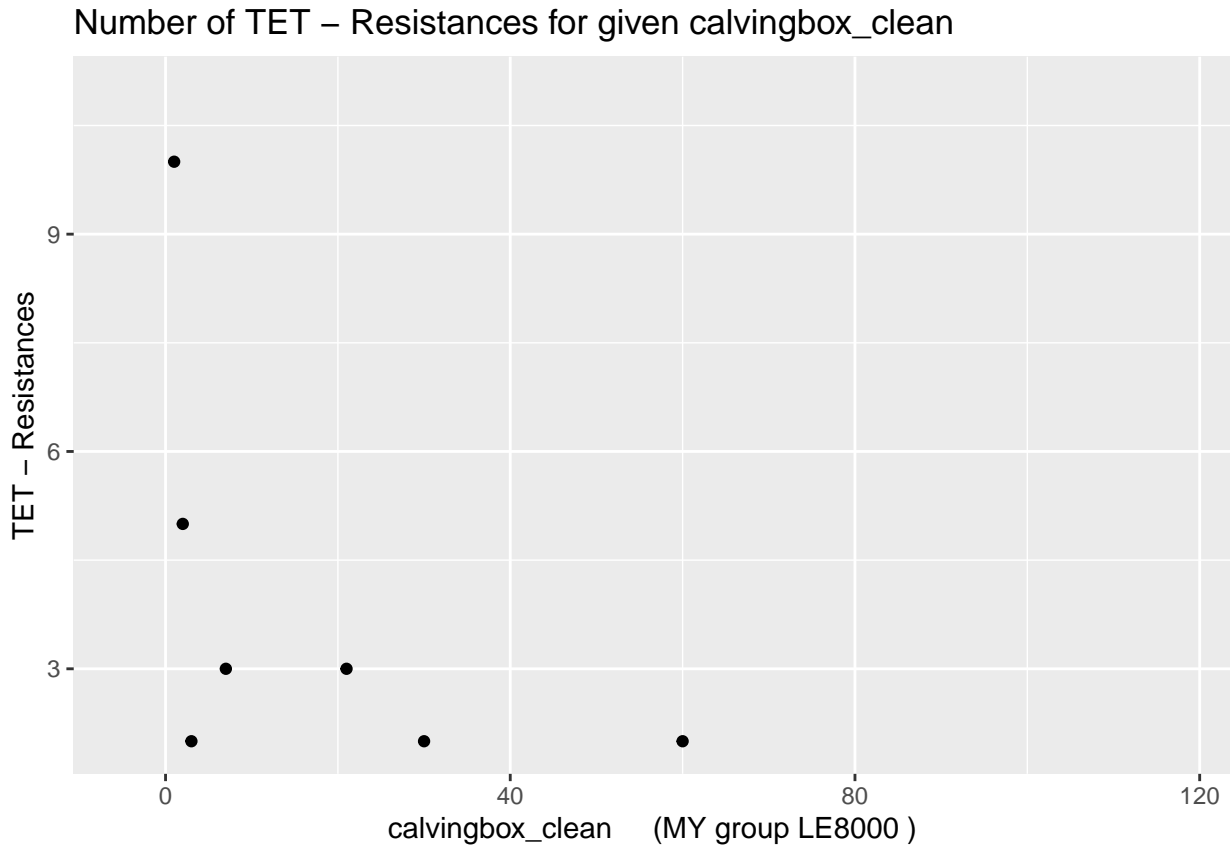
```
## Saving 6.5 x 4.5 in image
```
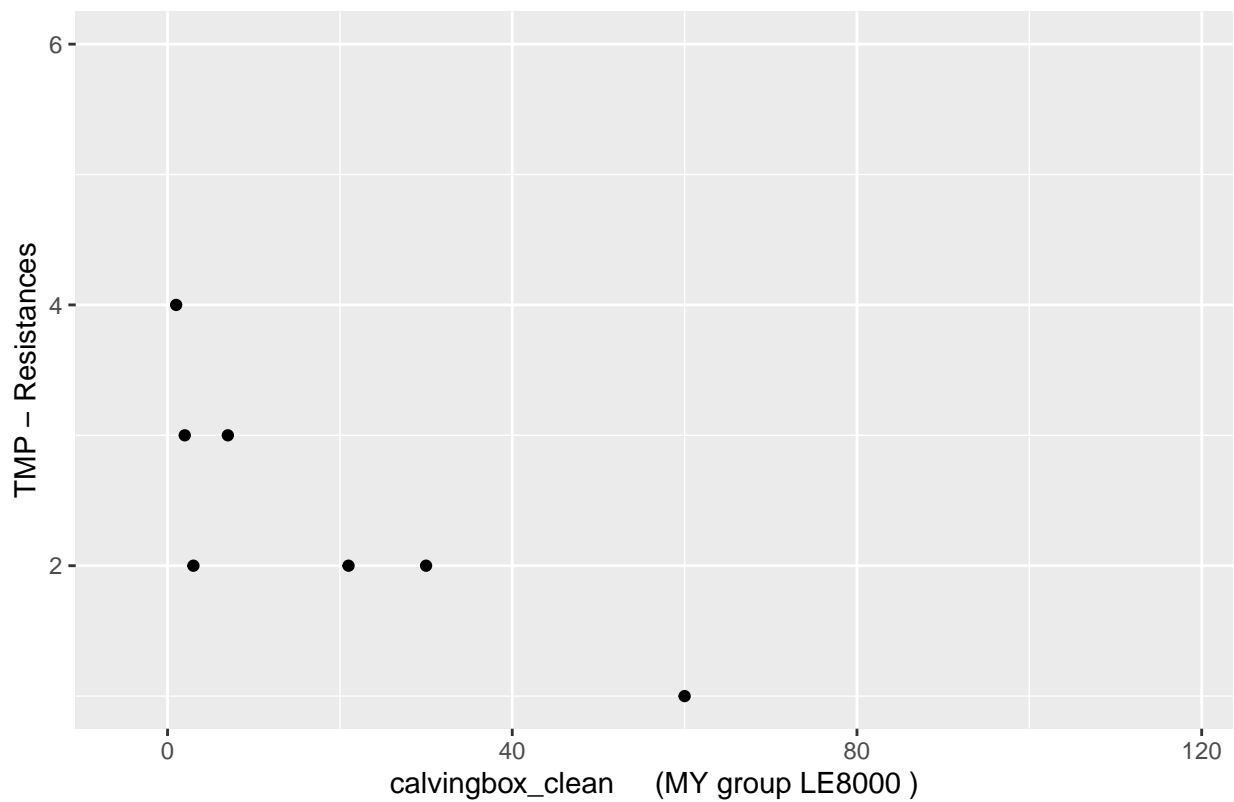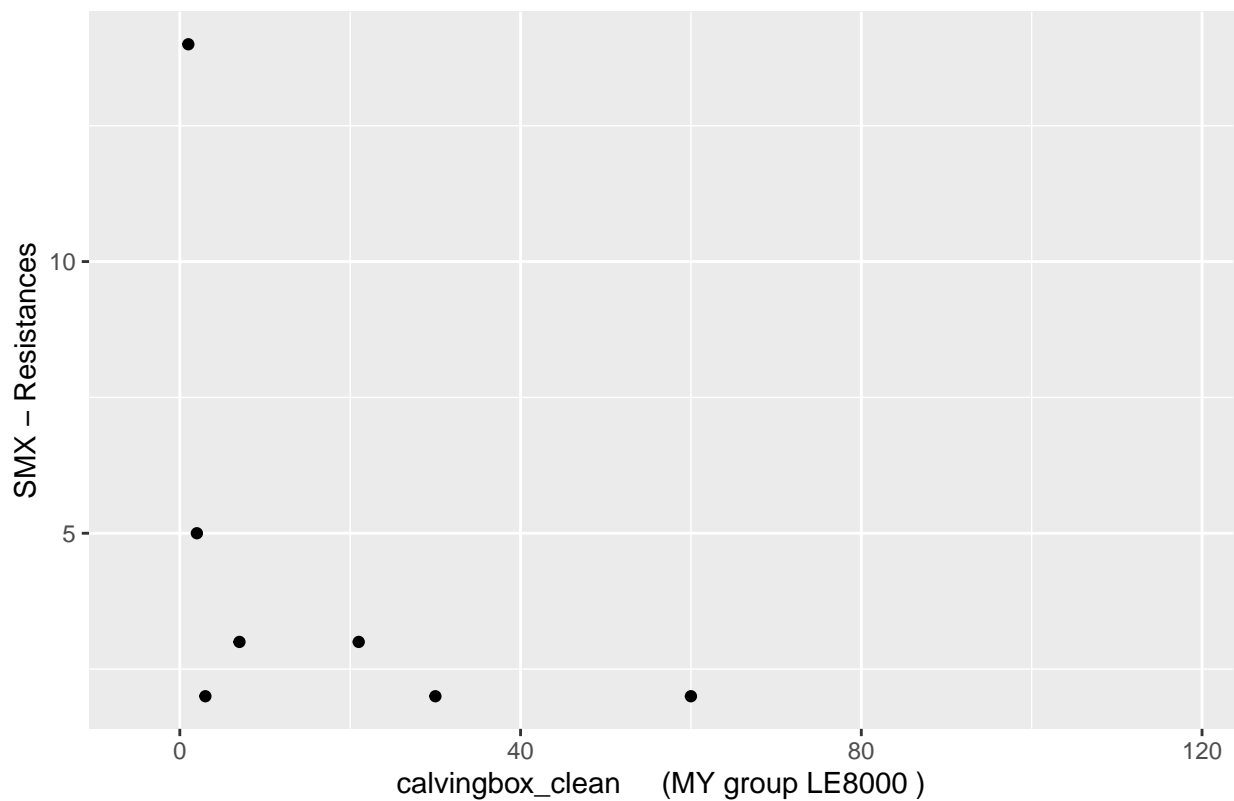
Number of AZI – Resistances for given calvingbox_clean


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of GEN – Resistances for given calvingbox_clean


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```
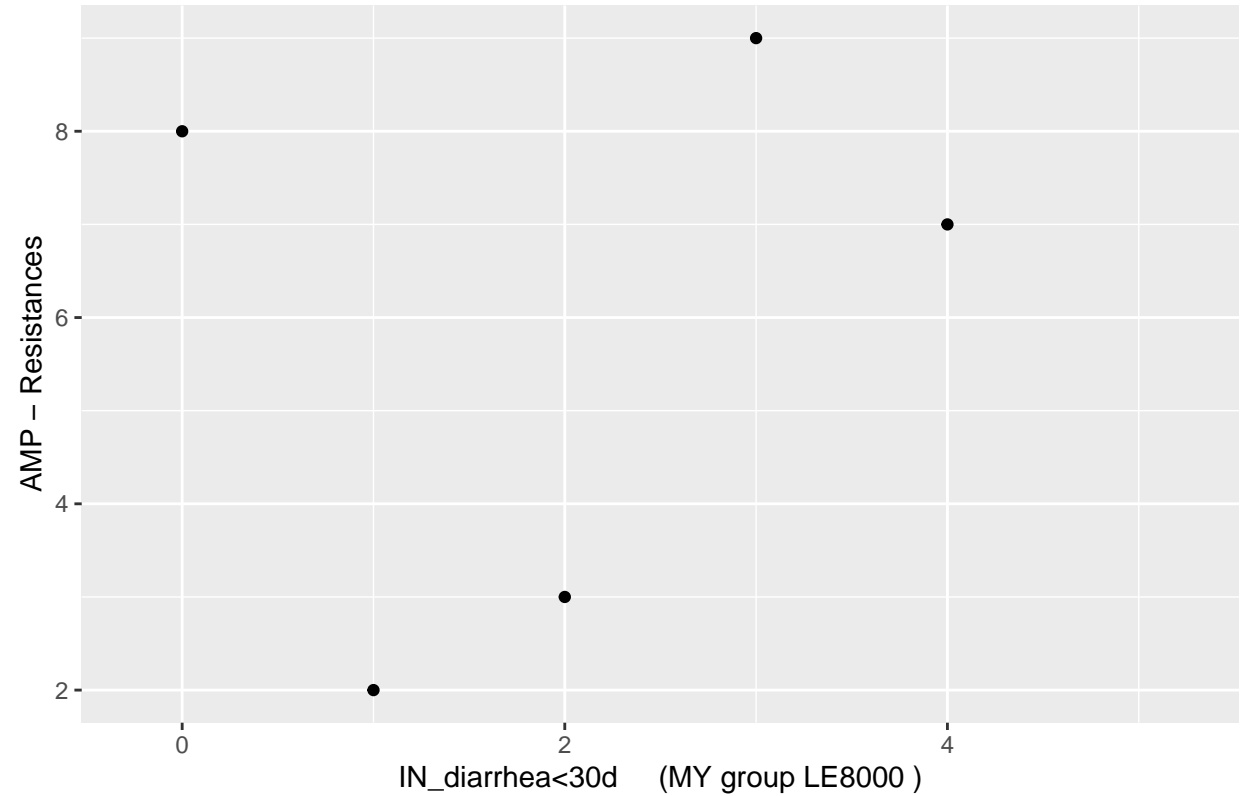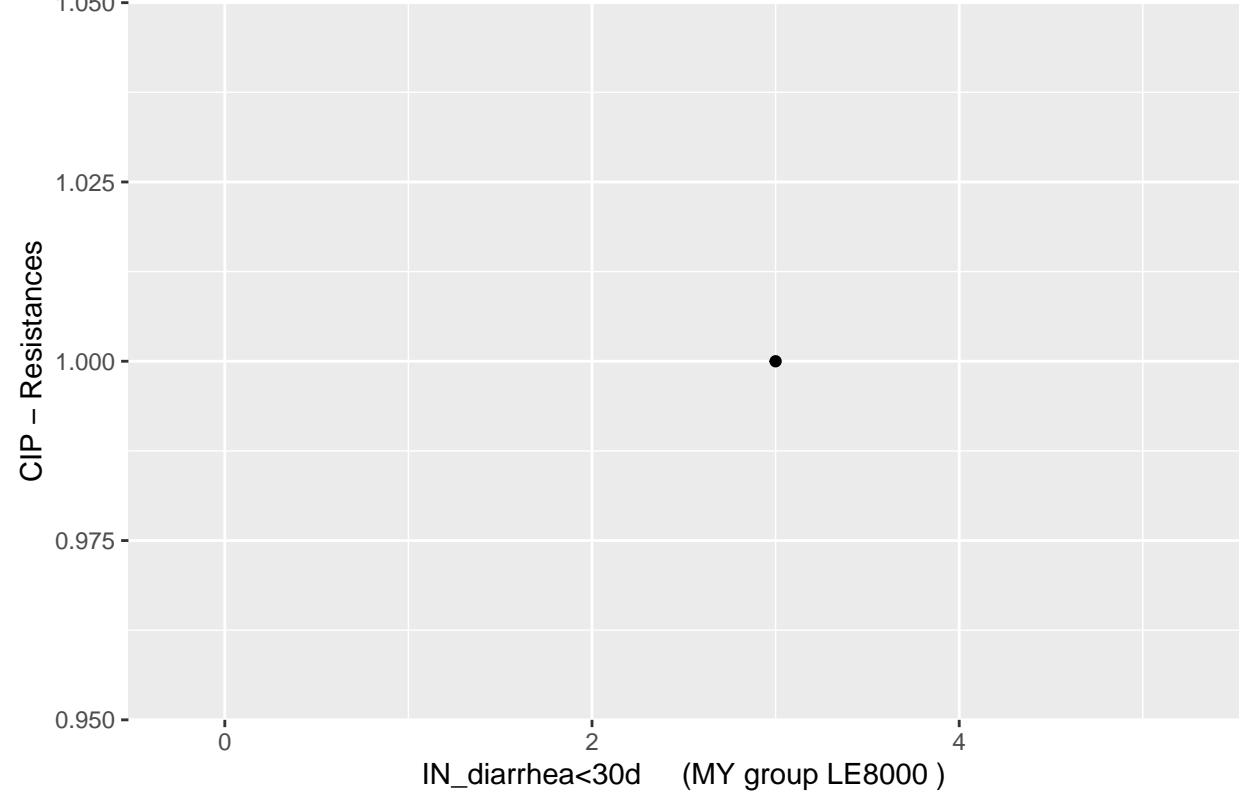
Number of FOT – Resistances for given calvingbox_clean

FOT – Resistances

0   40   80   120

calvingbox_clean   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given calvingbox_clean

CHL – Resistances

0   40   80   120

calvingbox_clean   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

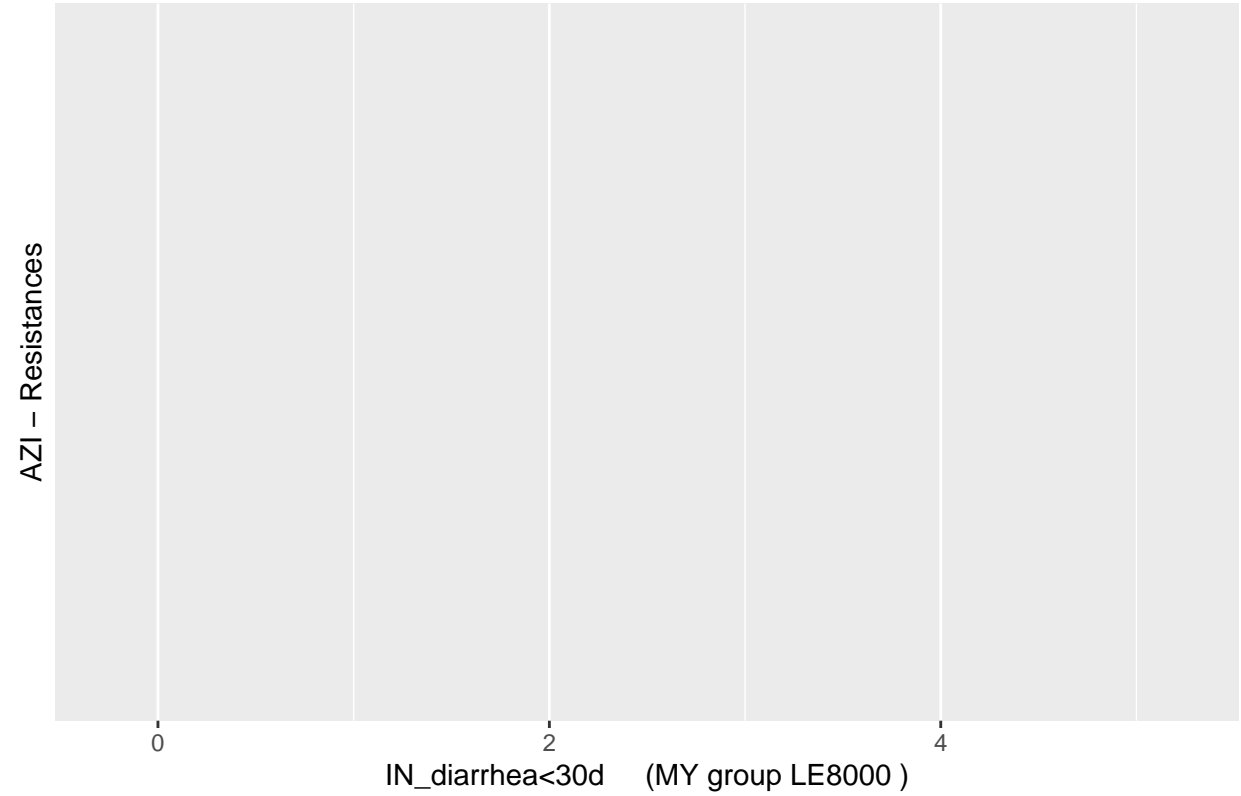## Number of NAL – Resistances for given calvingbox_clean

[1] ""

Saving 6.5 x 4.5 in image

Number of TET – Resistances for given calvingbox_clean

[1] ""

Saving 6.5 x 4.5 in image

Number of TMP – Resistances for given calvingbox_clean


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```
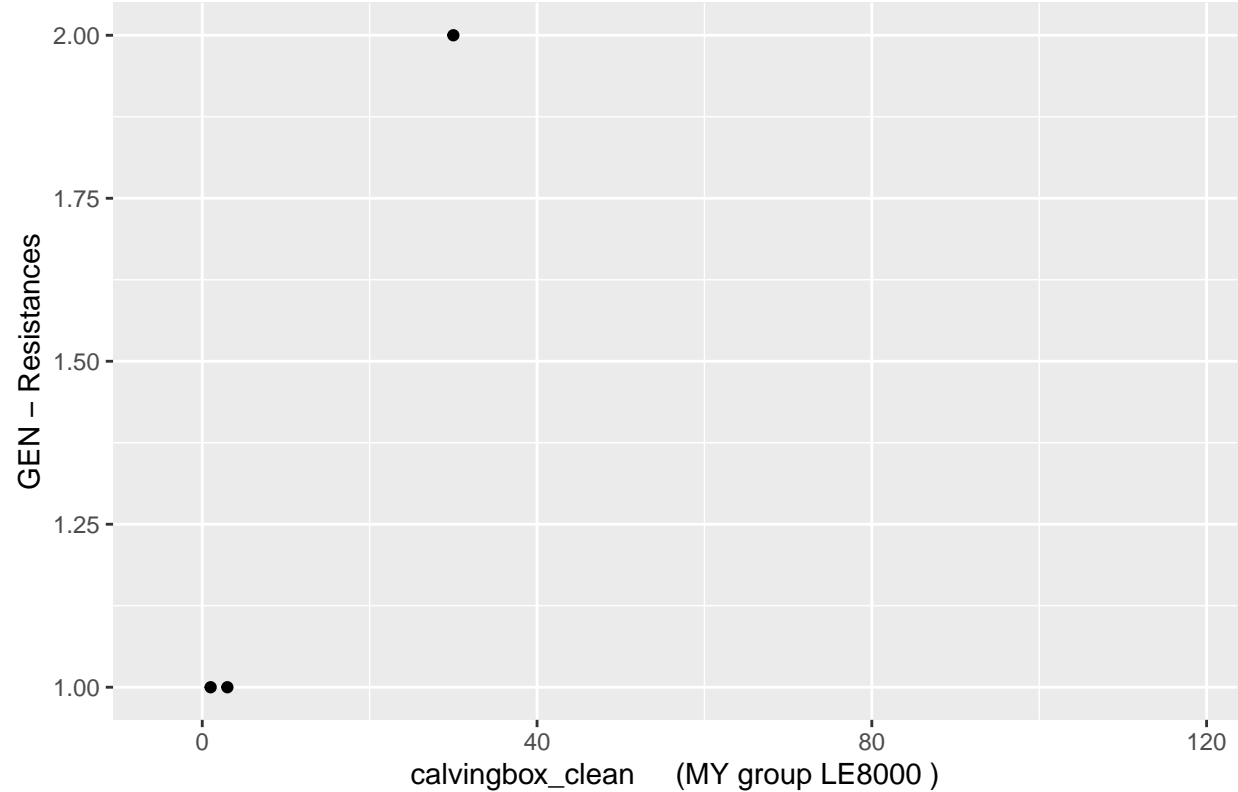
Number of SMX – Resistances for given calvingbox_clean


```
## [1] ""
## [1] "----------------------------------------------------------"
```

```
## Saving 6.5 x 4.5 in image
```

Number of AMP – Resistances for given IN_diarrhea<30d

[1] ""

Saving 6.5 x 4.5 in image
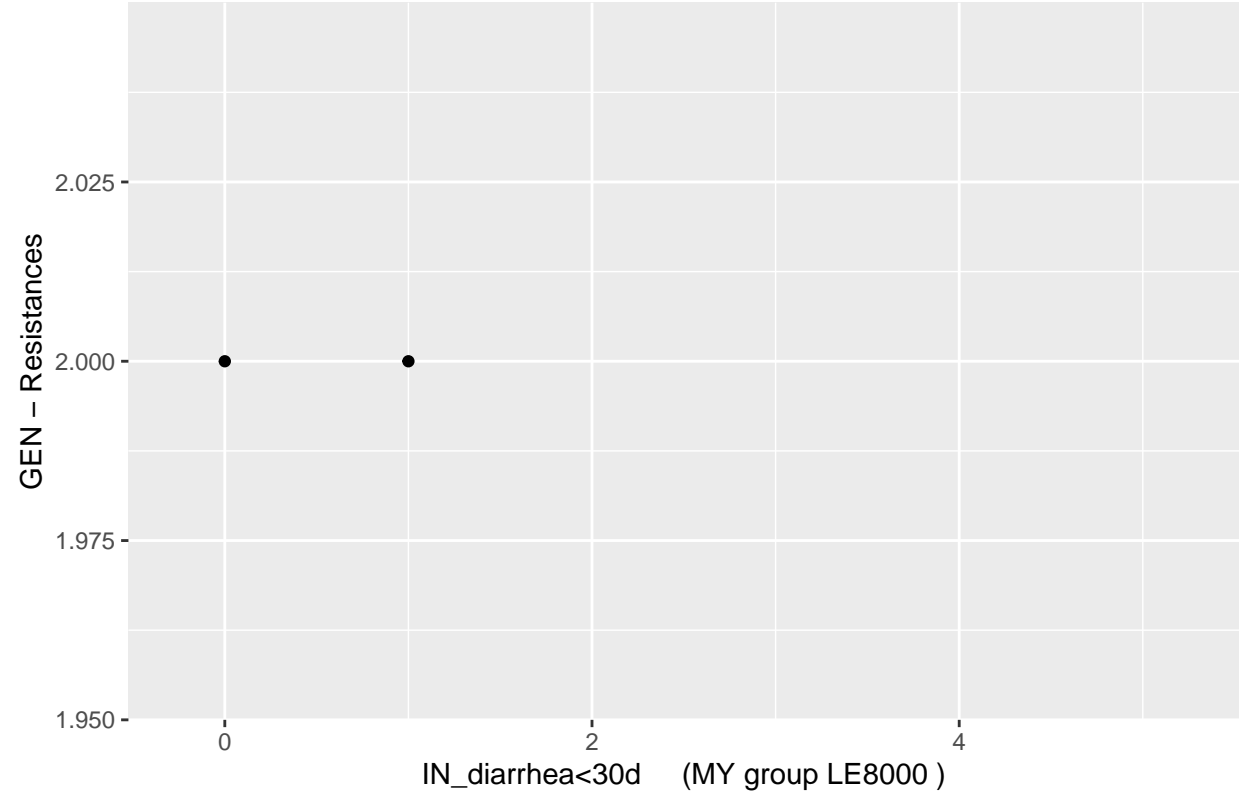
Number of CIP – Resistances for given IN_diarrhea<30d

[1] ""

Saving 6.5 x 4.5 in image
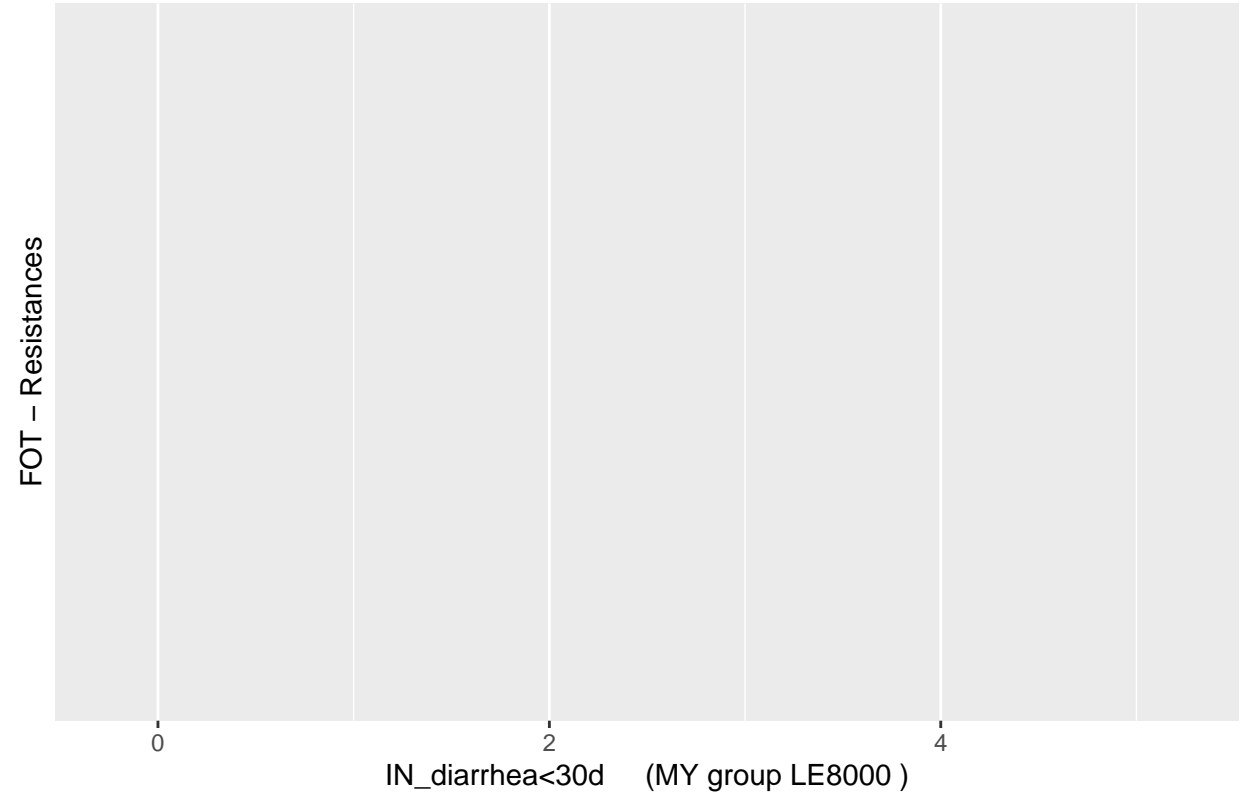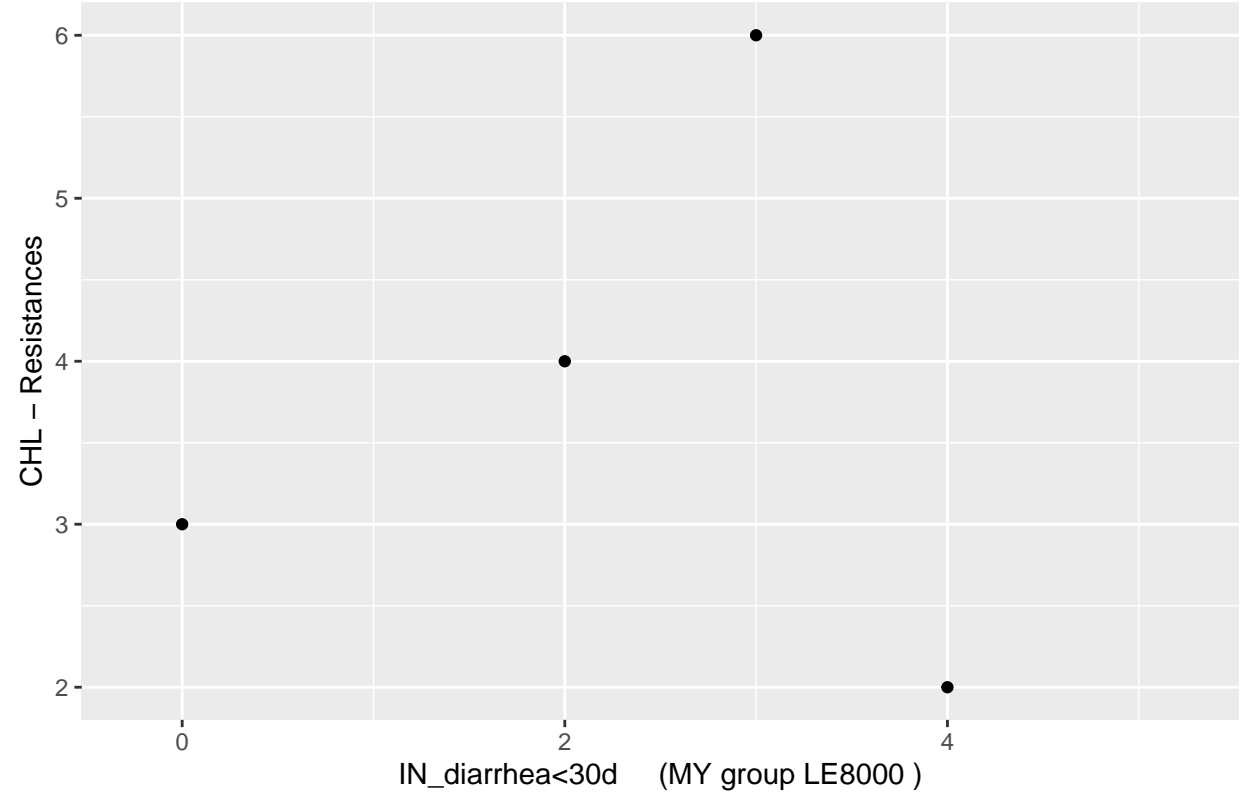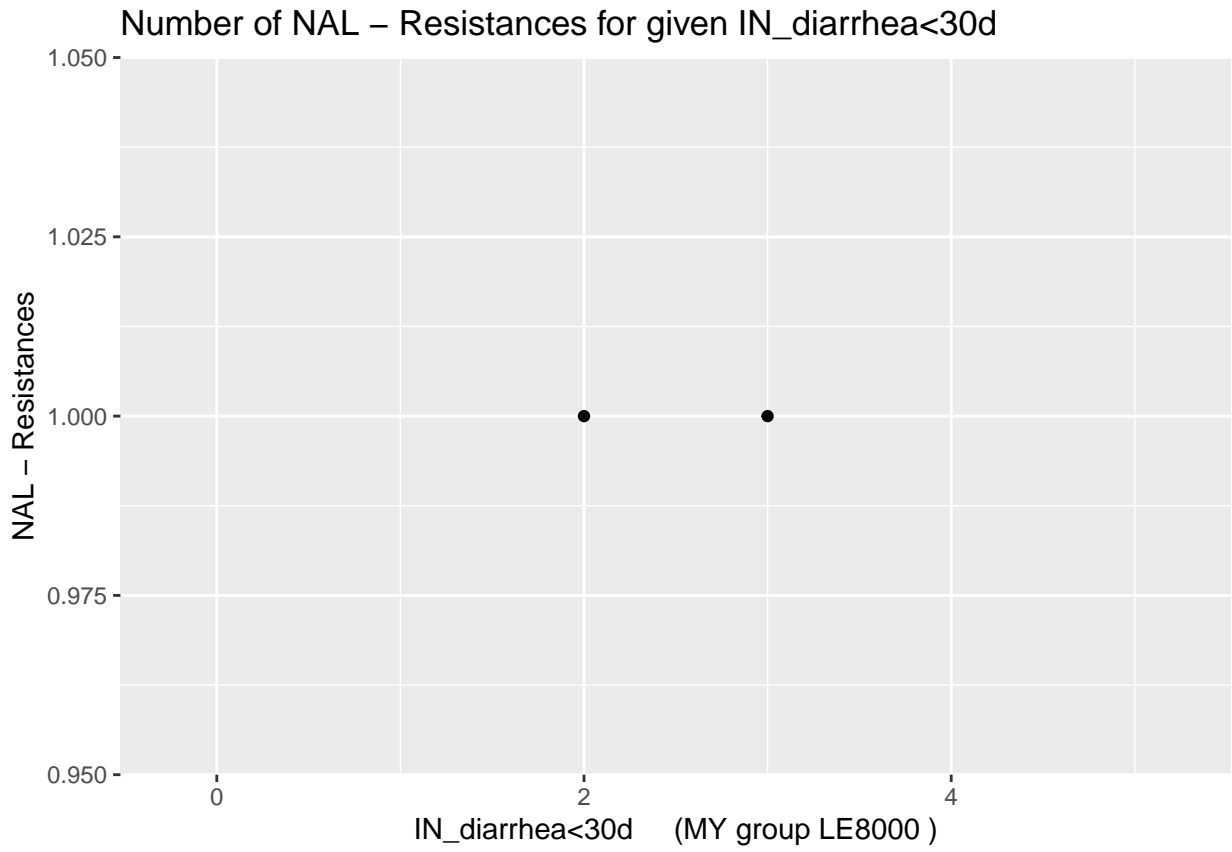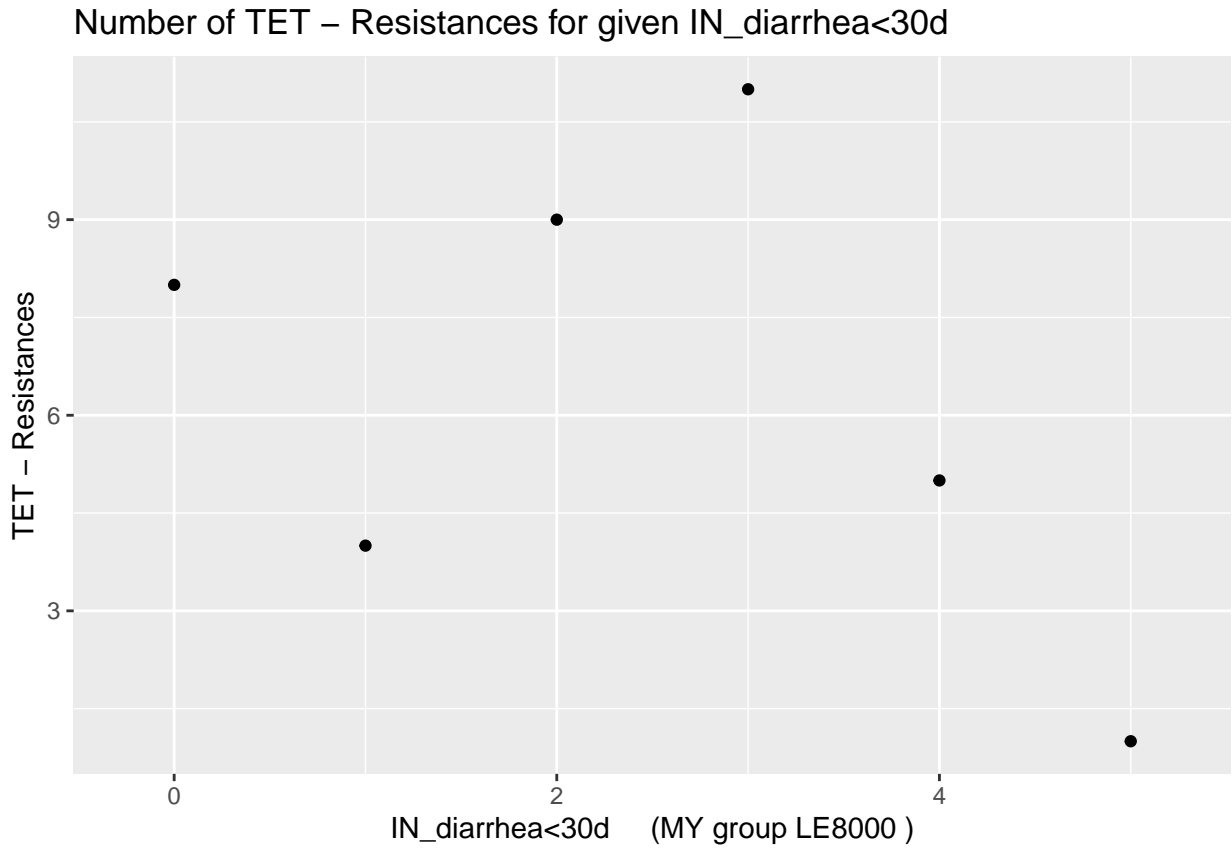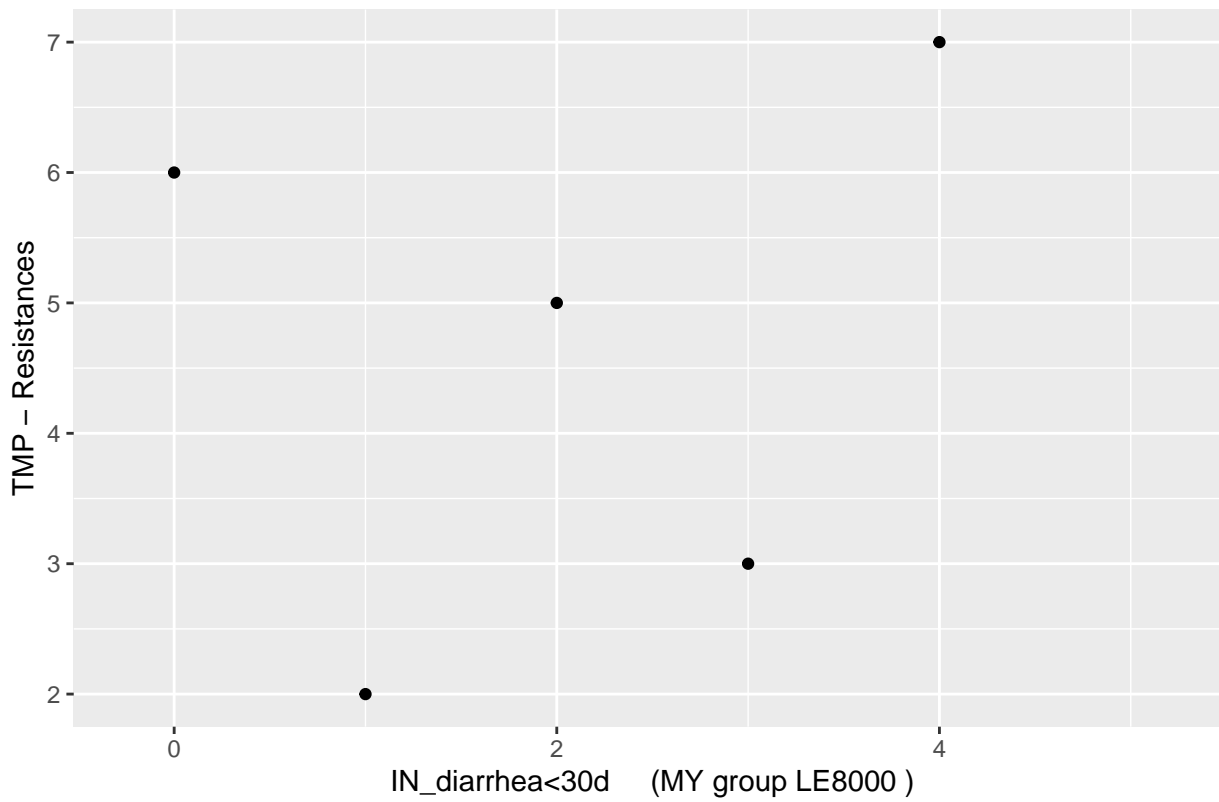
Number of AZI – Resistances for given IN_diarrhea<30d

AZI – Resistances

IN_diarrhea<30d   (MY group LE8000)

0   2   4

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of GEN – Resistances for given IN_diarrhea<30d

GEN – Resistances

2.025 –

2.000 –

1.975 –

1.950 –

0   2   4

IN_diarrhea<30d   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given IN_diarrhea<30d

FOT – Resistances

0 2 4

IN_diarrhea<30d   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given IN_diarrhea<30d

CHL – Resistances

6 –
5 –
4 –
3 –
2 –

0 2 4

IN_diarrhea<30d   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of NAL – Resistances for given IN_diarrhea<30d

NAL – Resistances

1.050 –

1.025 –

1.000 –

0.975 –

0.950 –

0   2   4

IN_diarrhea<30d   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of TET – Resistances for given IN_diarrhea<30d

TET – Resistances

9 –

6 –

3 –

0   2   4

IN_diarrhea<30d   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of TMP – Resistances for given IN_diarrhea<30d

IN_diarrhea<30d   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of SMX – Resistances for given IN_diarrhea<30d

IN_diarrhea<30d   (MY group LE8000)

```
## [1] ""
## [1] "------------------------------------------------------------"
```

Ungeschichtet: Resistenzen scheinen tendenziell zu

- steigen mit MY.group

- fallen mit SCC.group, CBC.group
- ? mit DIA.group

Eine Regression sagt mehr.

Binäre und Nominale Unabhängige Variablen

Anzahl Resistenzen

```r
# NA warnings interessieren nicht

# untersuchte binäre und nominale Variablen

### neue binäre oder nominale hier dazufügen : ###
bin_nom <- c("WM.group", "OLS.group","IAC.group",   "HSC.group")

for( group in bin_nom ){
  for( antib in c("AMP","CIP","AZI","GEN","FOT","CHL","NAL","TET","TMP","SMX") ){
    graphisch2(group,"for given",antib)
    print("")
  }
  print("----------------------------------------------------")
}
```

```
## Saving 6.5 x 4.5 in image
```
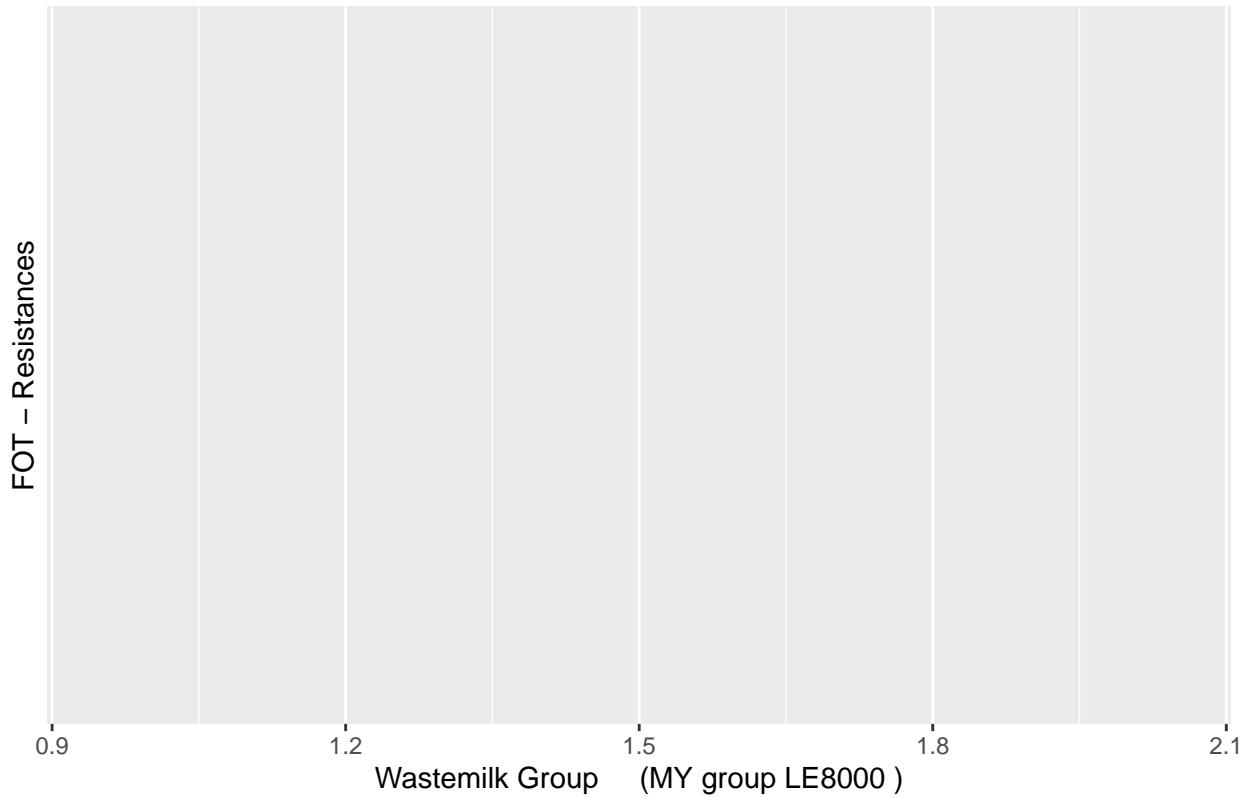

Number of AMP – Resistances for given Wastemilk Group

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

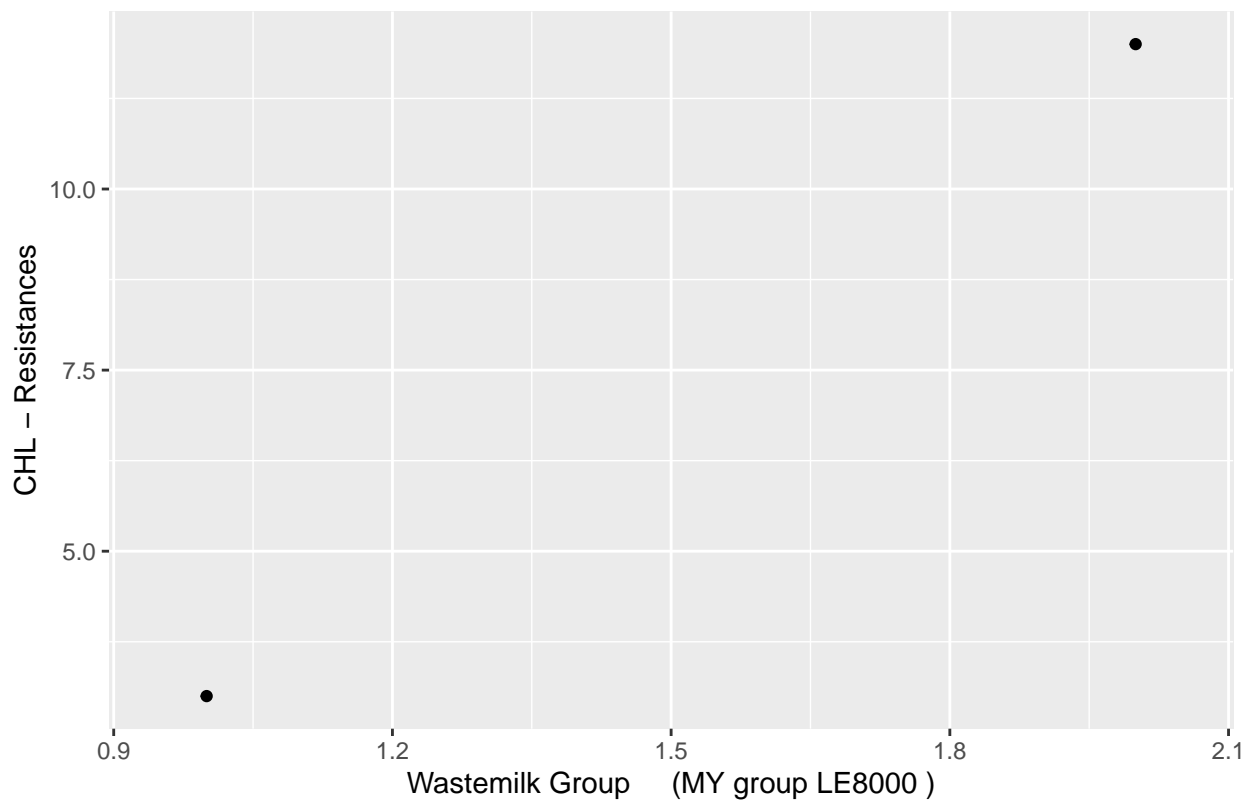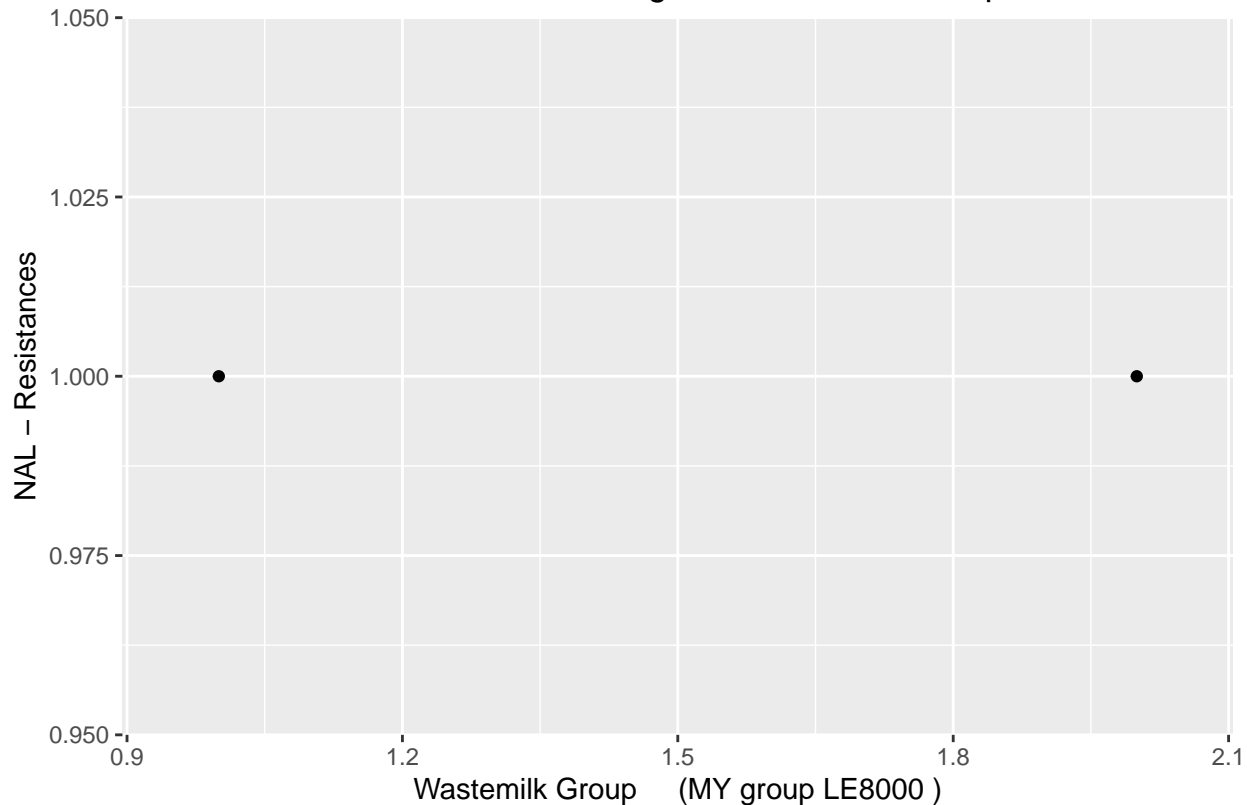## Number of CIP – Resistances for given Wastemilk Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of AZI – Resistances for given Wastemilk Group


```
## [1] ""
```
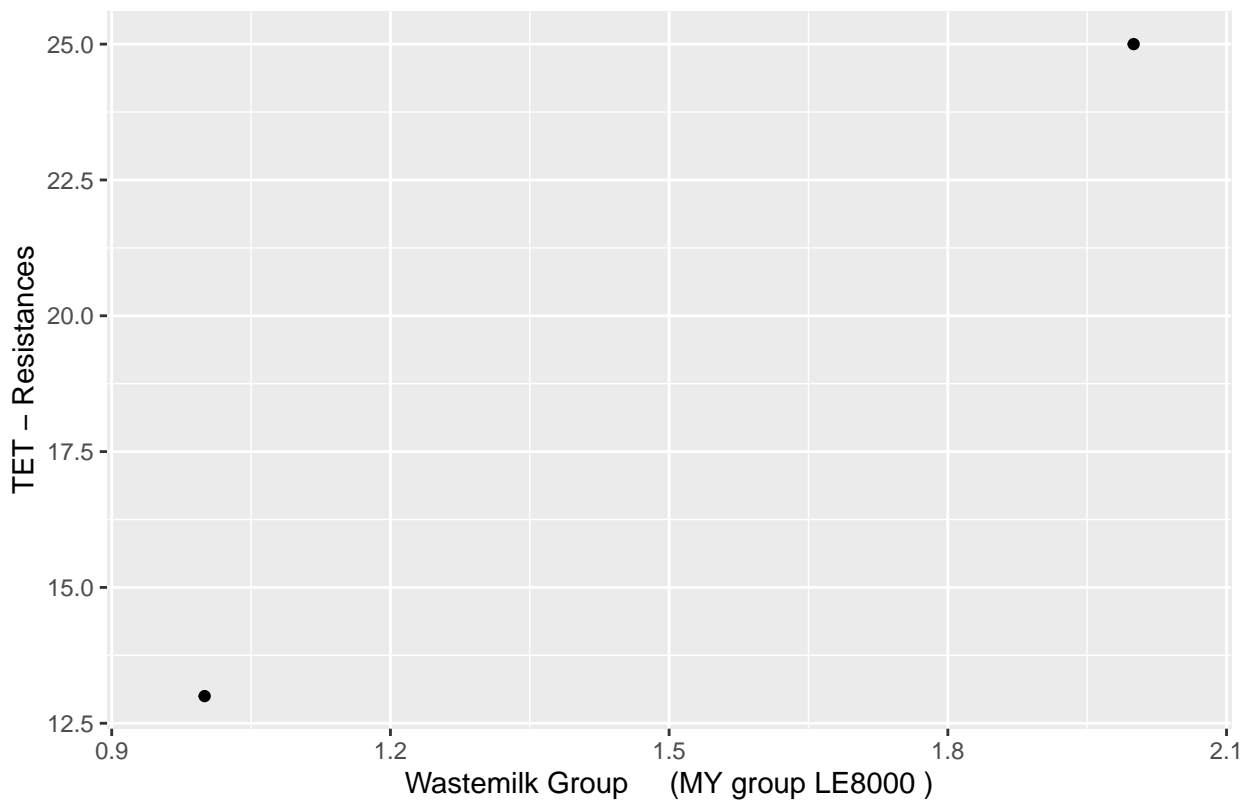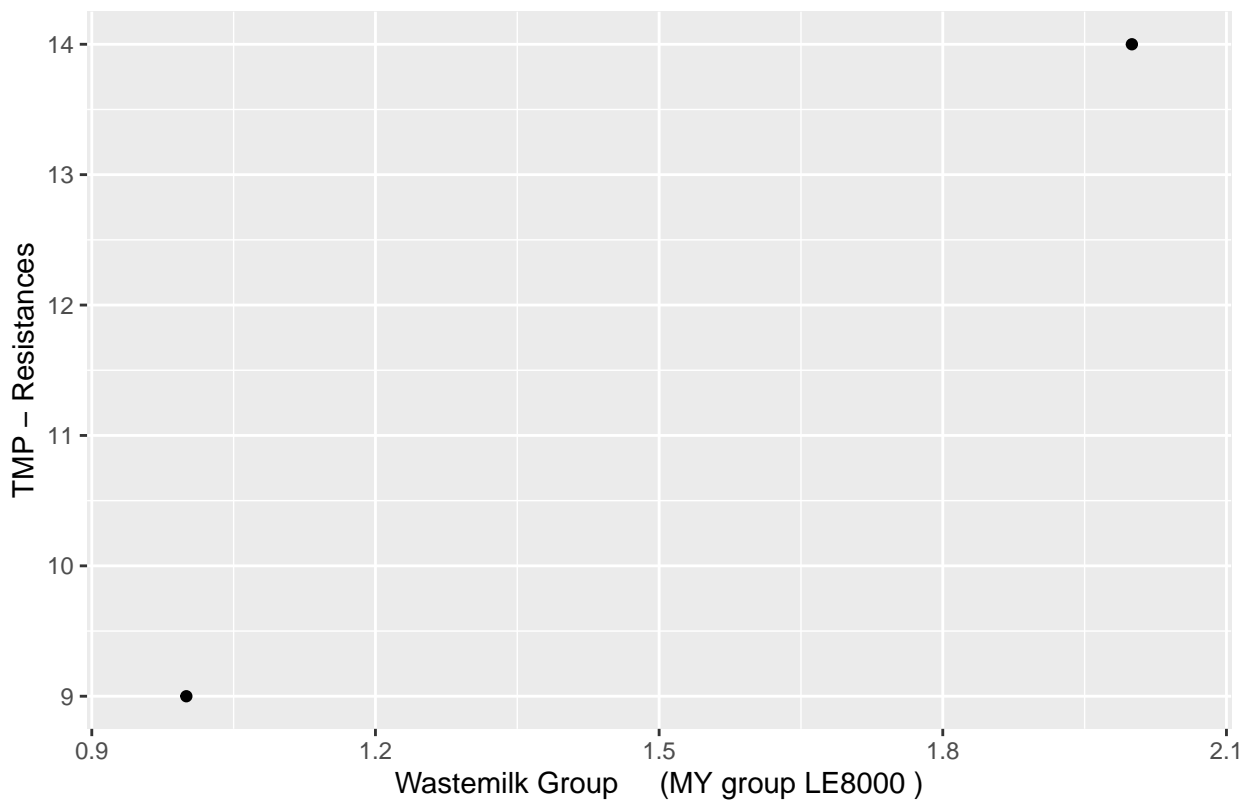
```
## Saving 6.5 x 4.5 in image
```

Number of GEN – Resistances for given Wastemilk Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given Wastemilk Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given Wastemilk Group
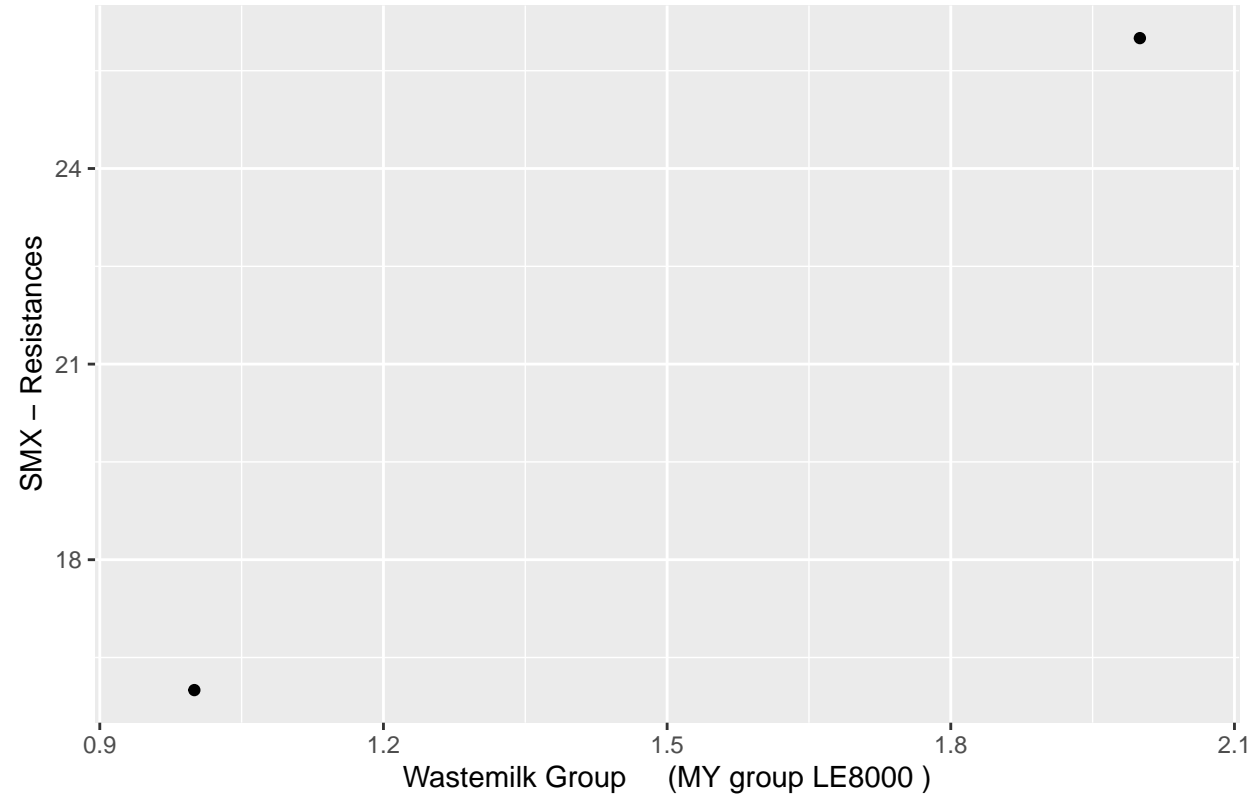


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of NAL – Resistances for given Wastemilk Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of TET – Resistances for given Wastemilk Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of TMP – Resistances for given Wastemilk Group
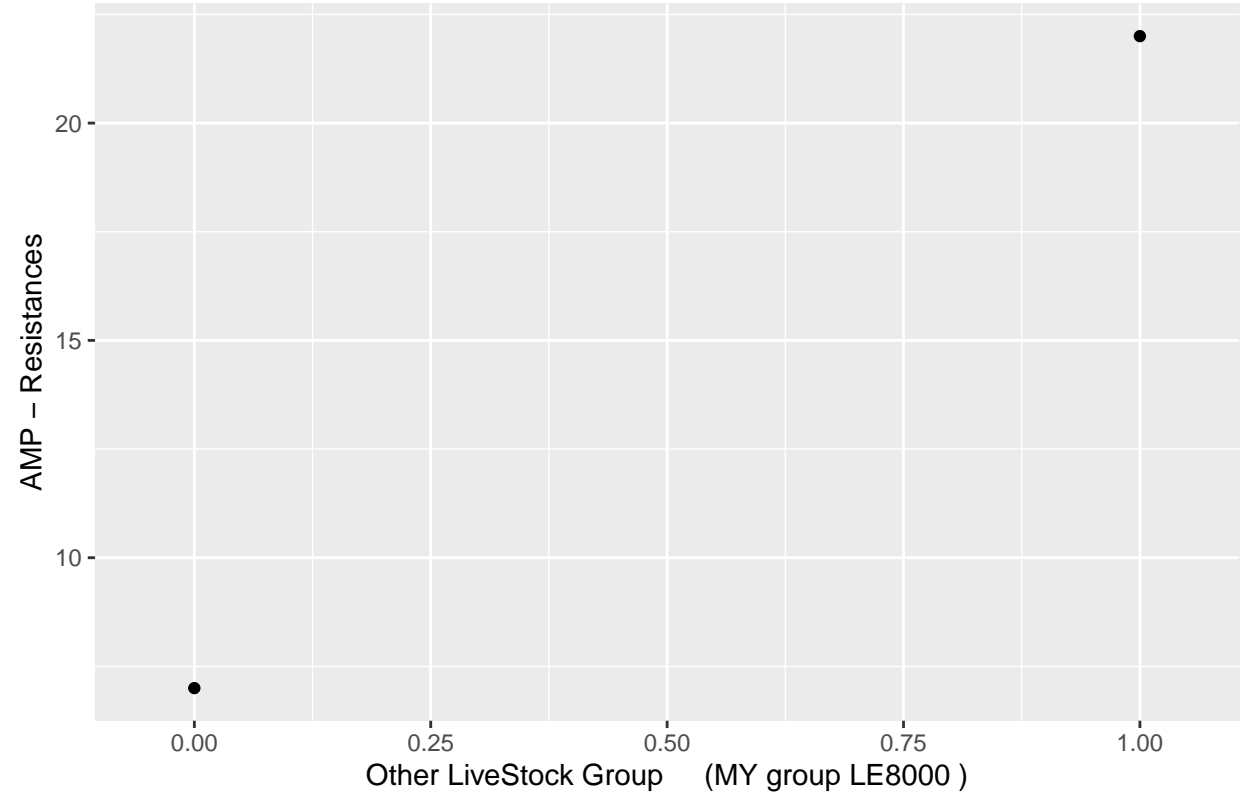


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

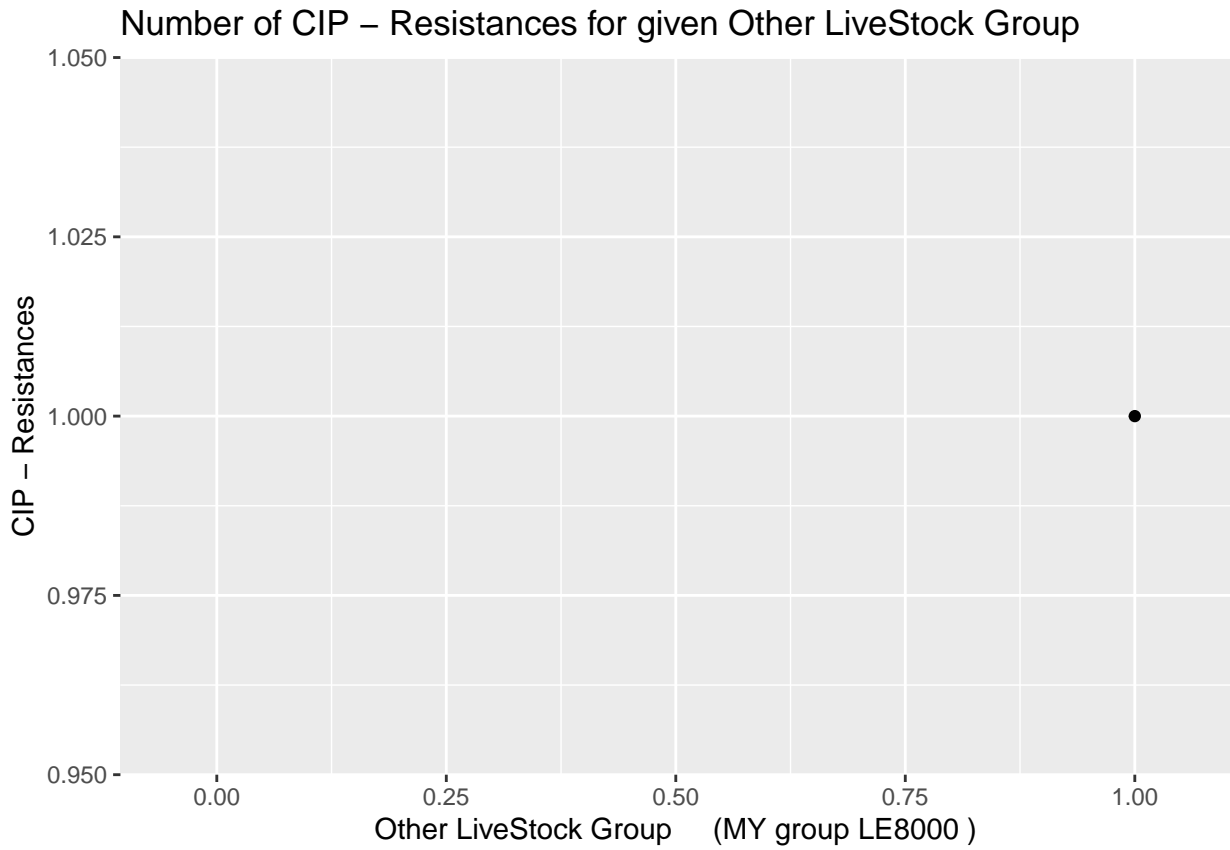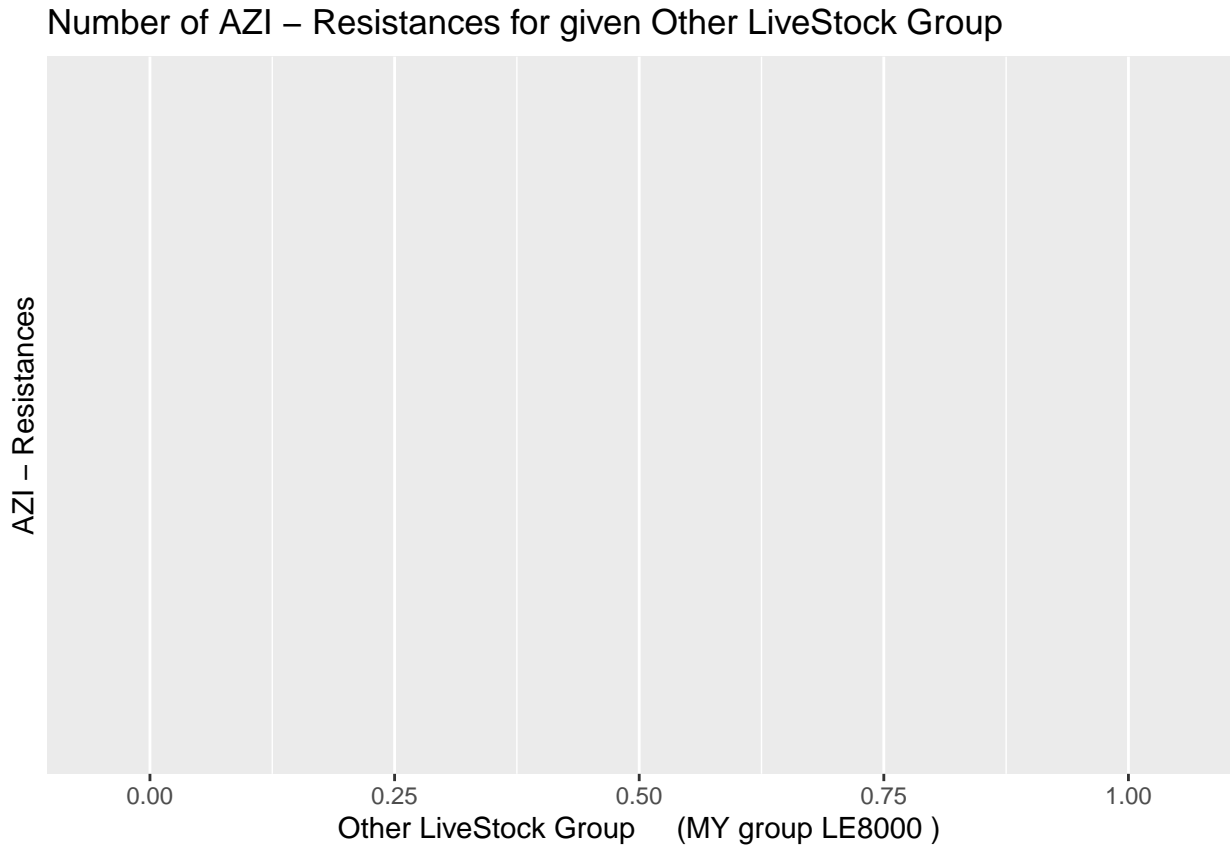## Number of SMX – Resistances for given Wastemilk Group


```
## [1] ""
## [1] "------------------------------------------------------------"

## Saving 6.5 x 4.5 in image
```

Number of AMP – Resistances for given Other LiveStock Group


```
## [1] ""

## Saving 6.5 x 4.5 in image
```

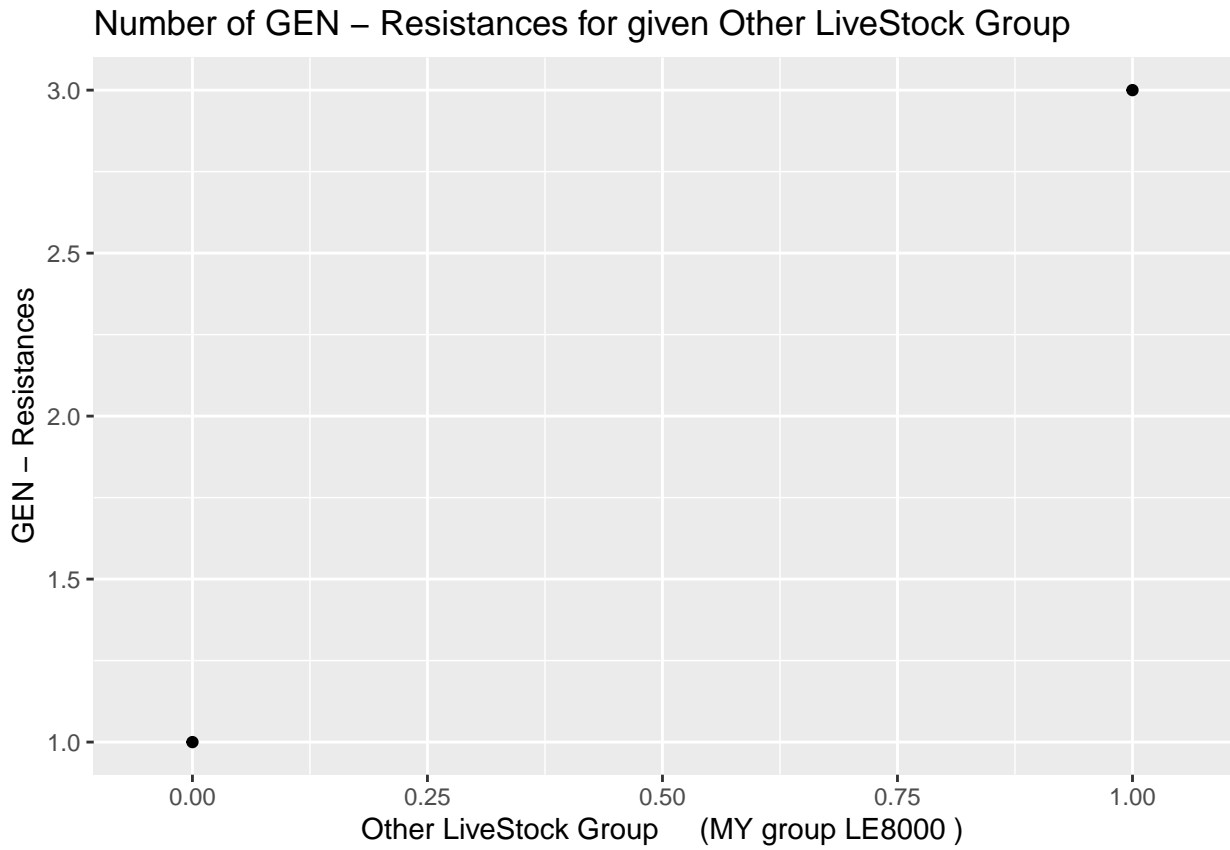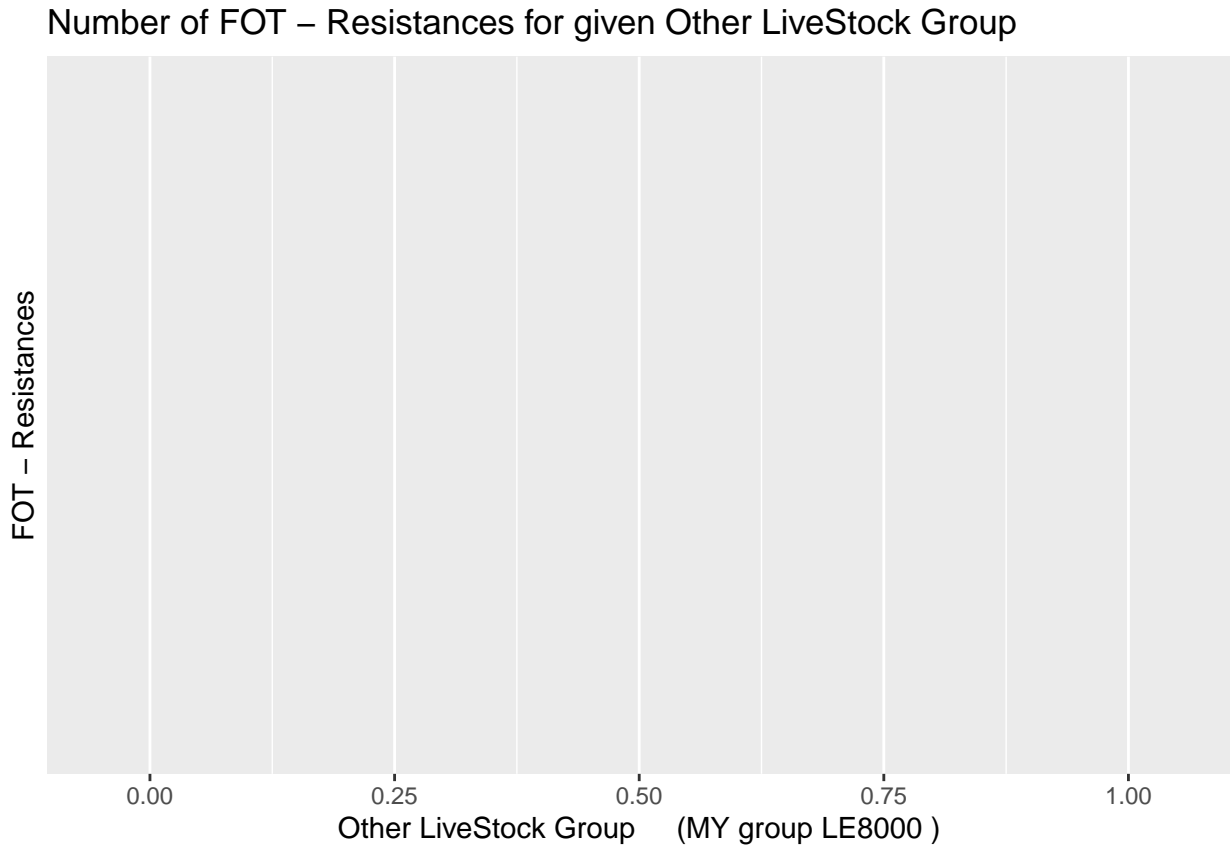## Number of CIP – Resistances for given Other LiveStock Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of AZI – Resistances for given Other LiveStock Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of GEN – Resistances for given Other LiveStock Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given Other LiveStock Group


```
## [1] ""
```
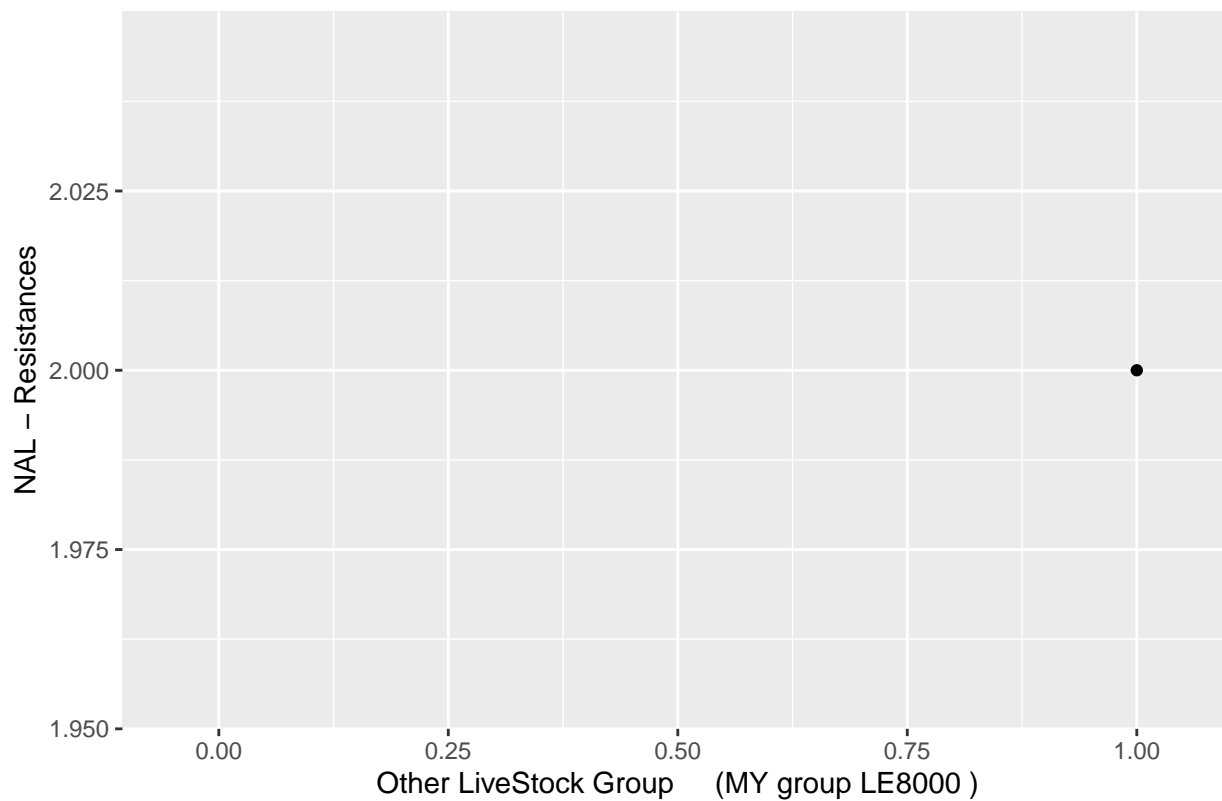
```
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given Other LiveStock Group


```
## [1] ""
```
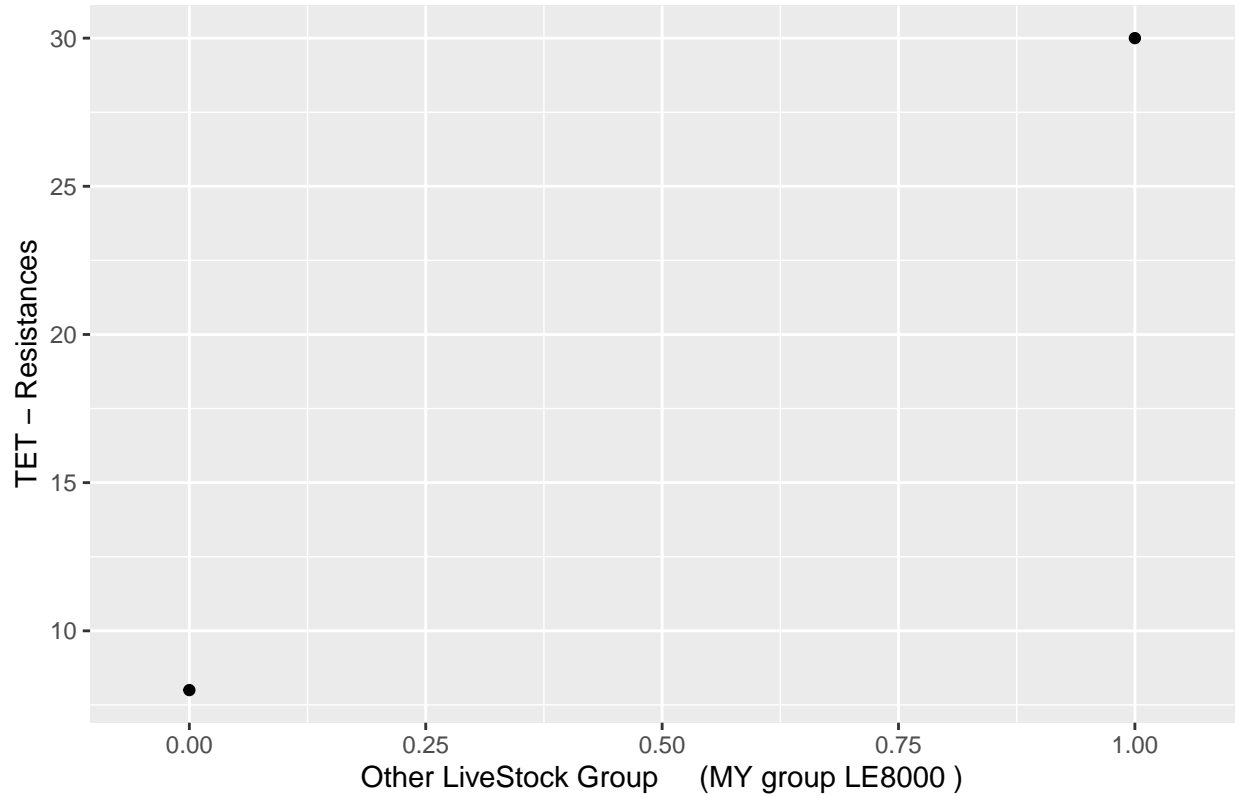
```
## Saving 6.5 x 4.5 in image
```

Number of NAL – Resistances for given Other LiveStock Group
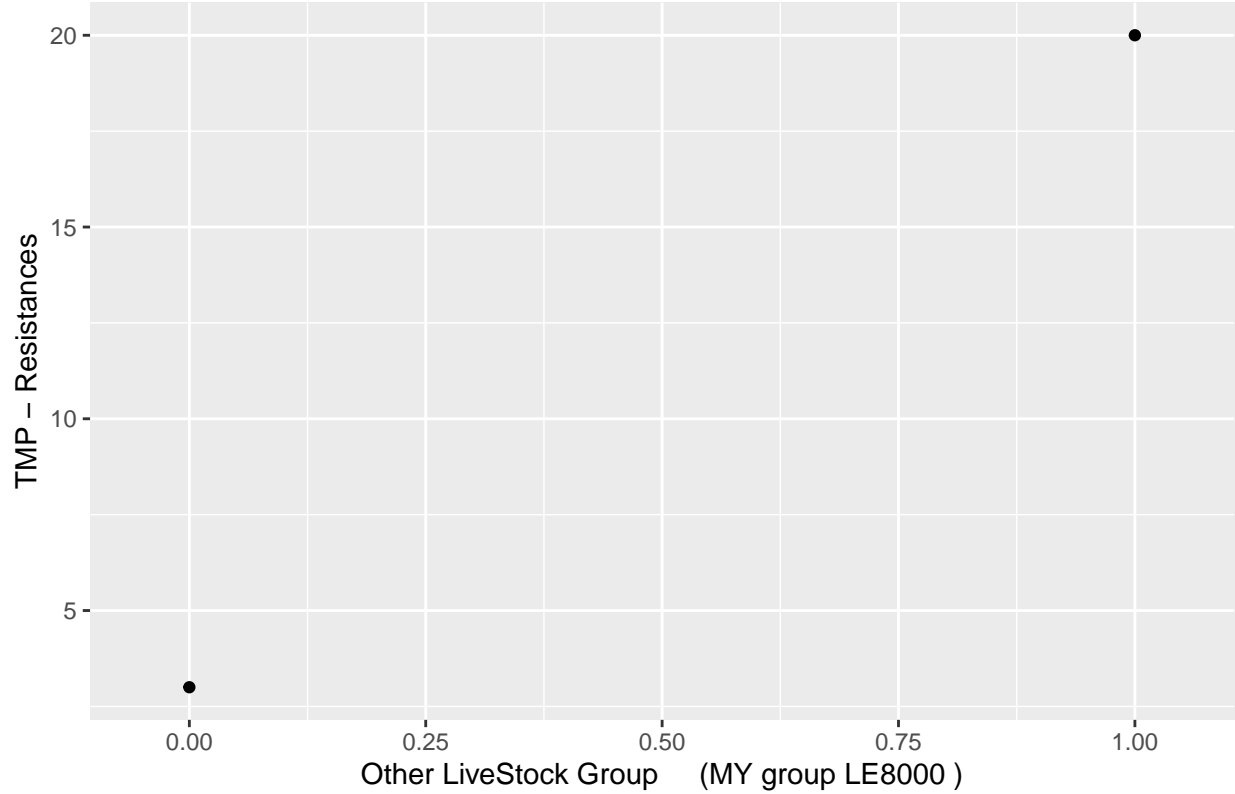


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of TET – Resistances for given Other LiveStock Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of TMP – Resistances for given Other LiveStock Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```
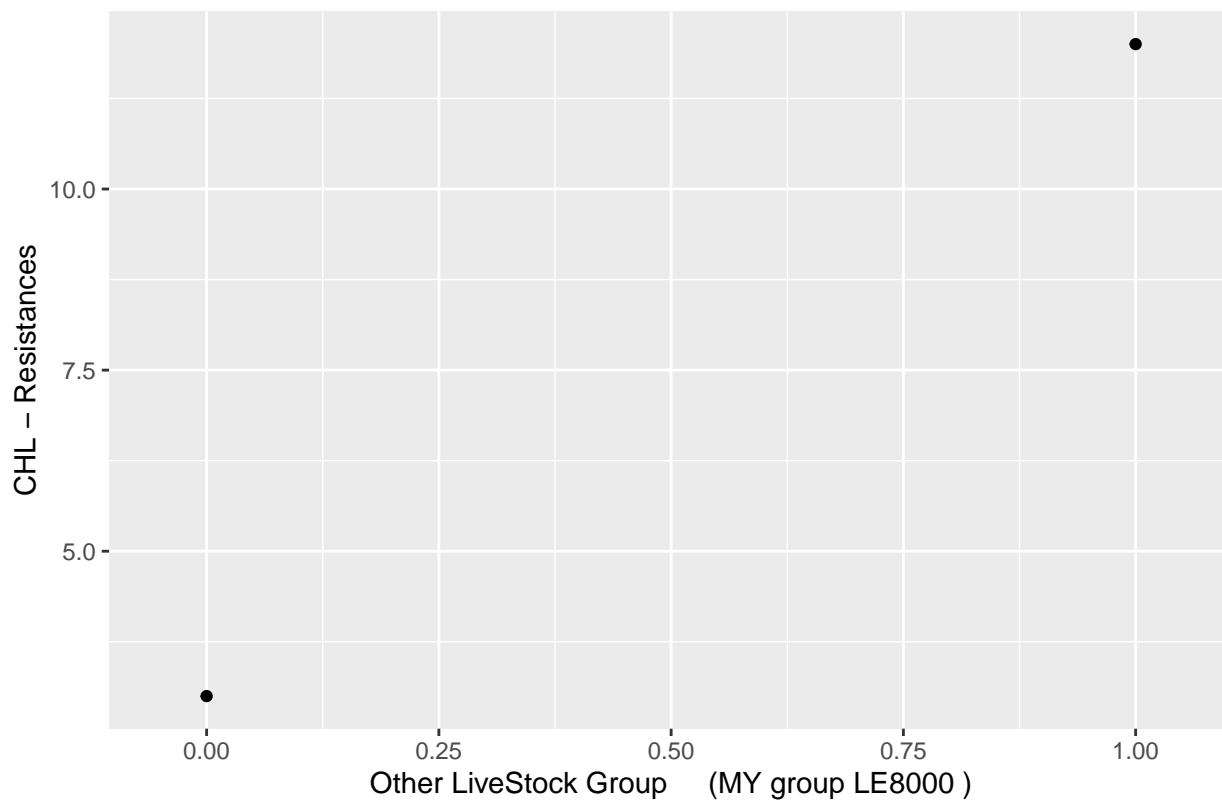
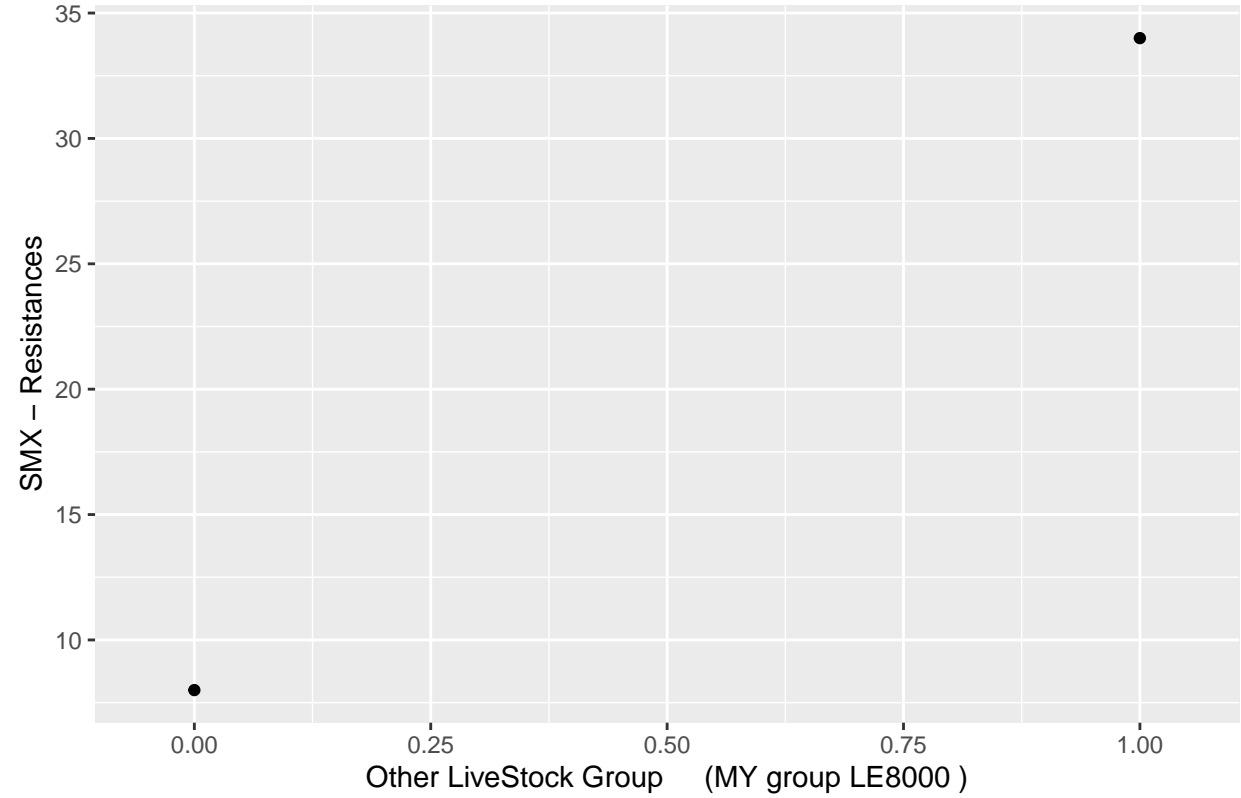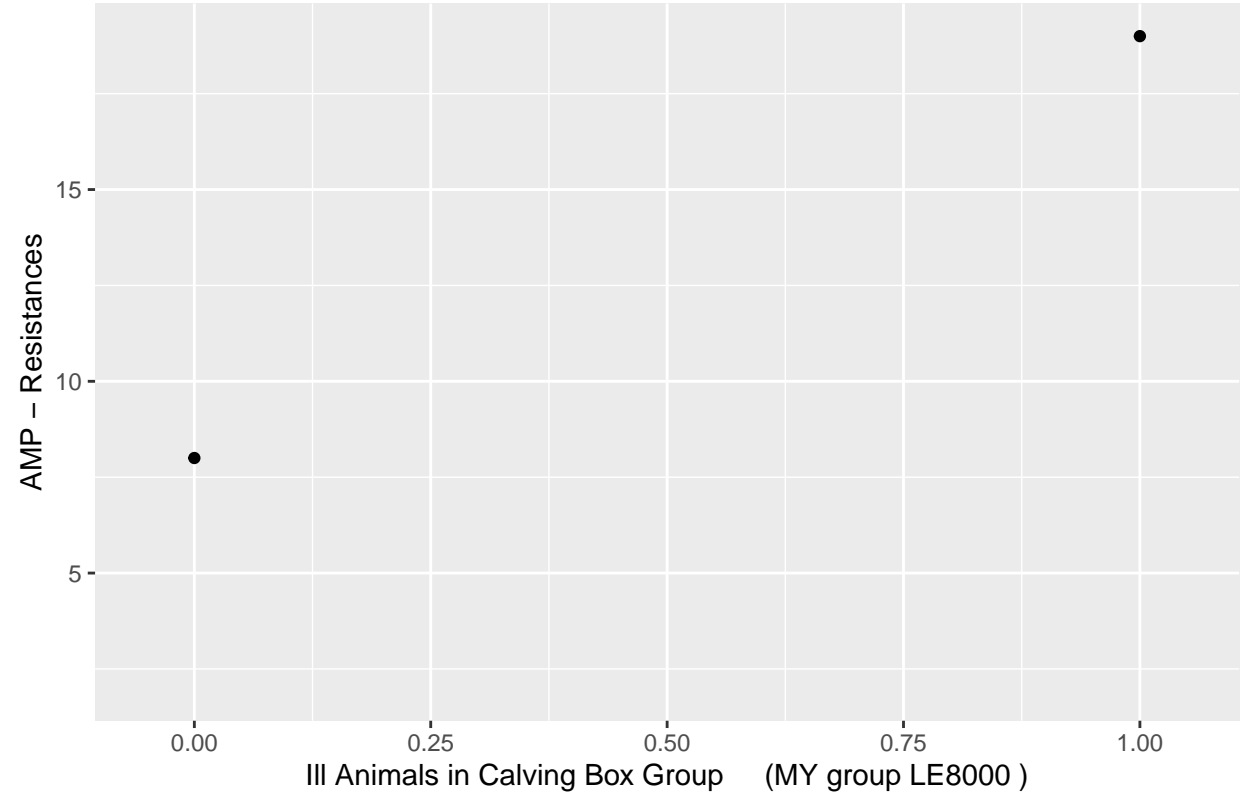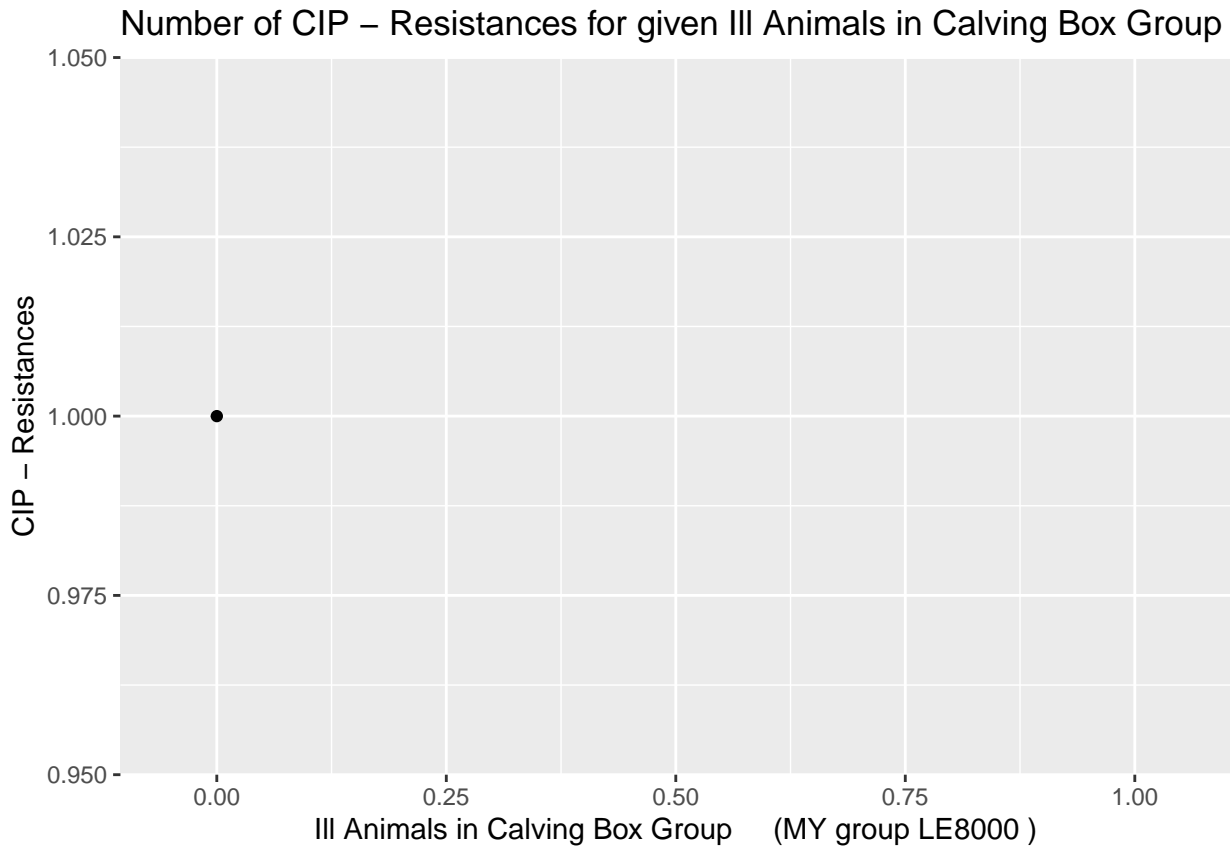## Number of SMX – Resistances for given Other LiveStock Group


```
## [1] ""
## [1] "------------------------------------------------------------"

## Saving 6.5 x 4.5 in image
```

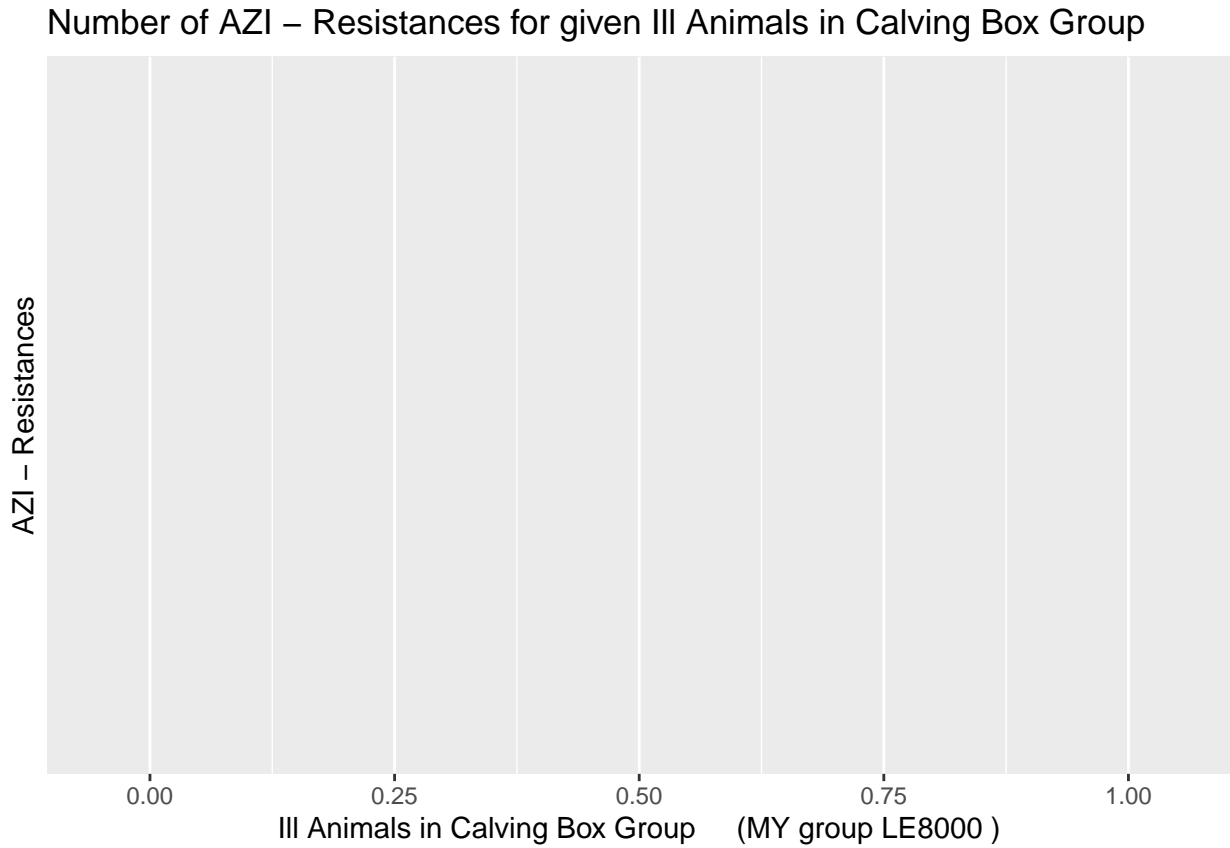## Number of AMP – Resistances for given Ill Animals in Calving Box Group


```
## [1] ""

## Saving 6.5 x 4.5 in image
```
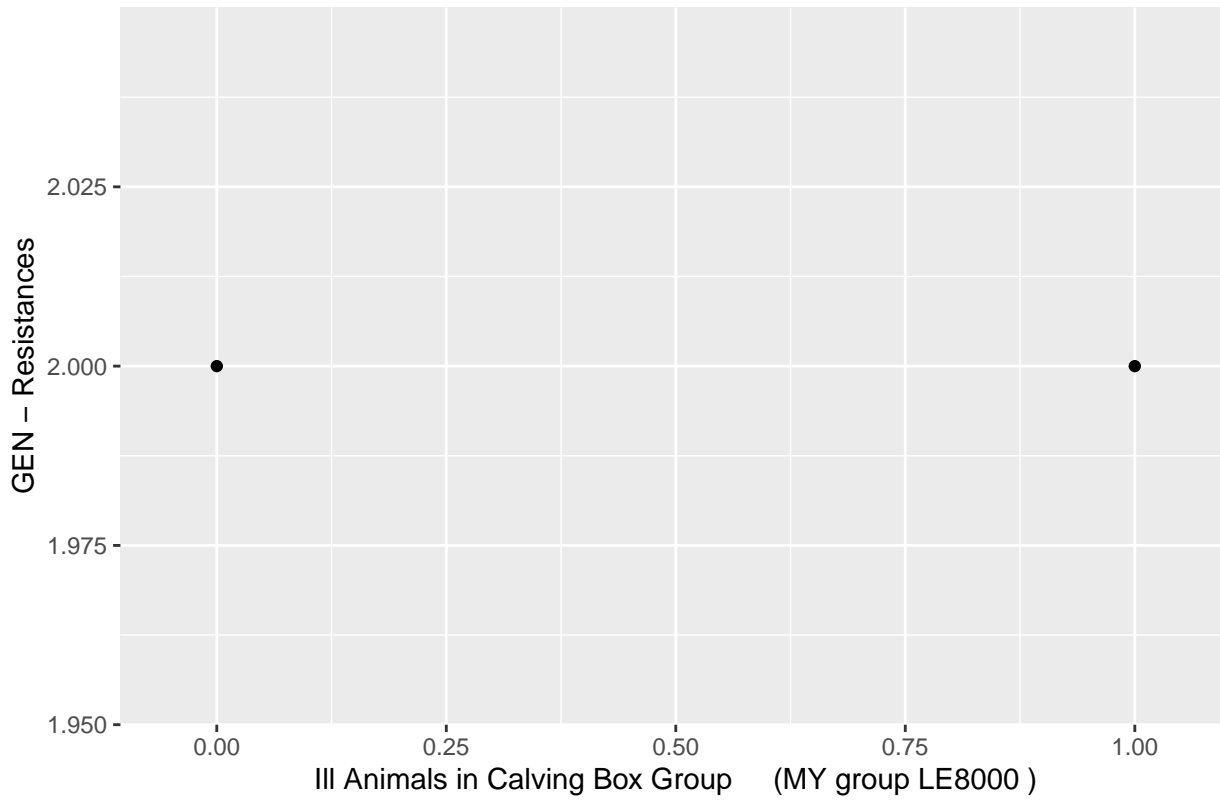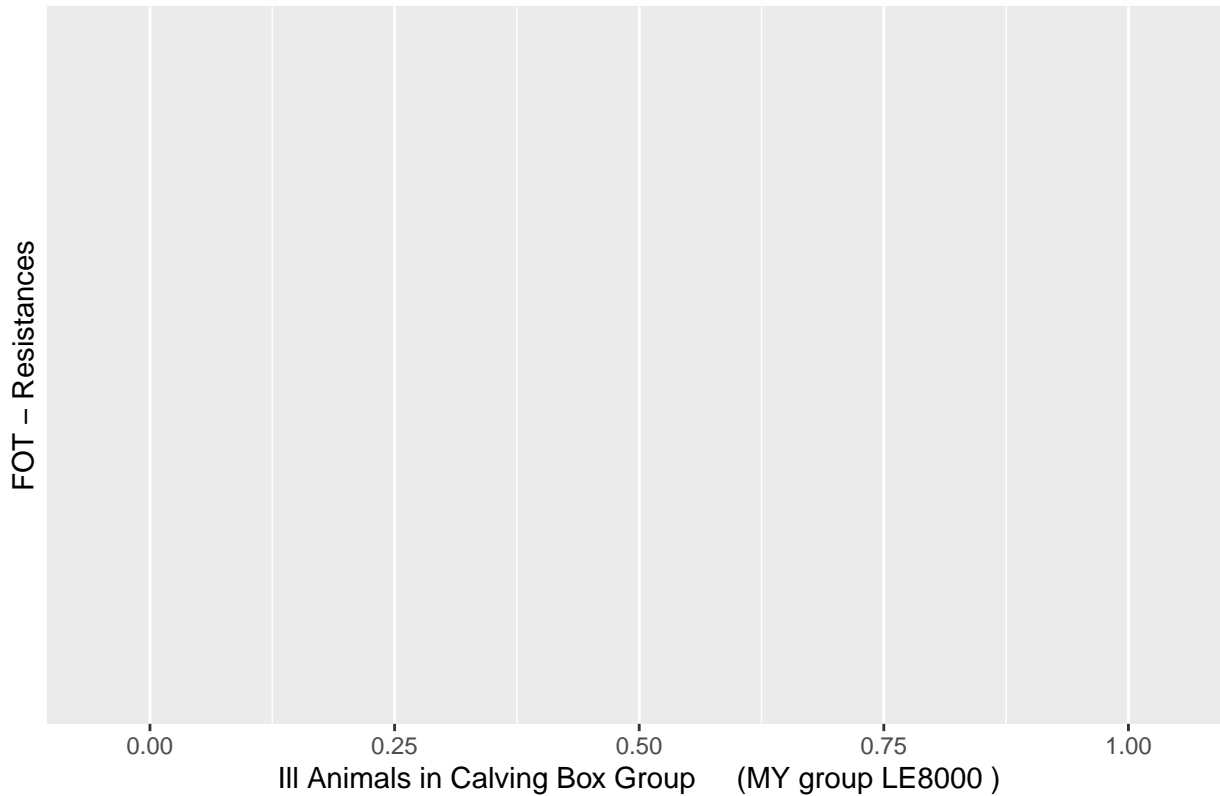
Number of CIP – Resistances for given Ill Animals in Calving Box Group

CIP – Resistances

1.050 –

1.025 –

1.000 –   ●

0.975 –

0.950 –

0.00   0.25   0.50   0.75   1.00

Ill Animals in Calving Box Group   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of AZI – Resistances for given Ill Animals in Calving Box Group

AZI – Resistances

0.00   0.25   0.50   0.75   1.00

Ill Animals in Calving Box Group   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of GEN – Resistances for given Ill Animals in Calving Box Group

GEN – Resistances

Ill Animals in Calving Box Group   (MY group LE8000)

```
## [1] ""
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given Ill Animals in Calving Box Group

FOT – Resistances

Ill Animals in Calving Box Group   (MY group LE8000)

```
## [1] ""
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given Ill Animals in Calving Box Group
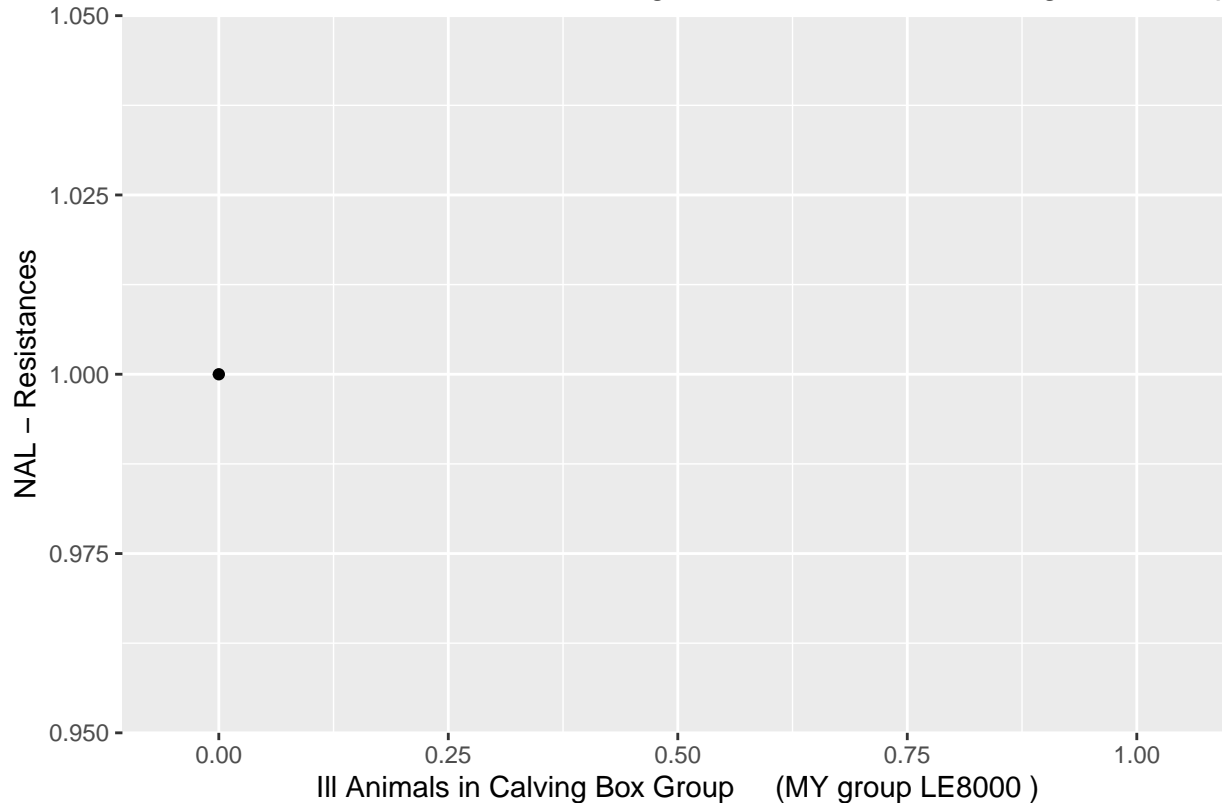

CHL – Resistances

Ill Animals in Calving Box Group   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of NAL – Resistances for given Ill Animals in Calving Box Group

NAL – Resistances

Ill Animals in Calving Box Group   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of TET – Resistances for given Ill Animals in Calving Box Group


```
## [1] ""
```
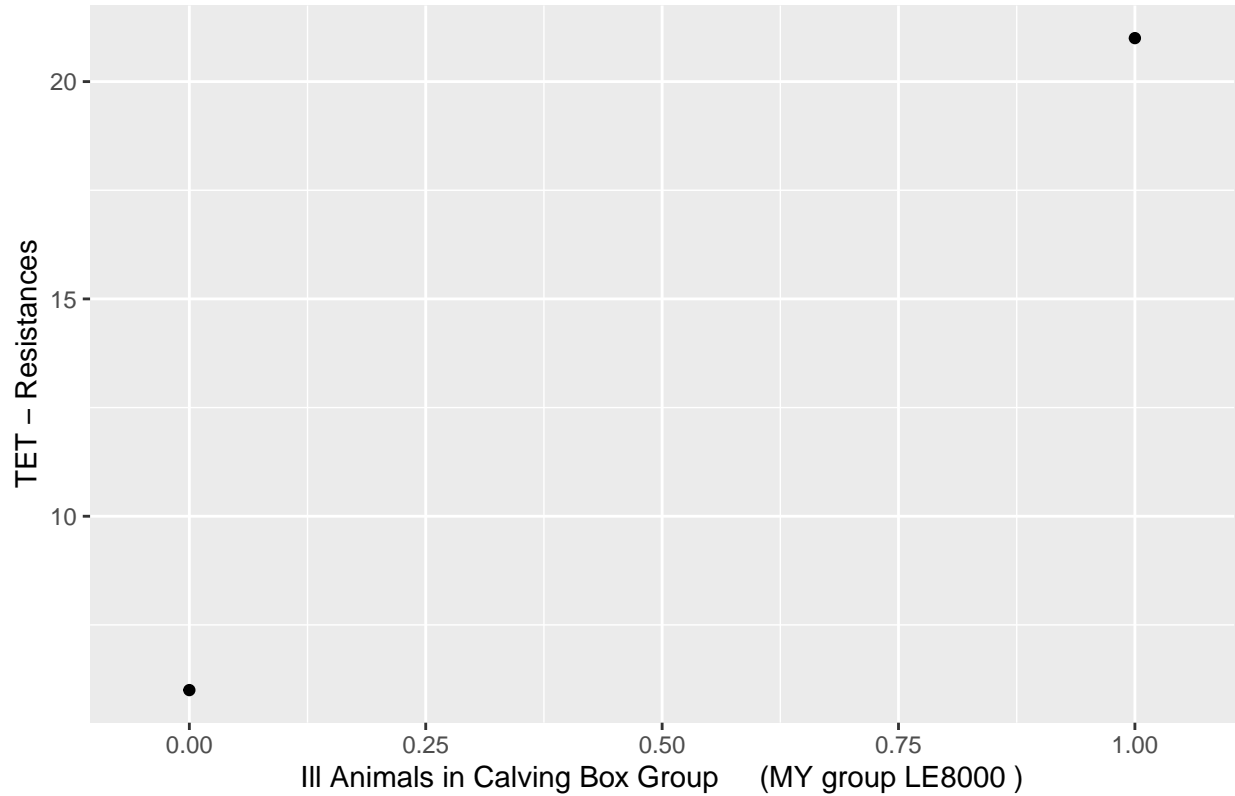```
Saving 6.5 x 4.5 in image
```

# Number of TMP – Resistances for given Ill Animals in Calving Box Group
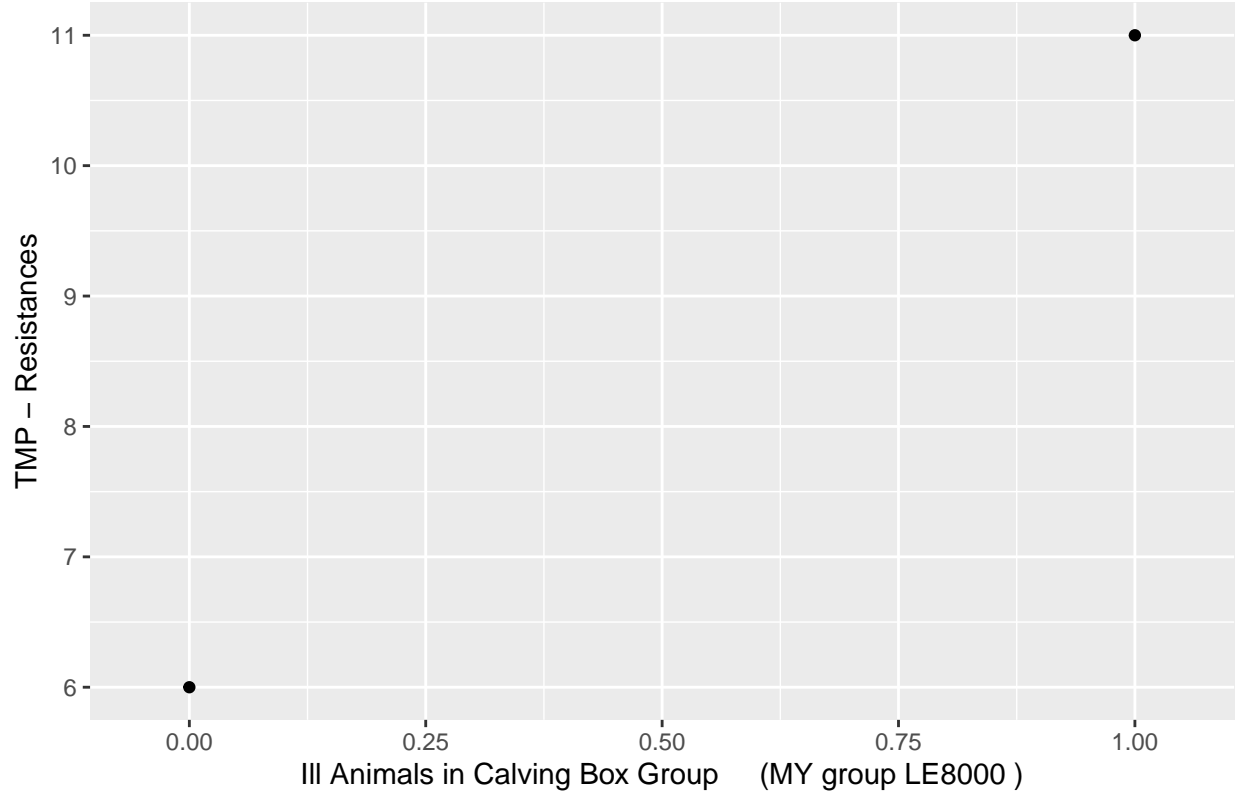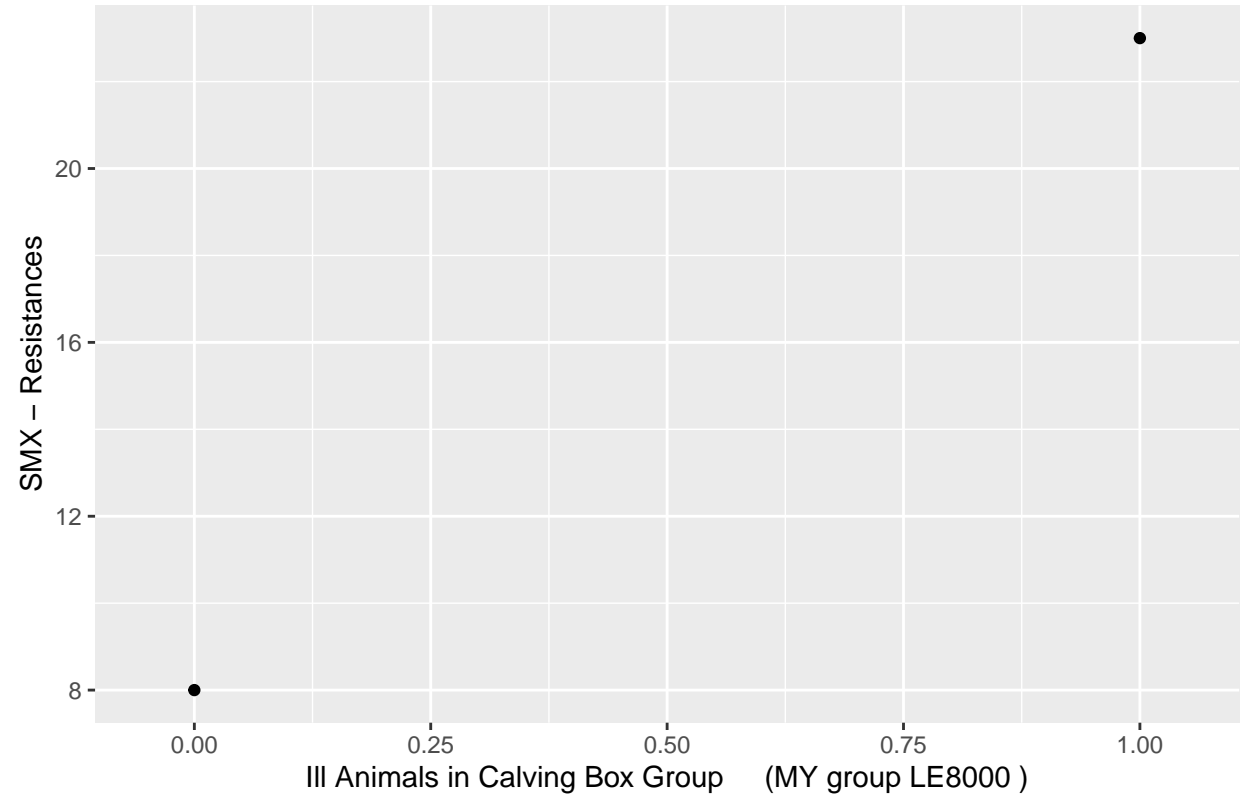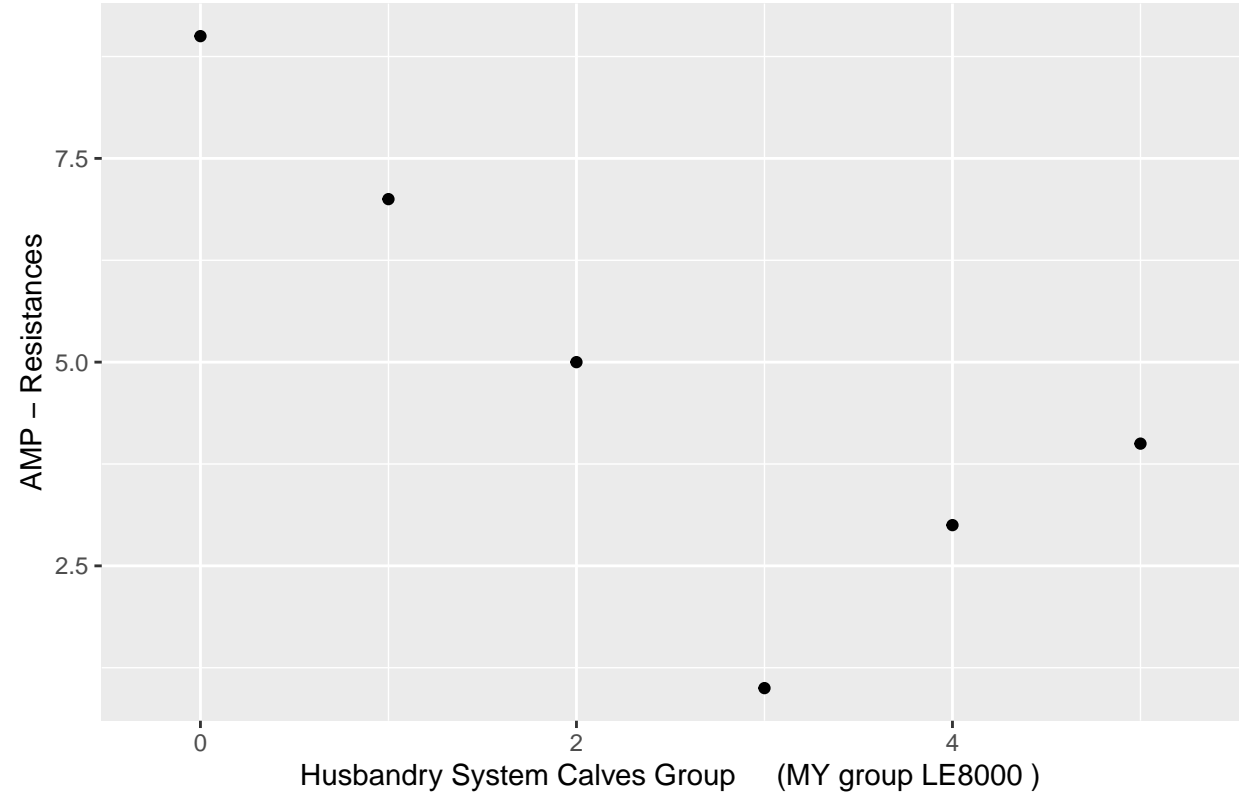


```
[1] ""
```
```
Saving 6.5 x 4.5 in image
```

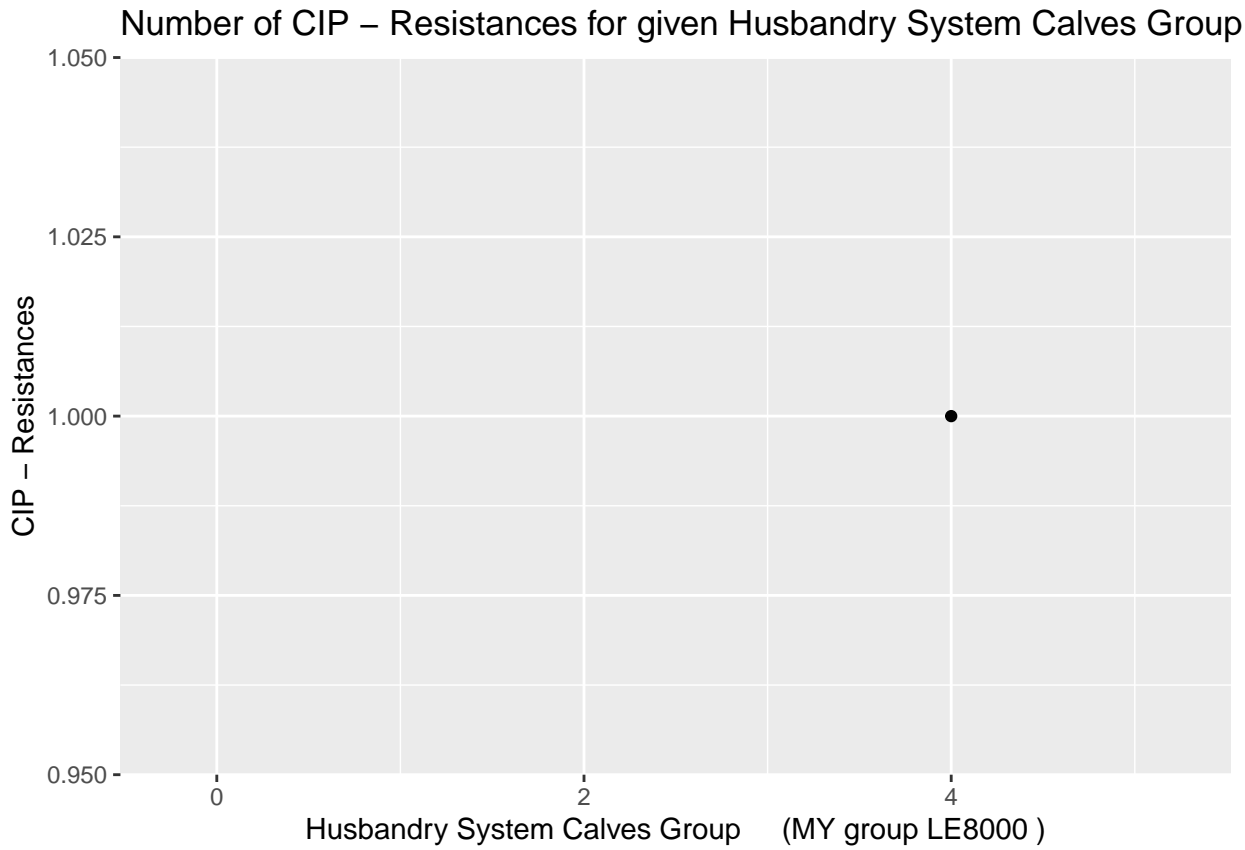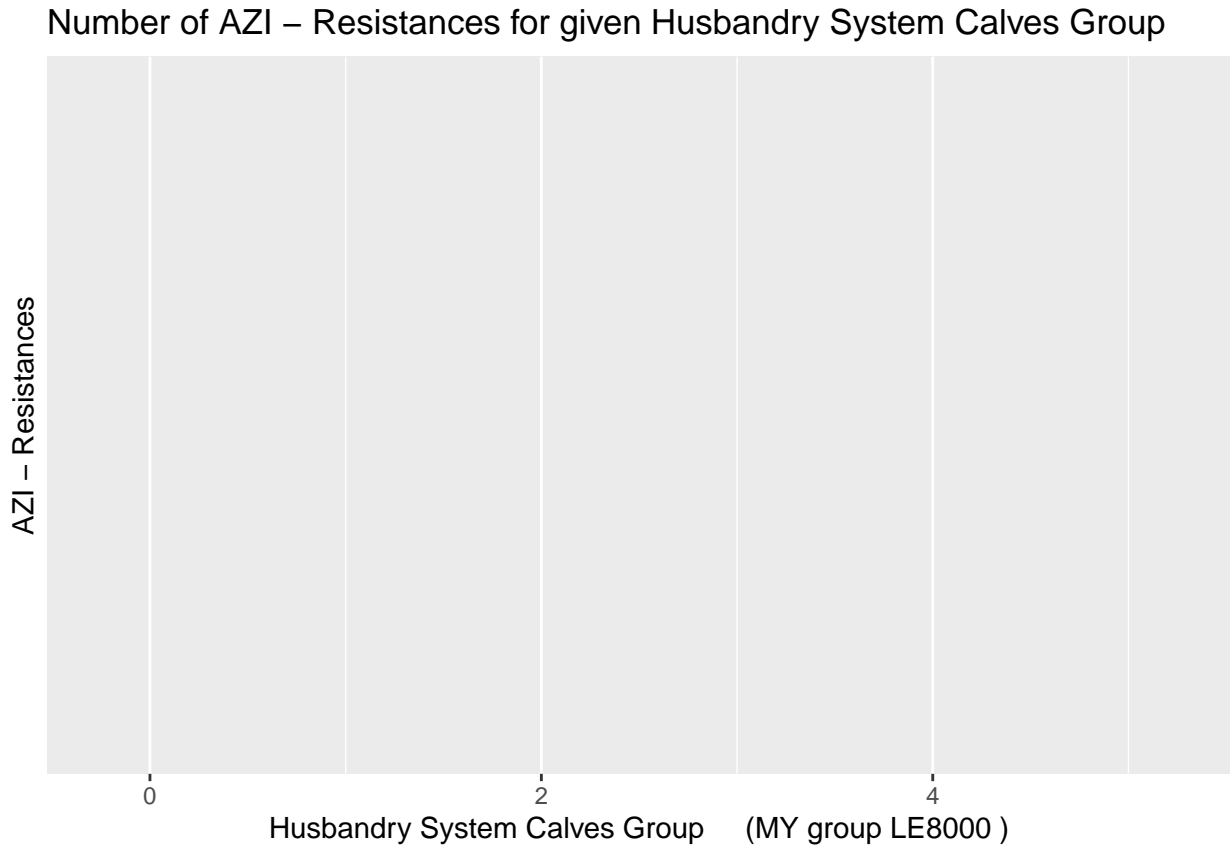## Number of SMX – Resistances for given Ill Animals in Calving Box Group



```
## [1] ""
## [1] "-----------------------------------------------------------"
## Saving 6.5 x 4.5 in image
```

Number of AMP – Resistances for given Husbandry System Calves Group


```
## [1] ""
## Saving 6.5 x 4.5 in image
```

Number of CIP – Resistances for given Husbandry System Calves Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

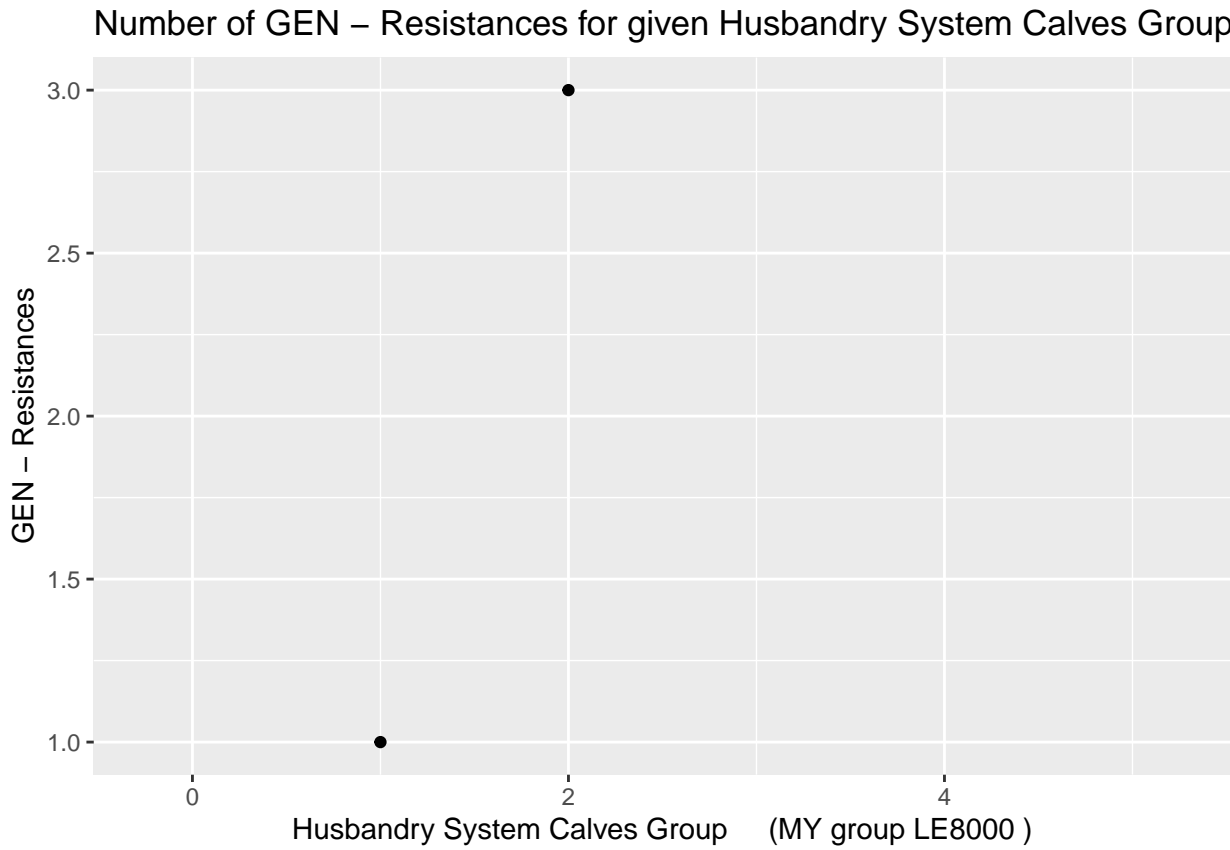## Number of AZI – Resistances for given Husbandry System Calves Group


```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of GEN – Resistances for given Husbandry System Calves Group

[1] ""
Saving 6.5 x 4.5 in image

Number of FOT – Resistances for given Husbandry System Calves Group

[1] ""
Saving 6.5 x 4.5 in image

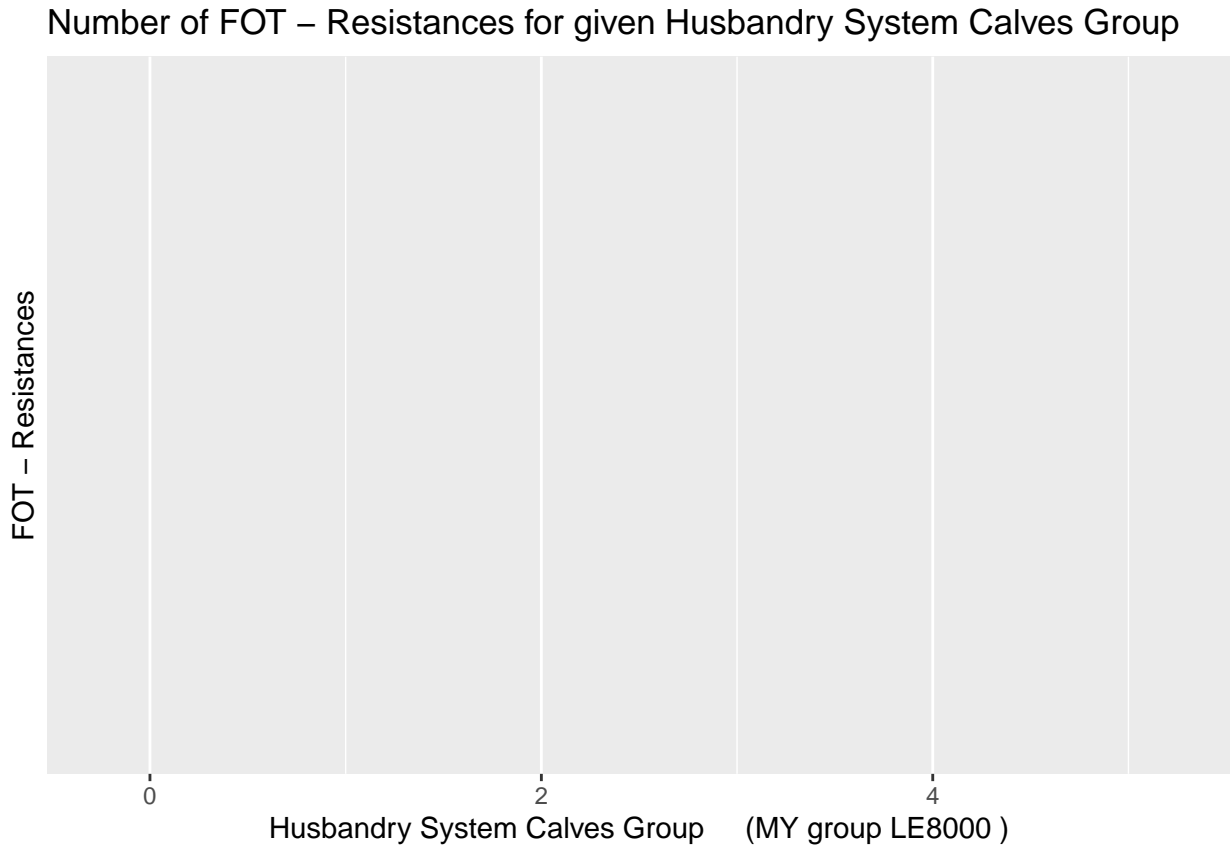## Number of CHL – Resistances for given Husbandry System Calves Group

CHL – Resistances

Husbandry System Calves Group   (MY group LE8000)

```
## [1] ""
```

```
## Saving 6.5 x 4.5 in image
```

Number of NAL – Resistances for given Husbandry System Calves Group

NAL – Resistances

Husbandry System Calves Group   (MY group LE8000)

```
## [1] ""
```
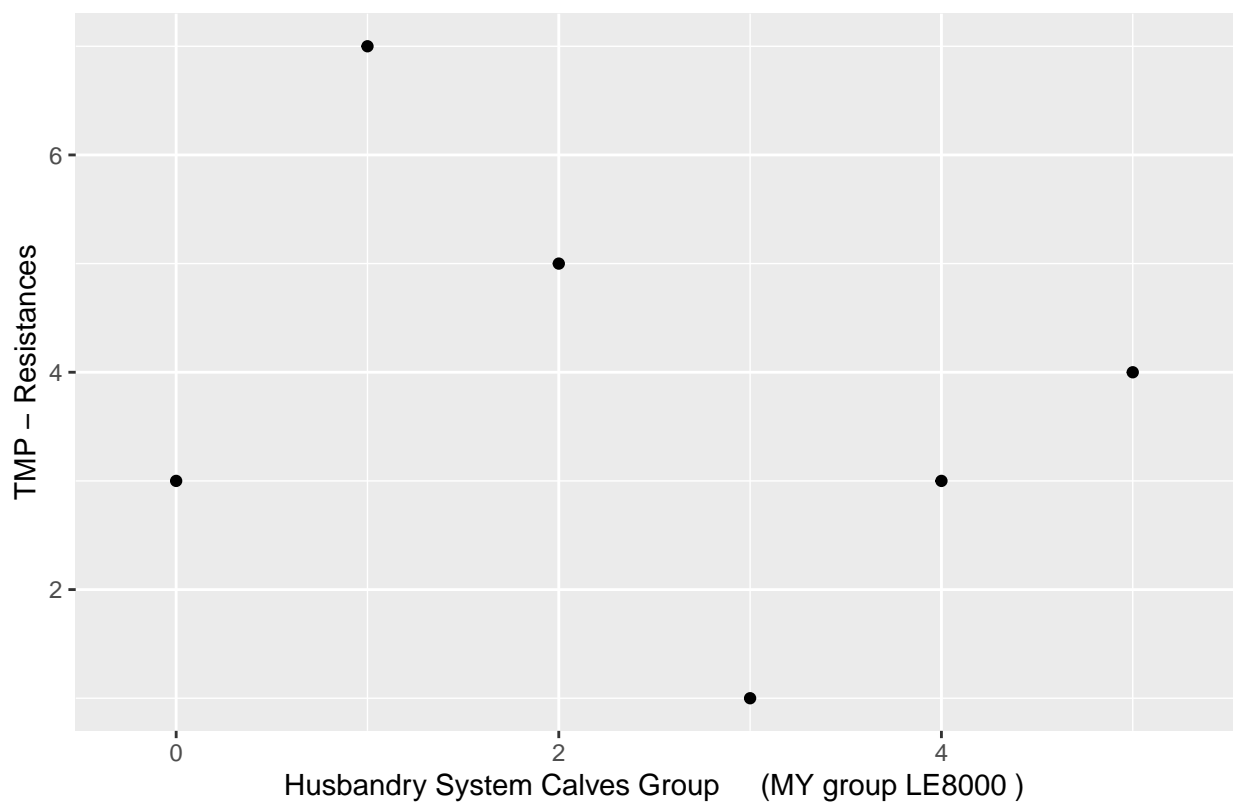
```
## Saving 6.5 x 4.5 in image
```

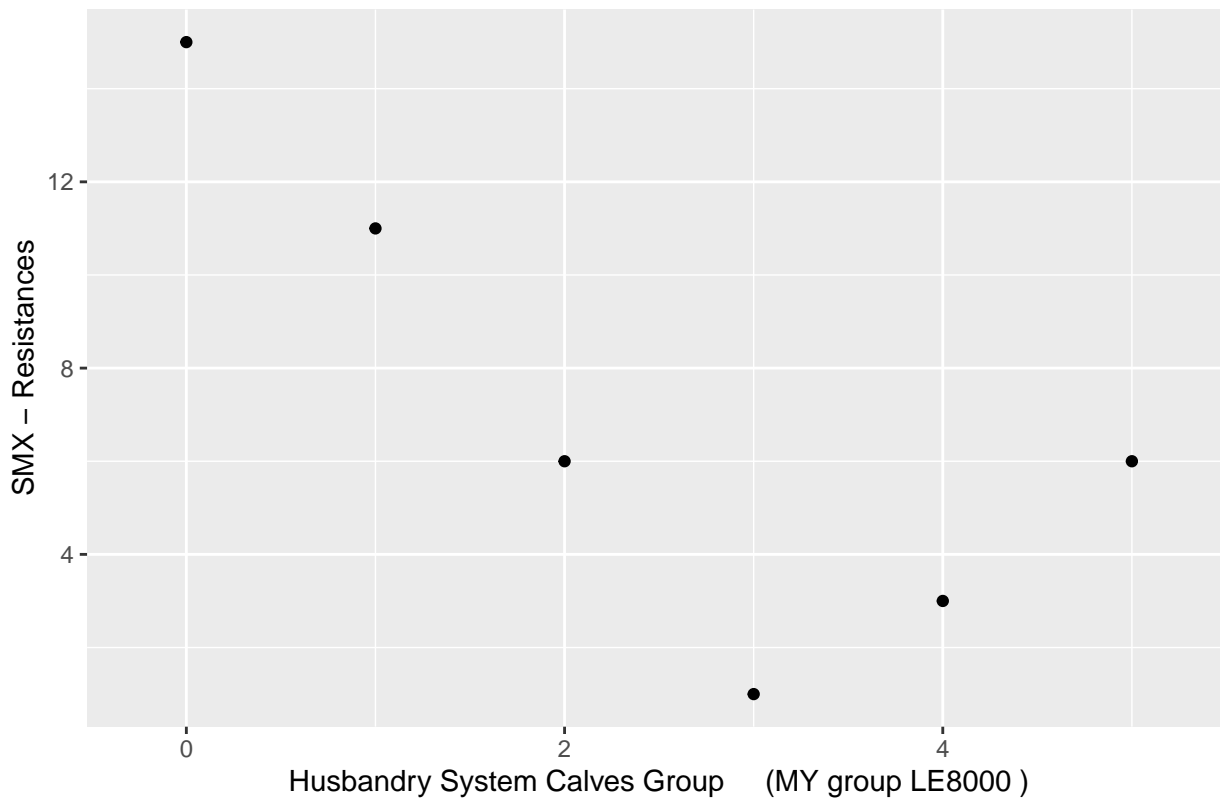## Number of TET – Resistances for given Husbandry System Calves Group

[1] ""

Saving 6.5 x 4.5 in image

Number of TMP – Resistances for given Husbandry System Calves Group

[1] ""
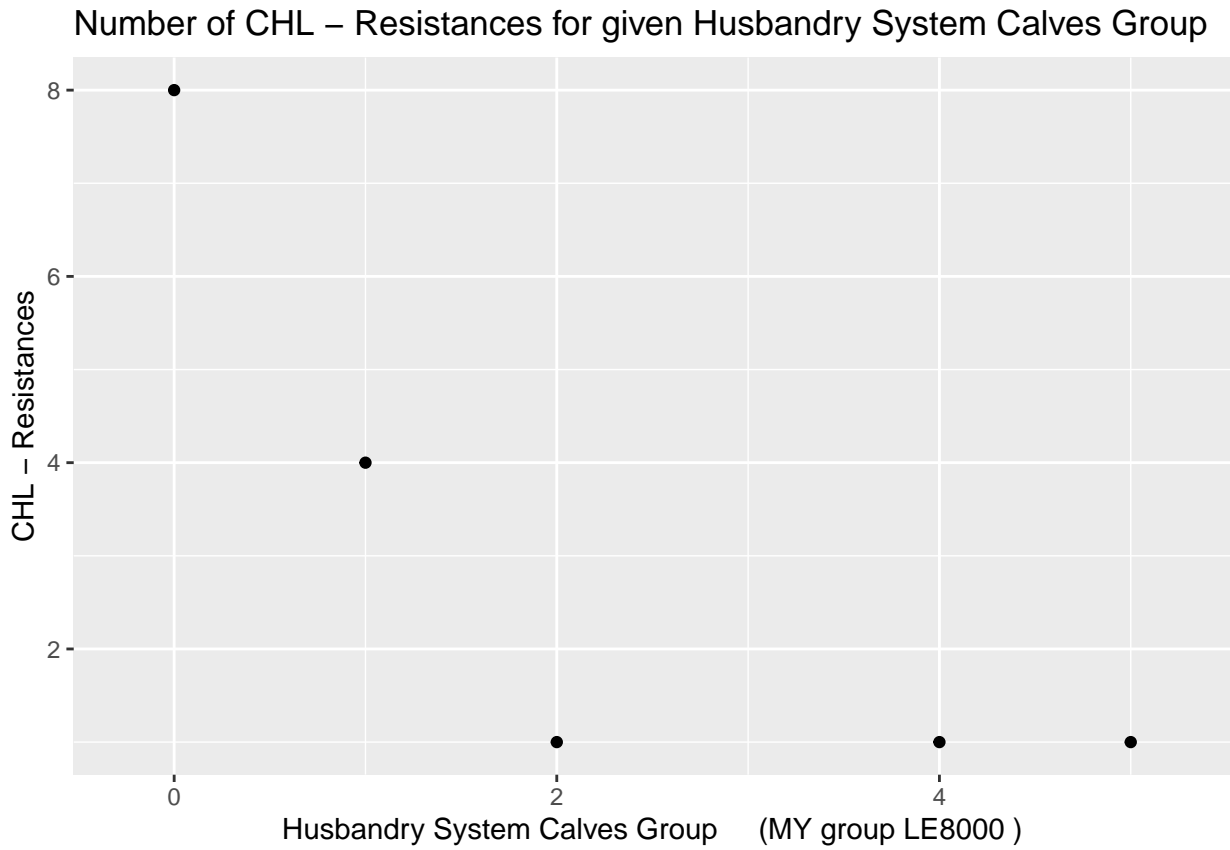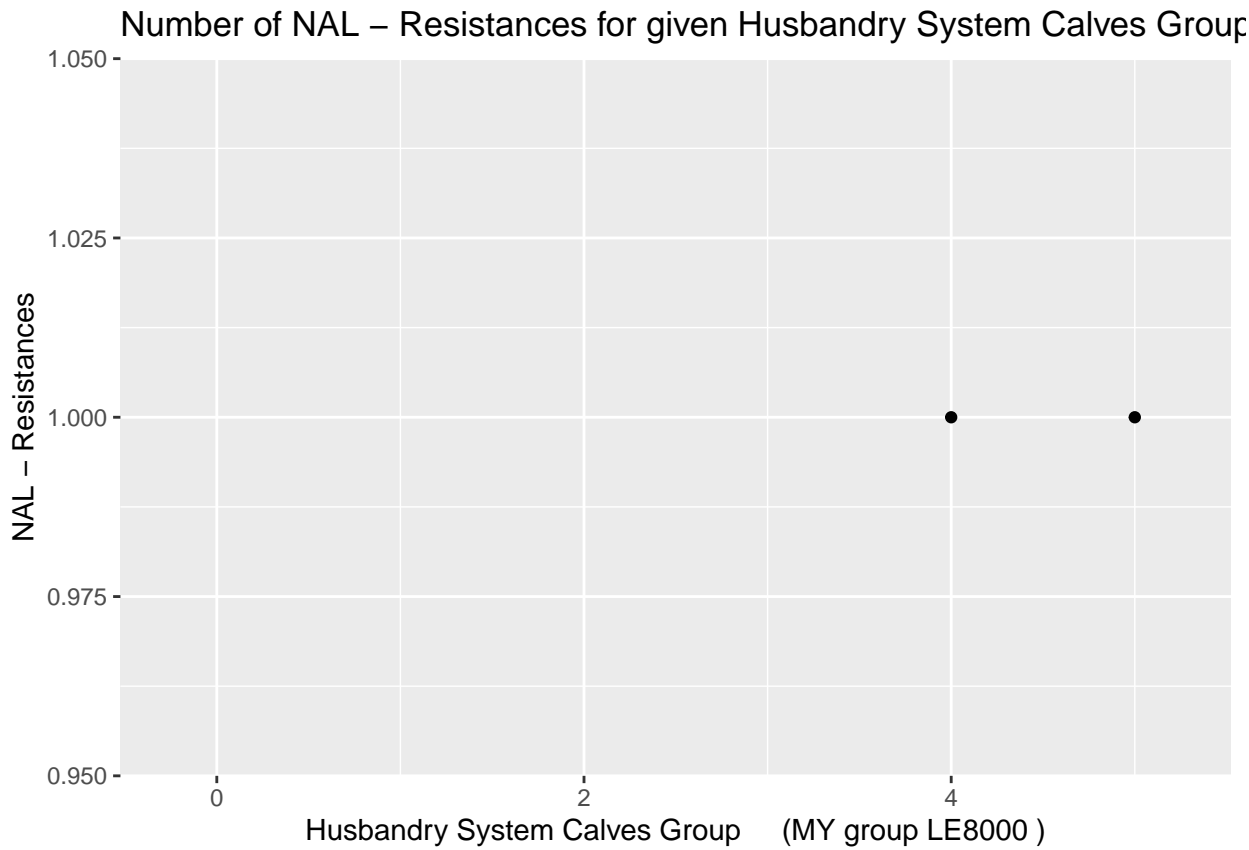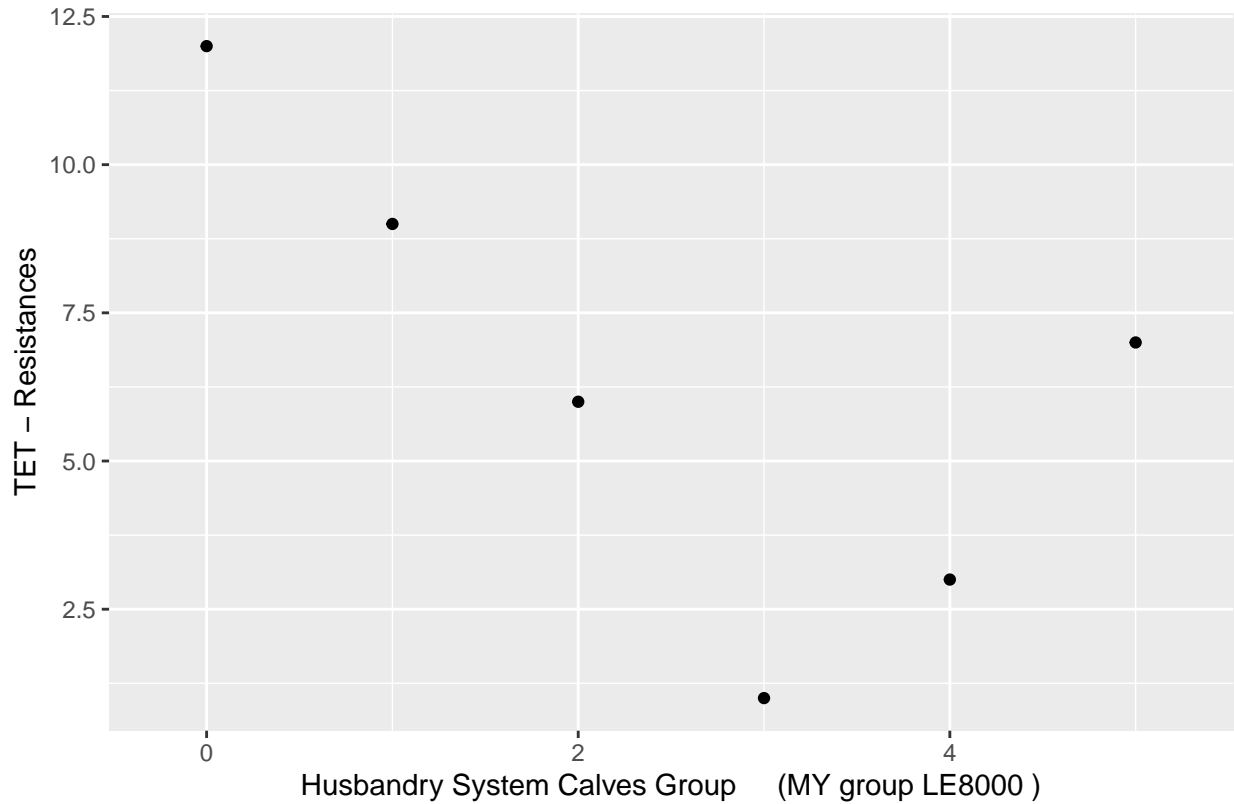
Saving 6.5 x 4.5 in image

Number of SMX – Resistances for given Husbandry System Calves Group


```
## [1] ""
## [1] "-----------------------------------------------------------"
```

Ungeschichtet: Resistenzen scheinen zu

- steigen mit MY (das sahen wir schon aus den Verteilungen), OLS.group, tendenziell auch IAC.group
- fallen bis HSC.group = 3, dann wieder etwas zu steigen (die Steigung von $4 \mapsto 5$ scheint einleuchtend, da 5=0+2 und 4=1+2; man könnte $4 \leftrightarrow 5$ im plot vertauschen)
- jedenfalls sind die Trends klarer als aus den Verteilungen. Eine Regression sagt nochmal mehr