

Number of Resistances and Simple Plots

20.04.2022

Bibliotheken laden, Hilfsfunktion

```
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!

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

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

Und evtl. ansehen

```
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, Multiresistenz dokumentieren und als NResistenzen.csv ausschreiben

```
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
}
```

```

if(debug){View(NResistenzen)}

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

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

  for(j in 2:maxcol){
    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$NRes <- rep(0,NResRow) # neue Spalte, zählt für jeden Betrieb Resistenzen über Antibiotika; erstmal 0
NResistenzen$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

```

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

```

```

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)

NA warnings interessieren nicht

```

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

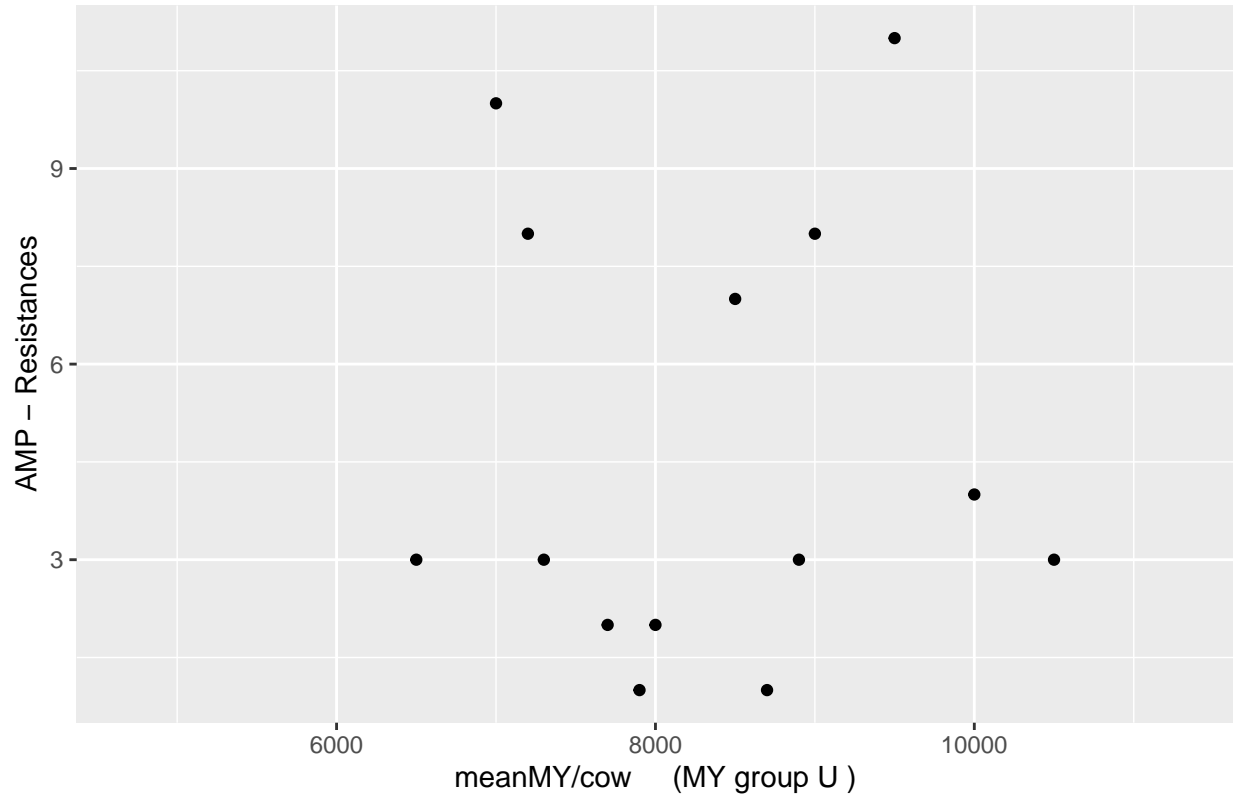
  for( antib in c("AMP","CIP","AZI","GEN","FOT","CHL","NAL","TET","TMP","SMX") ){

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

```

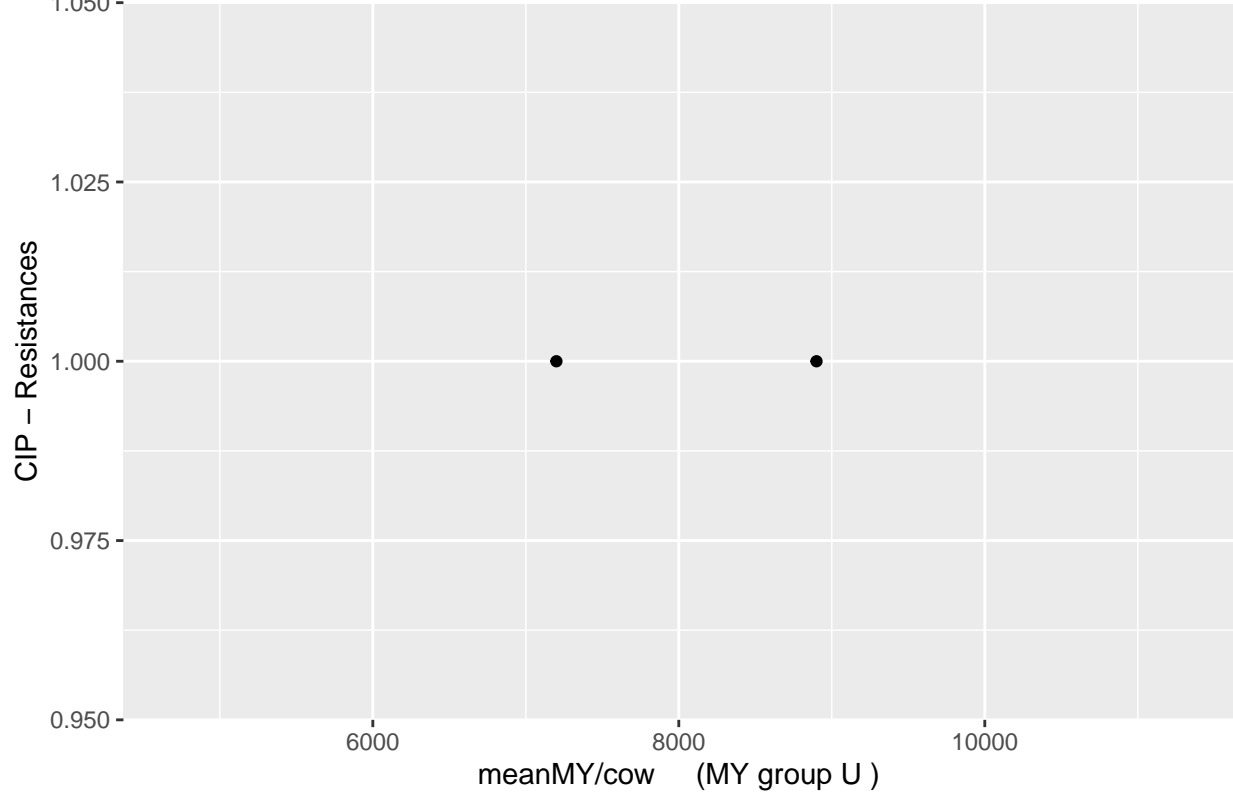
Saving 6.5 x 4.5 in image

Number of AMP – Resistances for given meanMY/cow

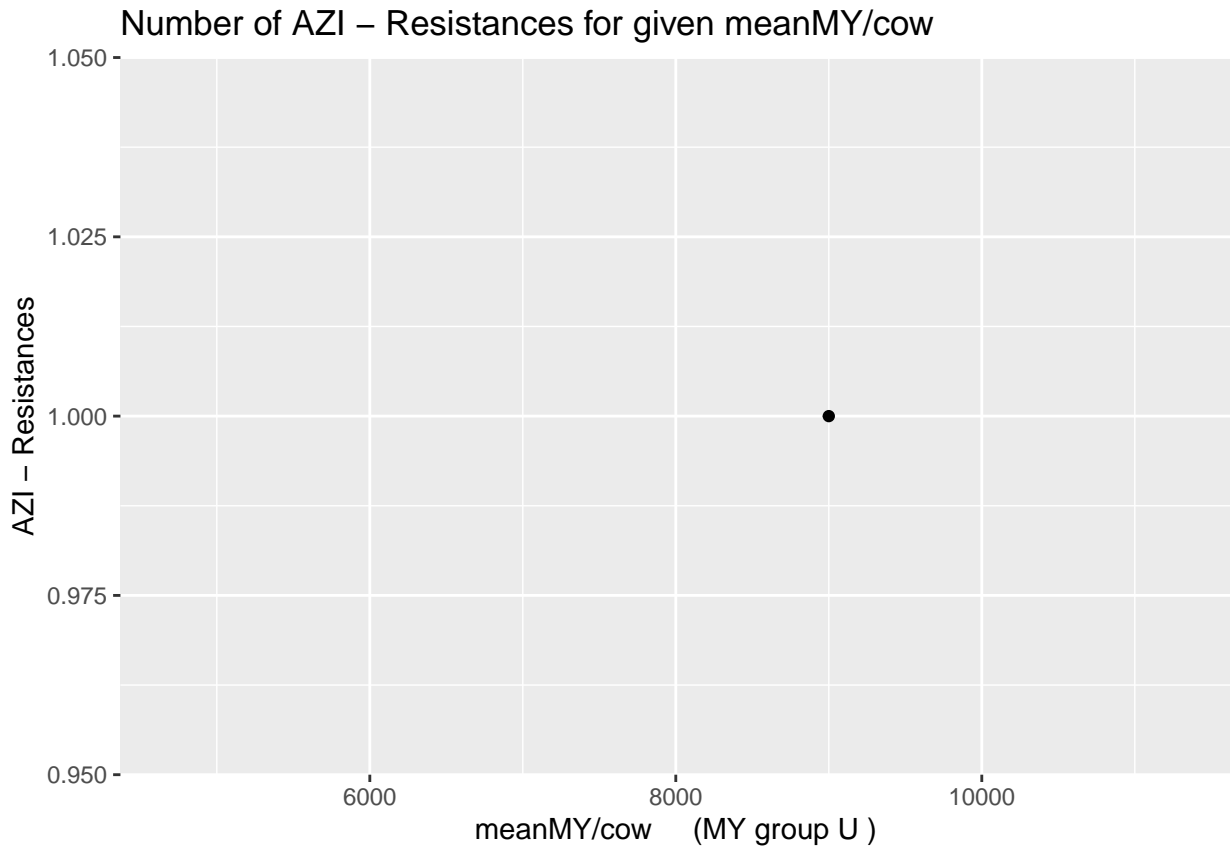


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

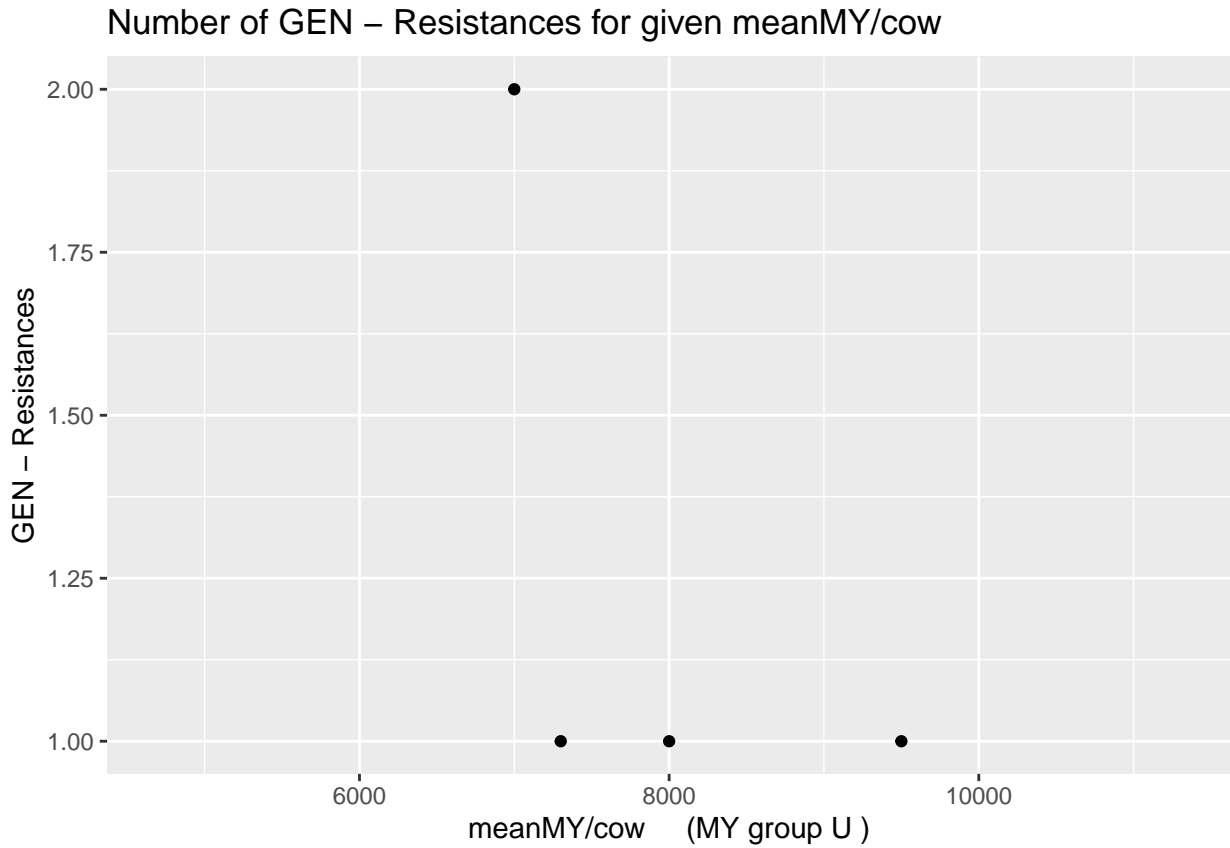
Number of CIP – Resistances for given meanMY/cow



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

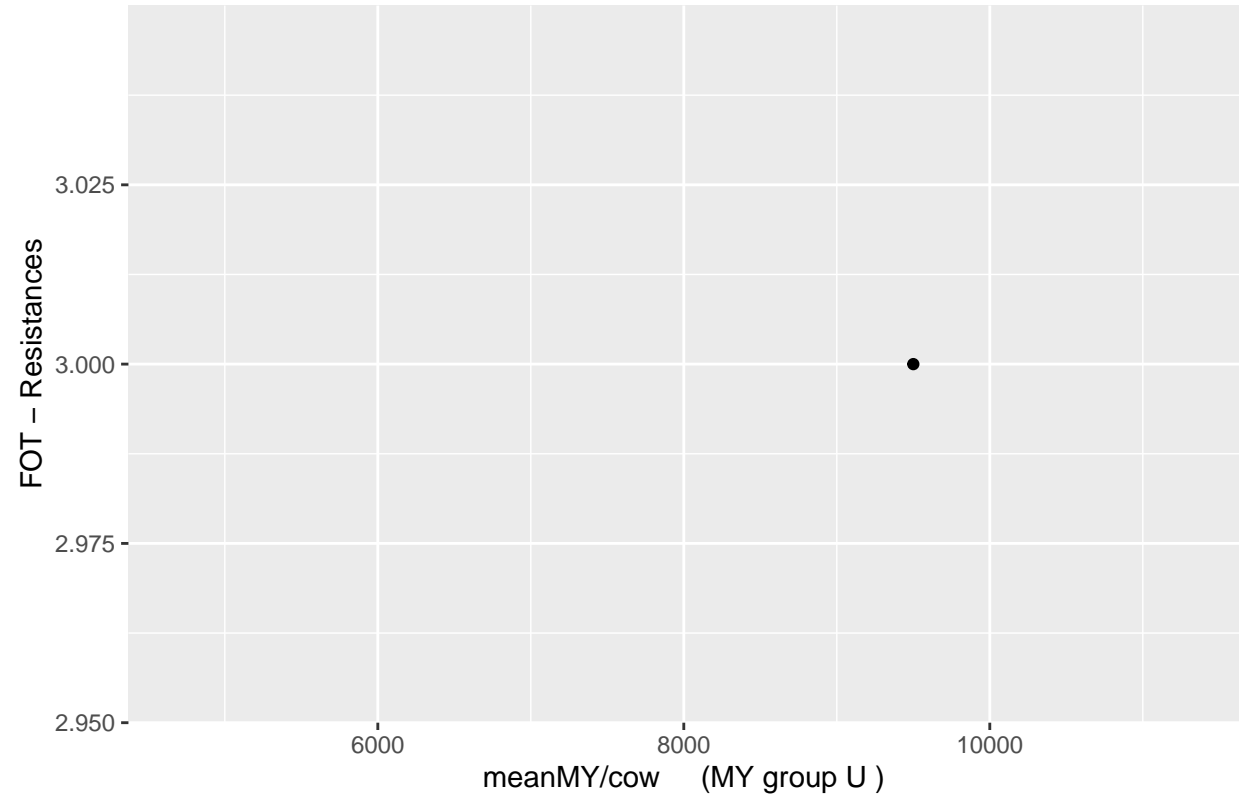


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



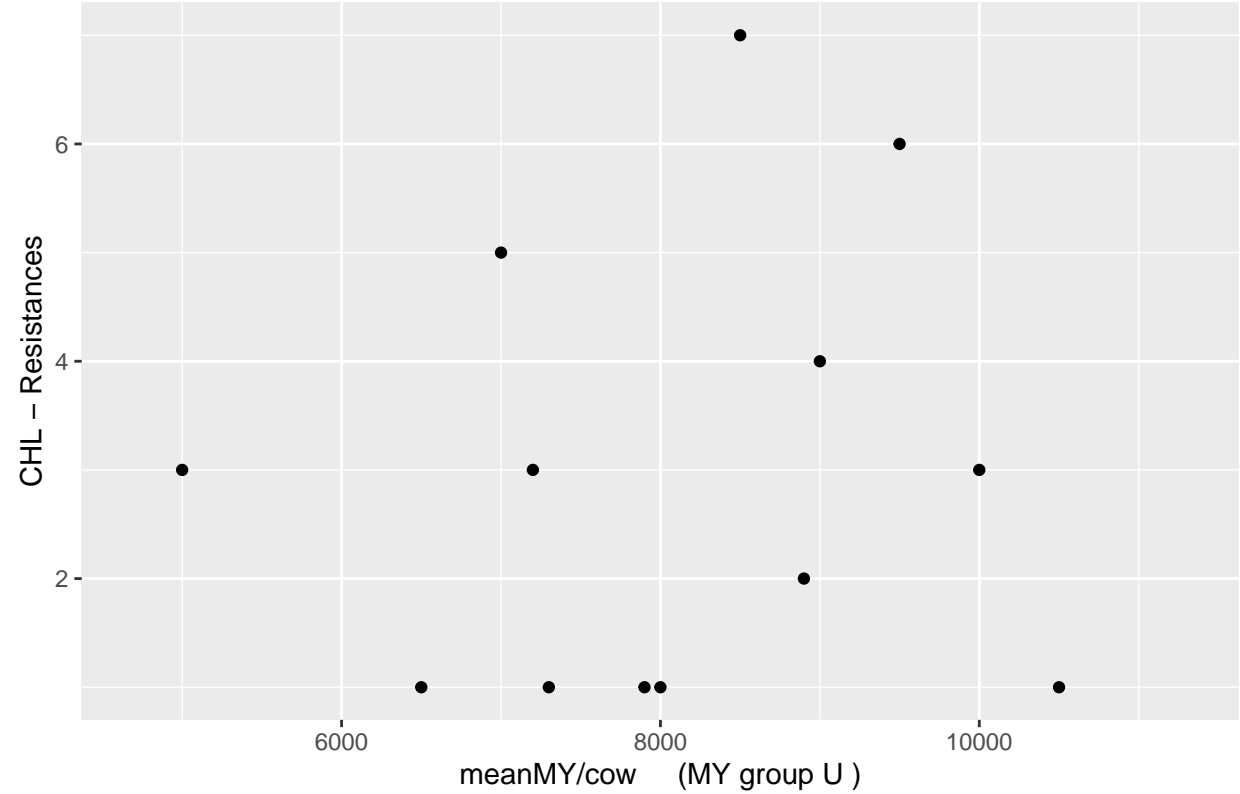
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given meanMY/cow

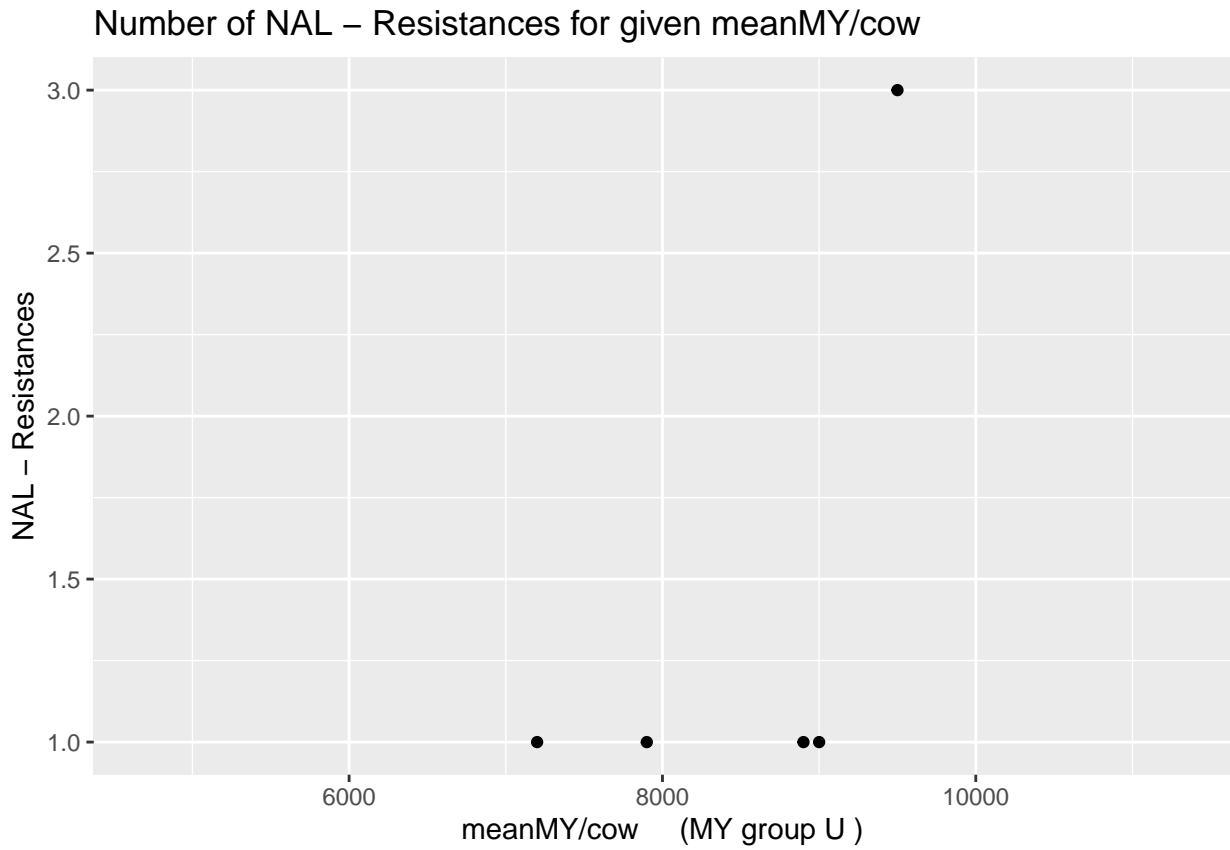


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

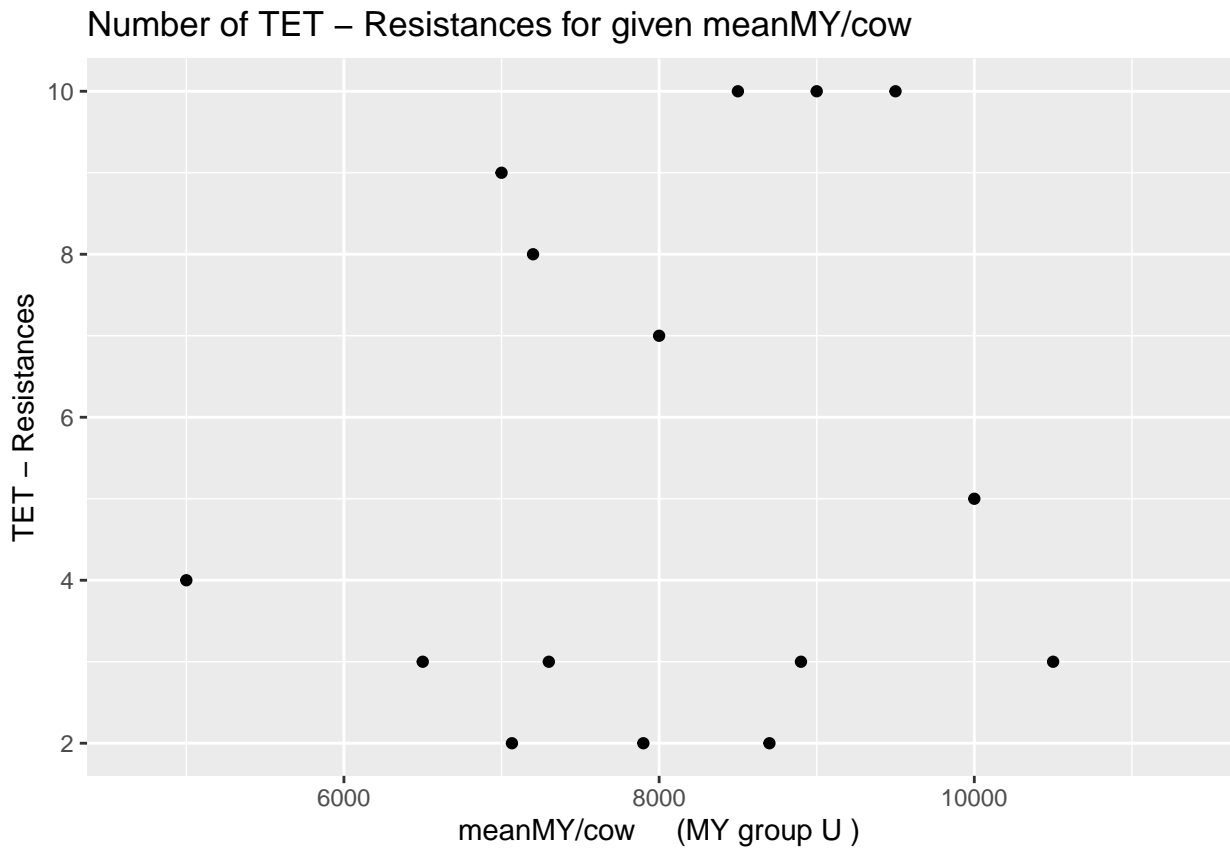
Number of CHL – Resistances for given meanMY/cow



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

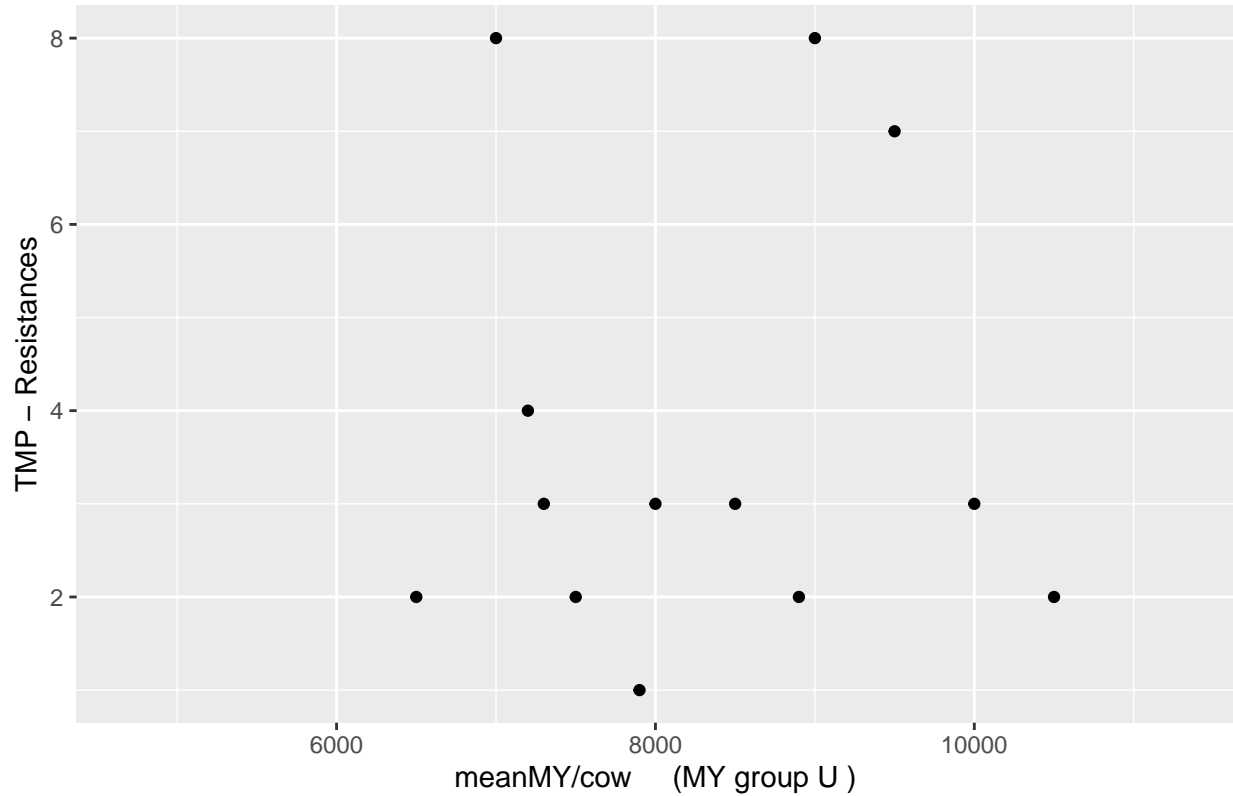


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



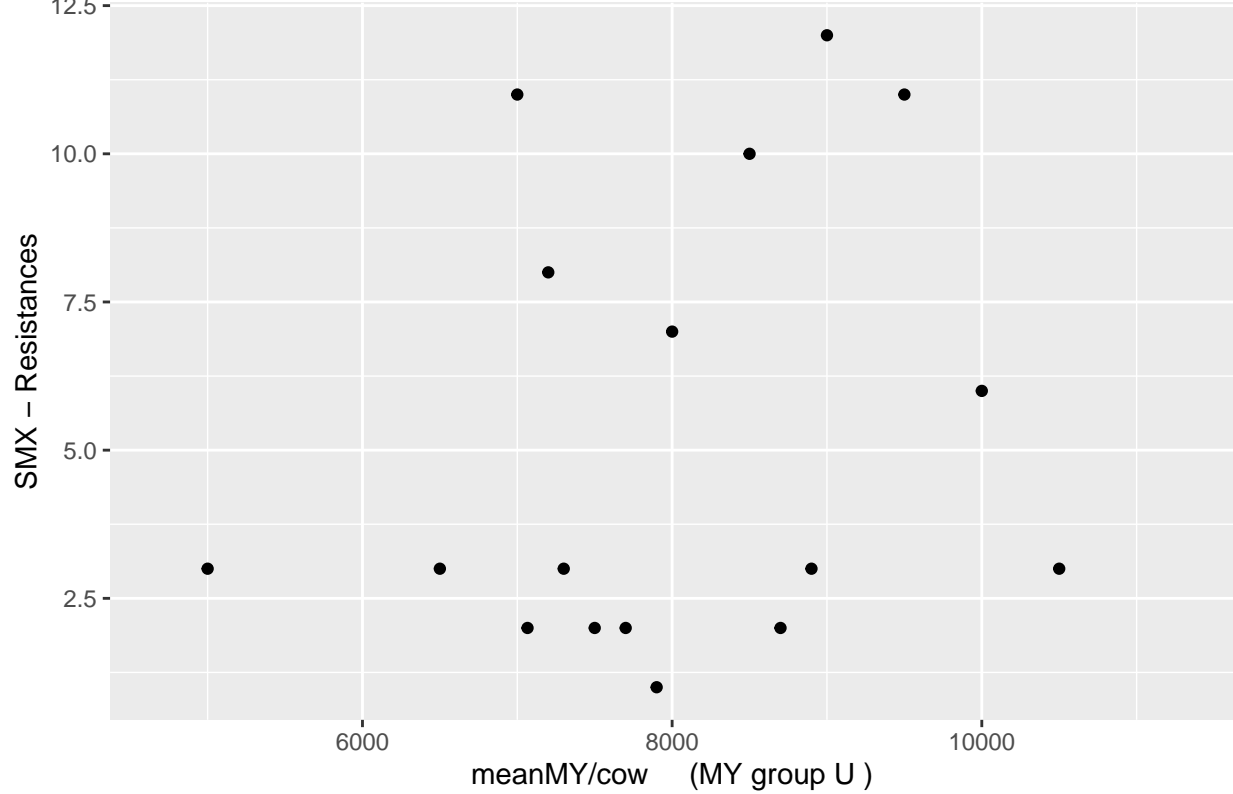
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of TMP – Resistances for given meanMY/cow

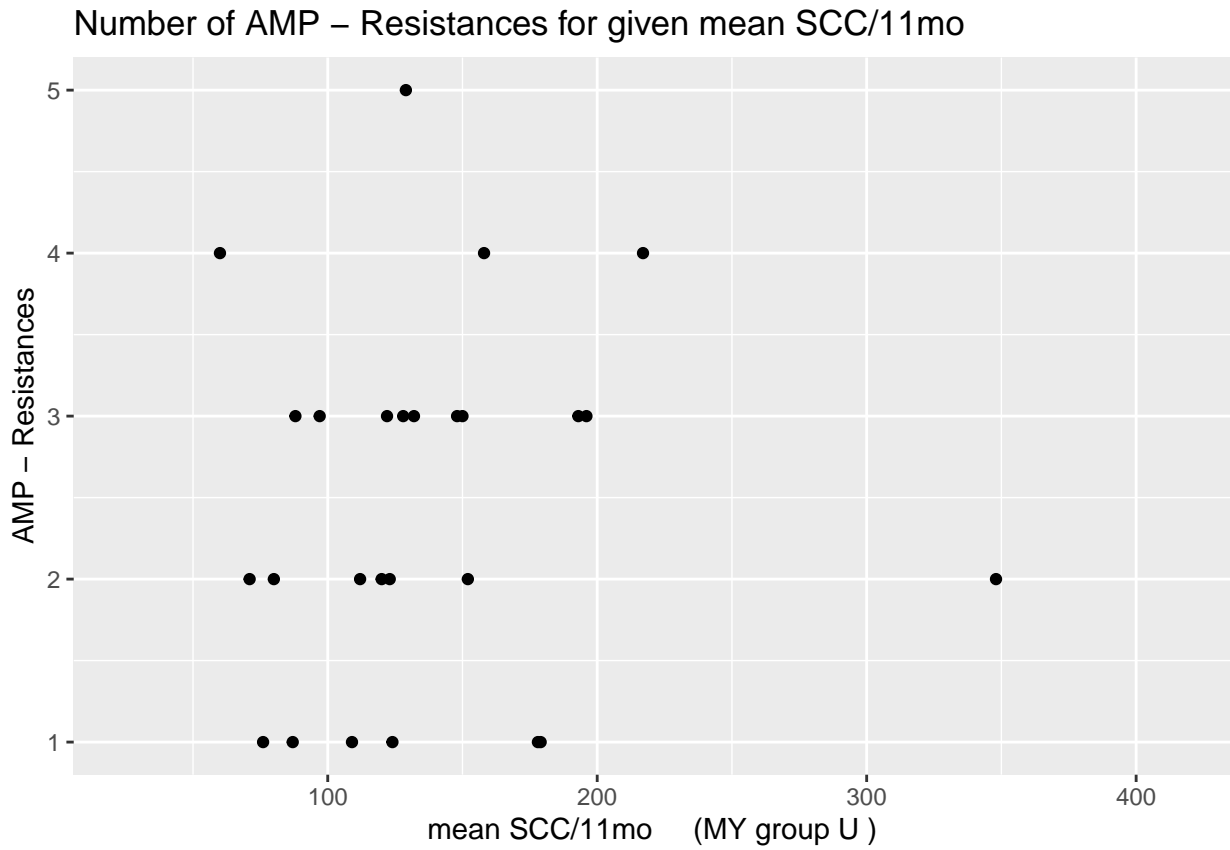


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

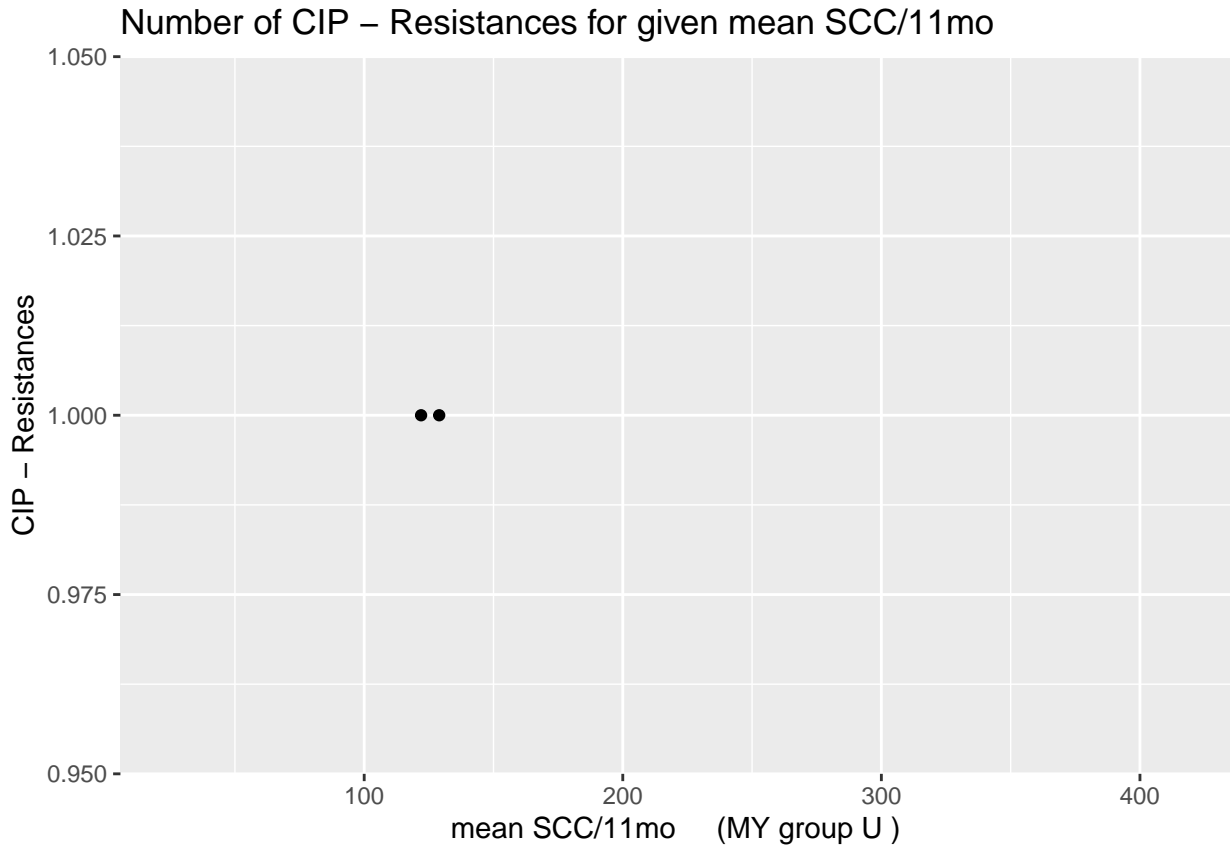
Number of SMX – Resistances for given meanMY/cow



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

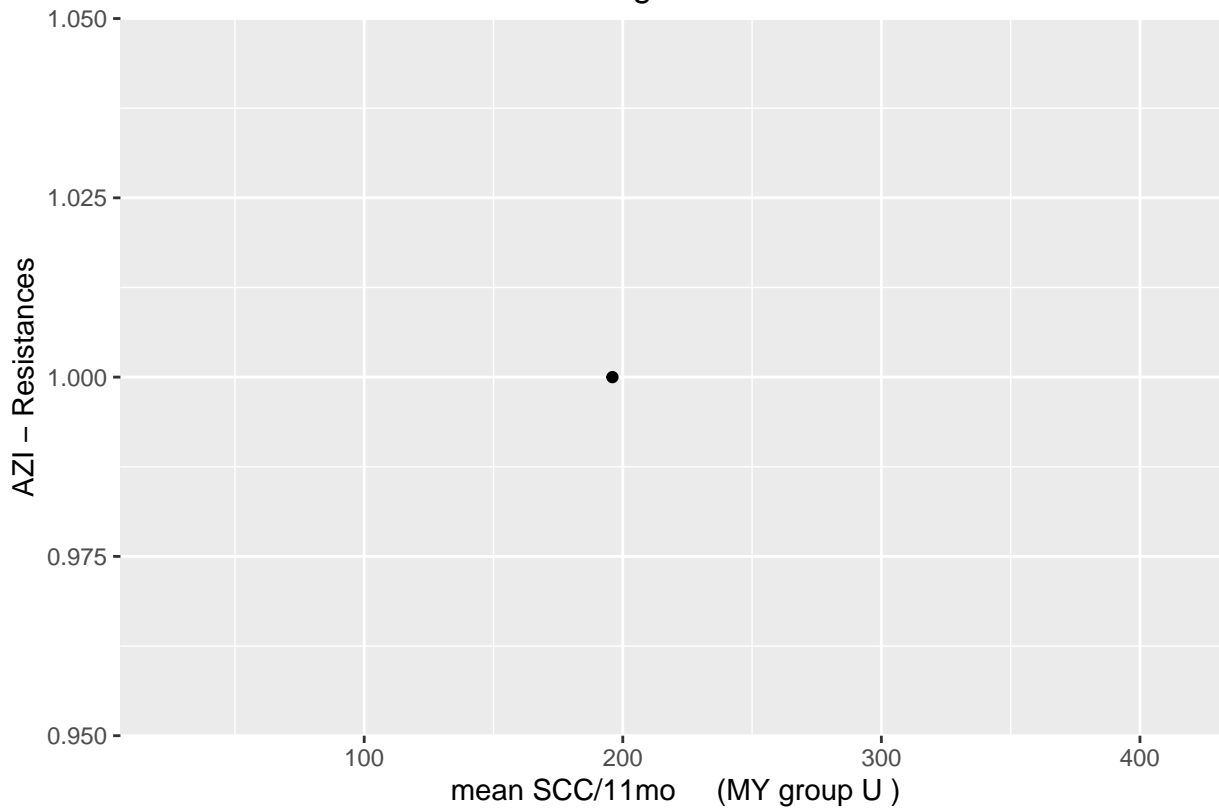



```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



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

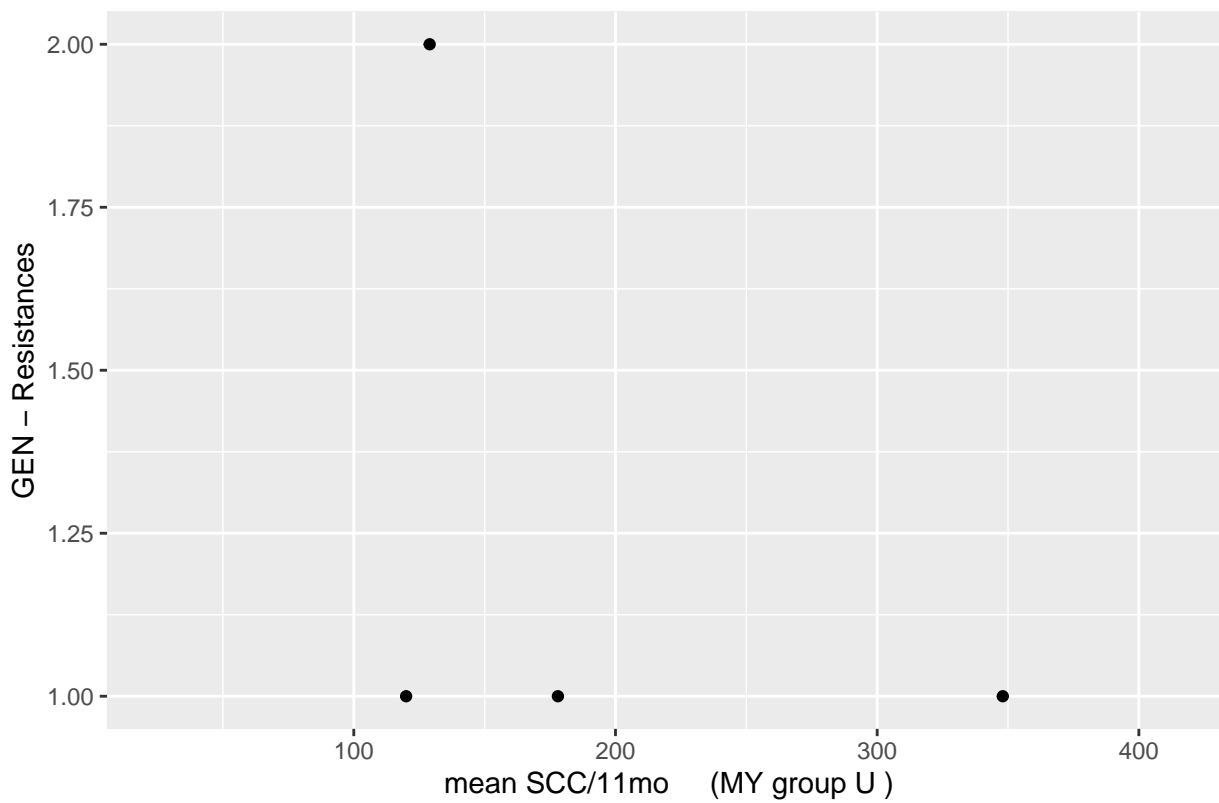
Number of AZI – Resistances for given mean SCC/11mo



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

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

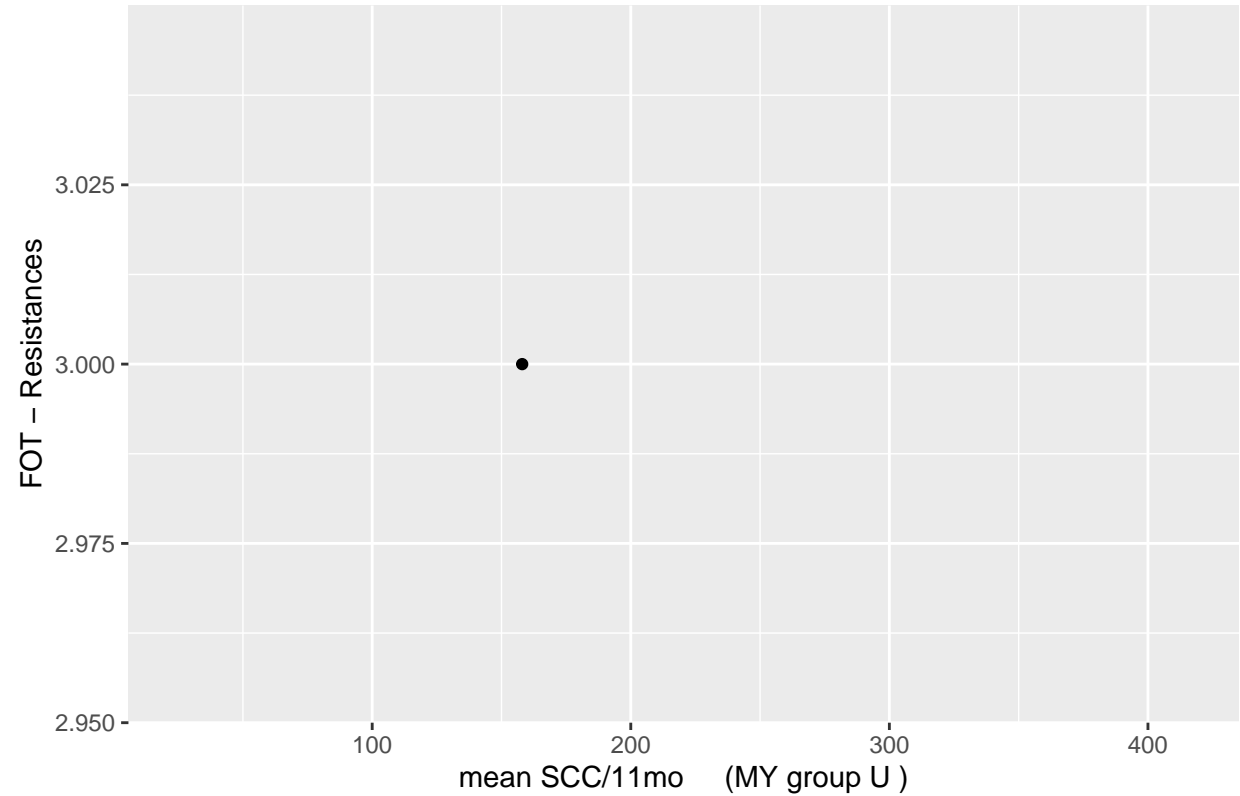
Number of GEN – Resistances for given mean SCC/11mo



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

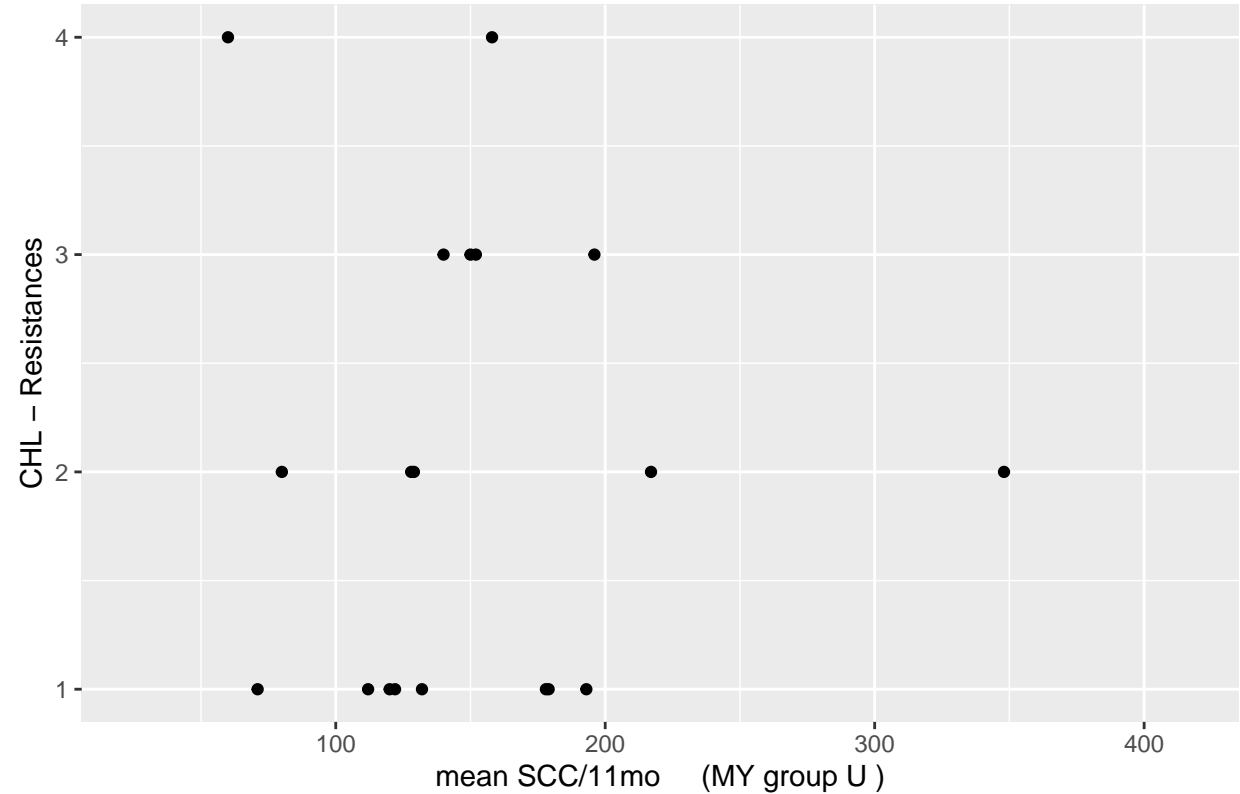
```
## Saving 6.5 x 4.5 in image
```

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

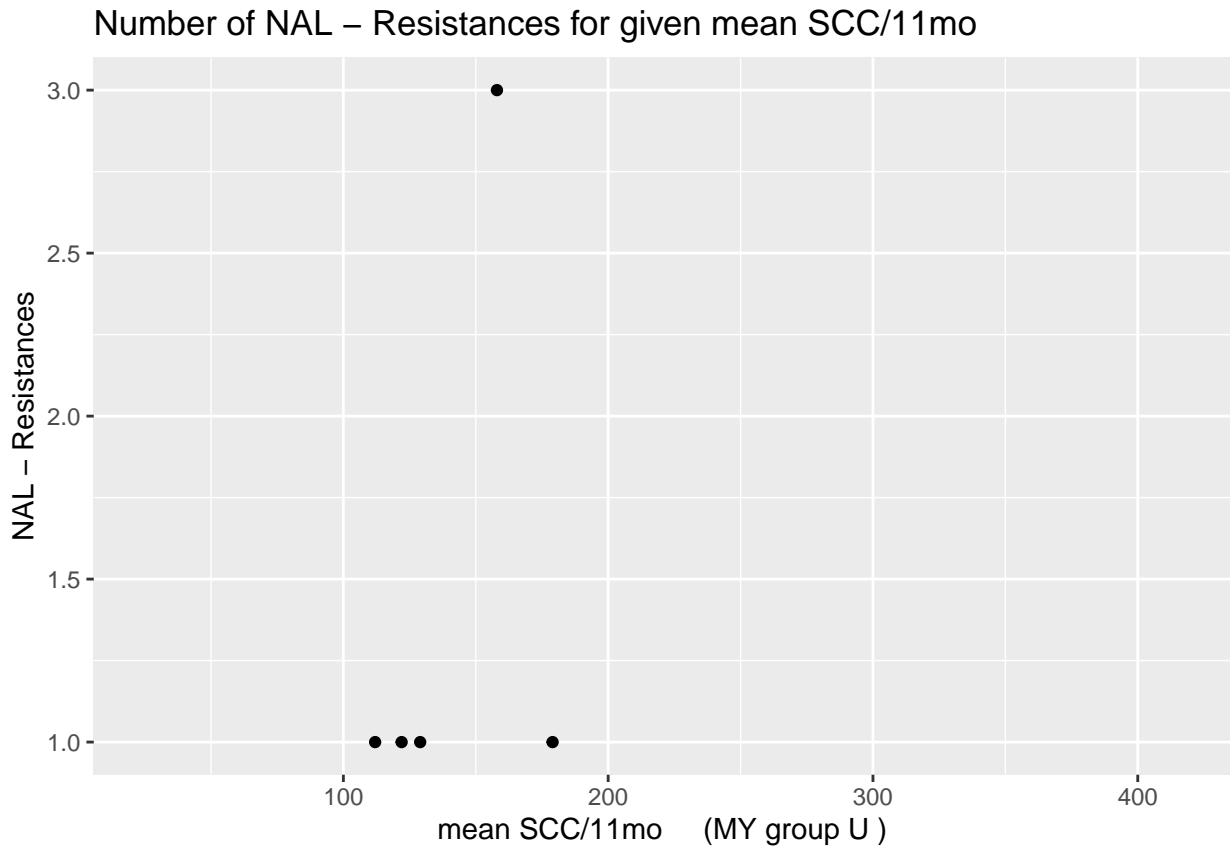


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

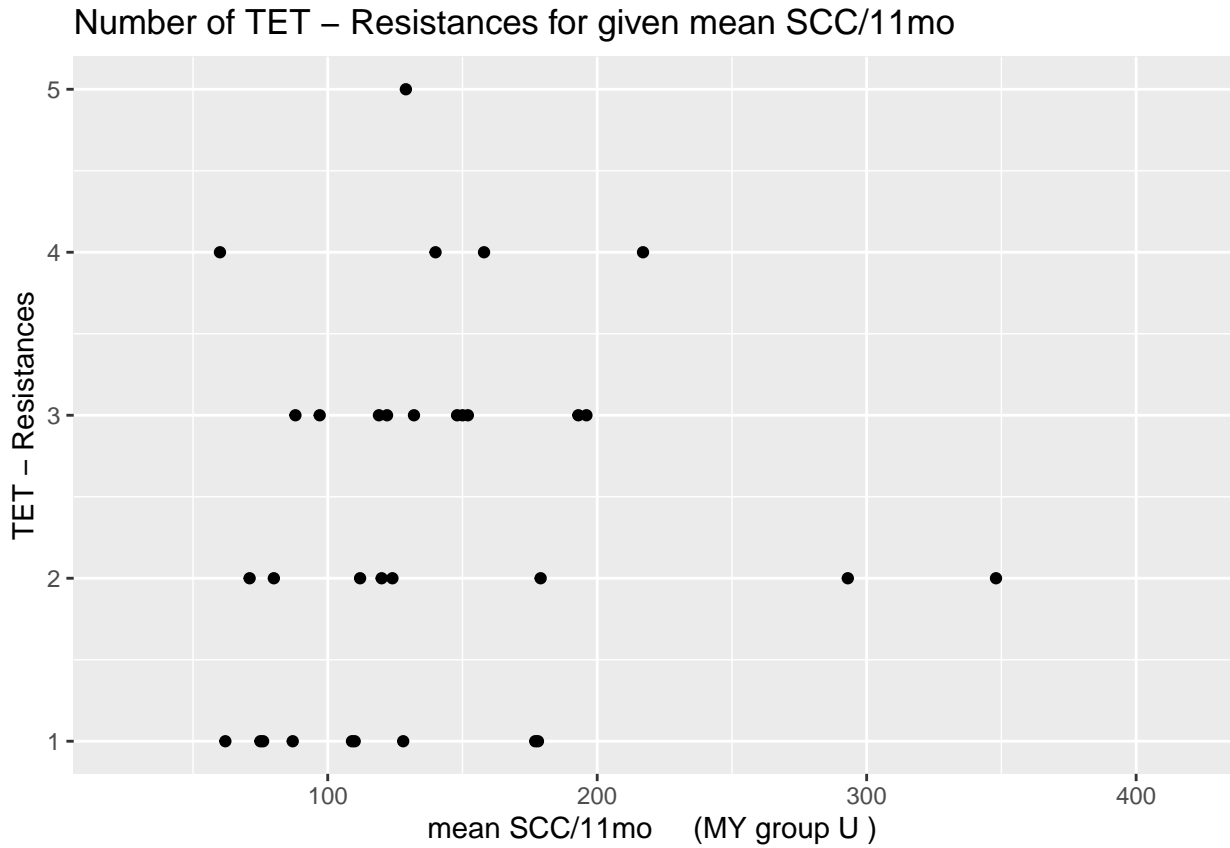
Number of CHL – Resistances for given mean SCC/11mo



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

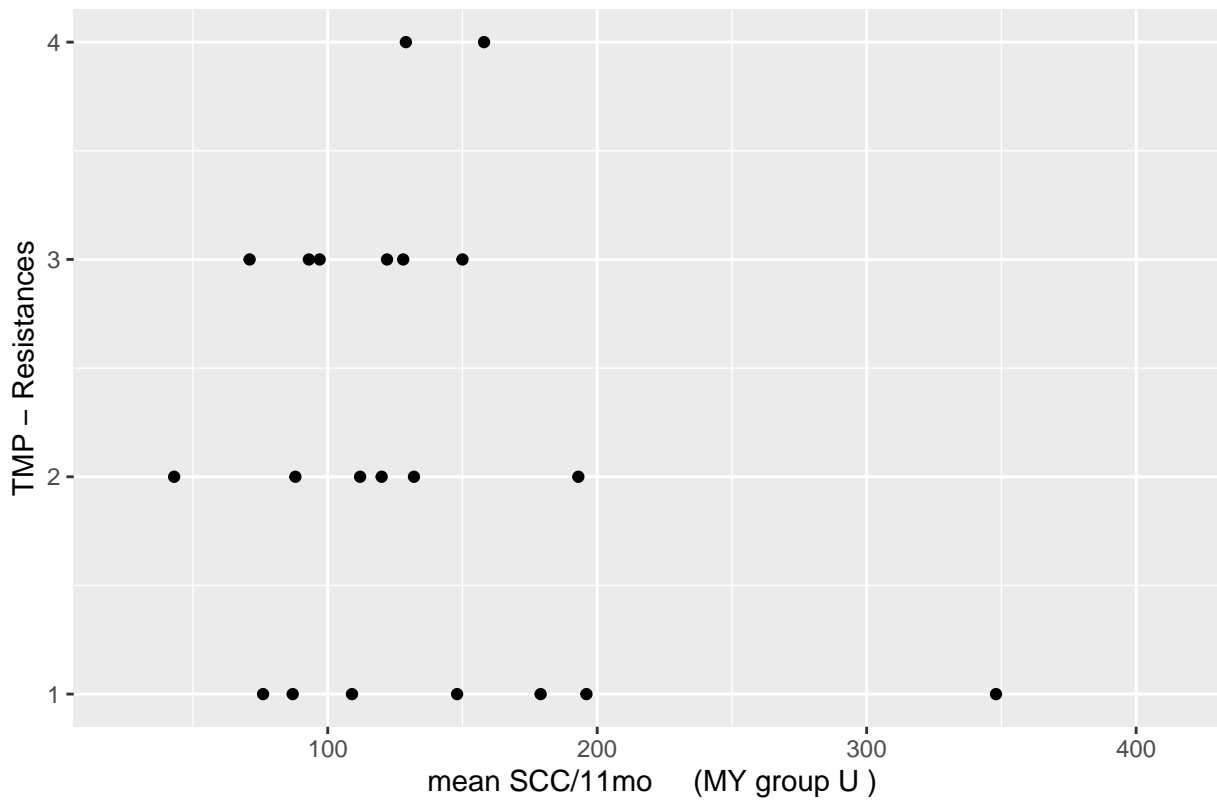


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



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

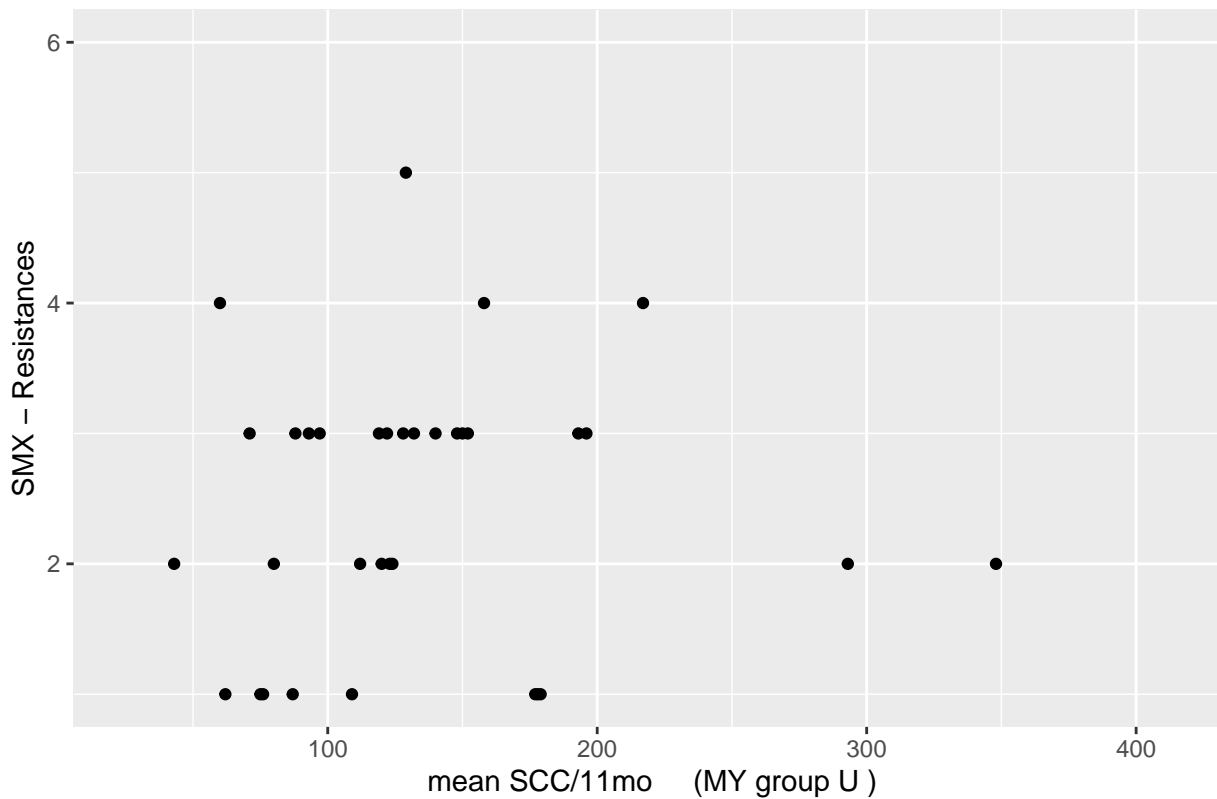
Number of TMP – Resistances for given mean SCC/11mo



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

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

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

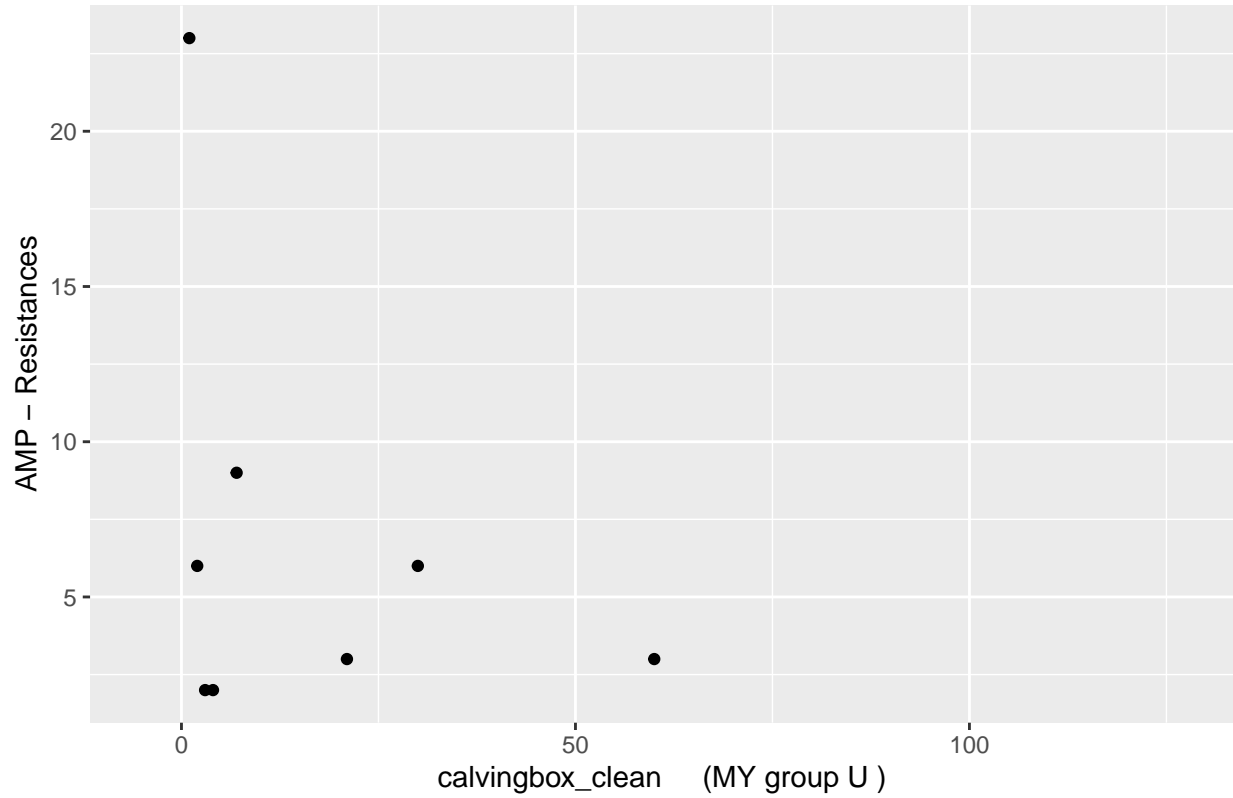


```
## [1] ""
```

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

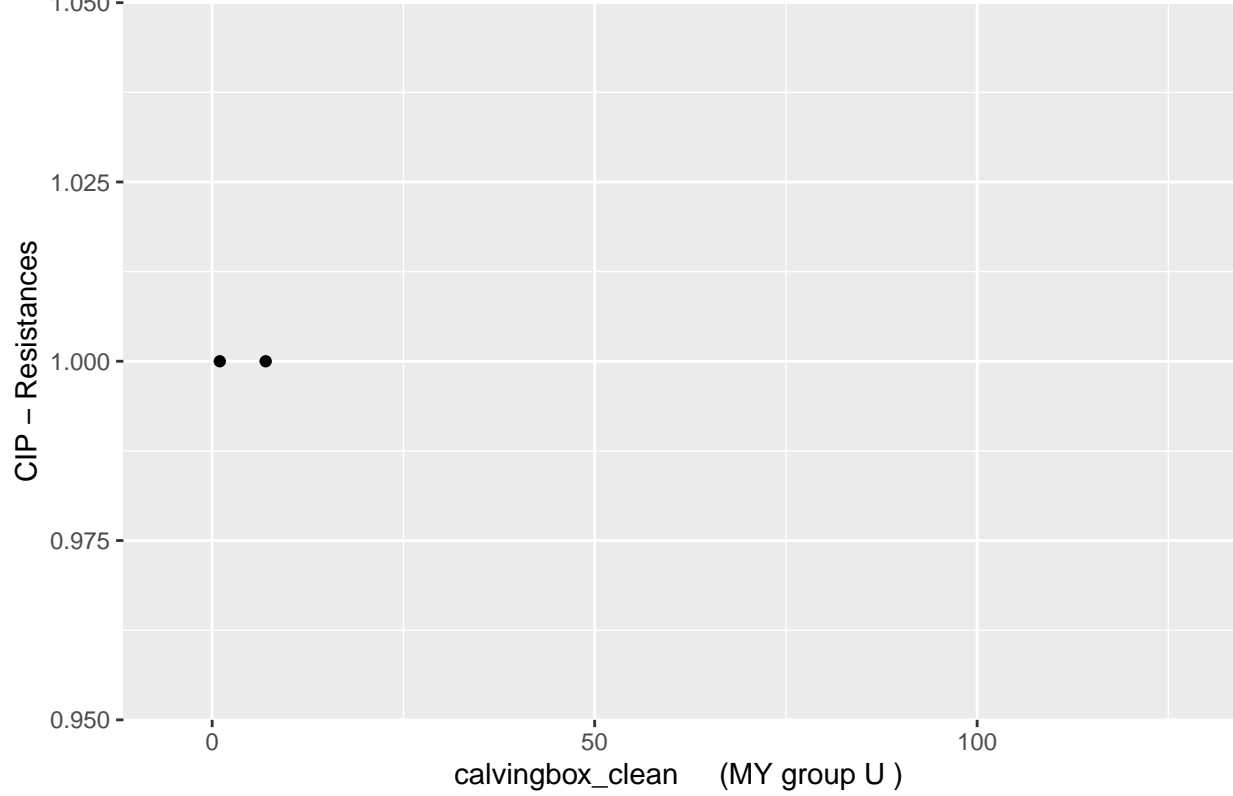
```
## Saving 6.5 x 4.5 in image
```

Number of AMP – Resistances for given calvingbox_clean

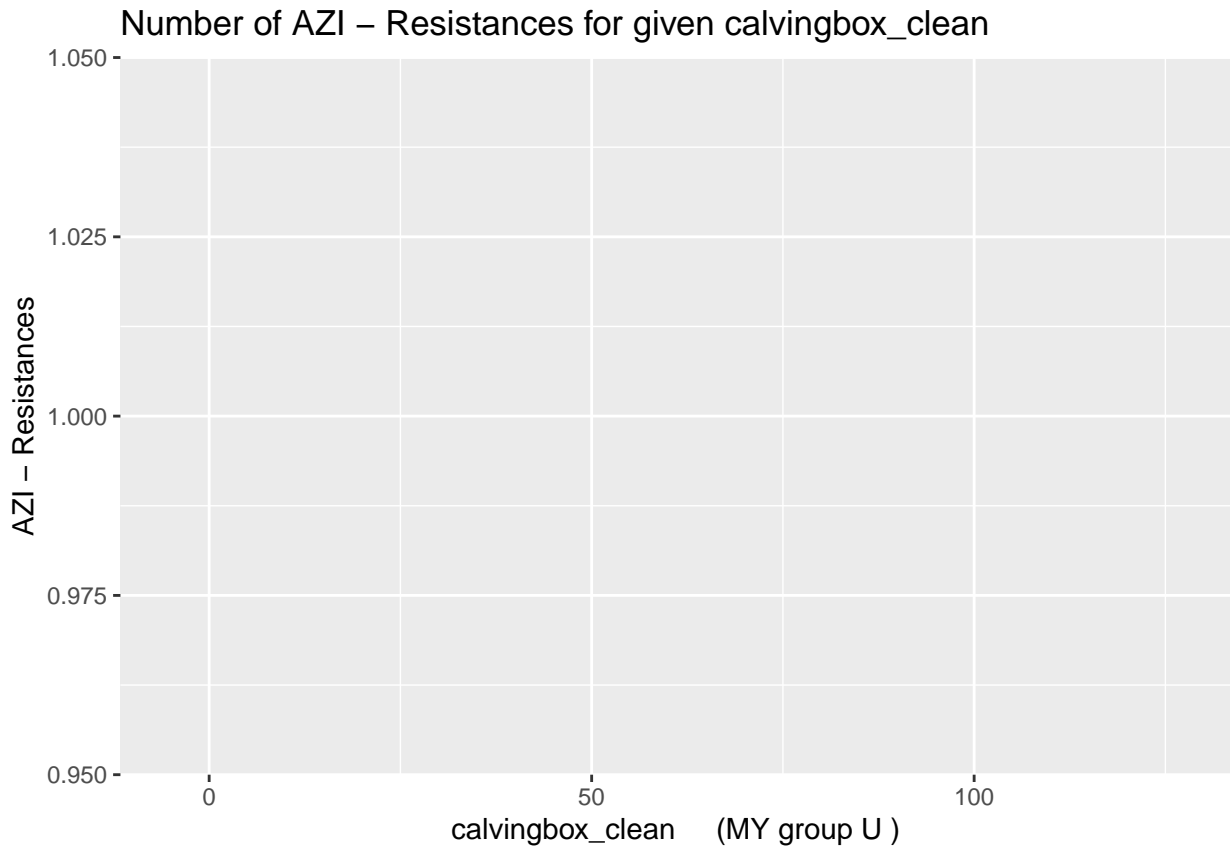


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

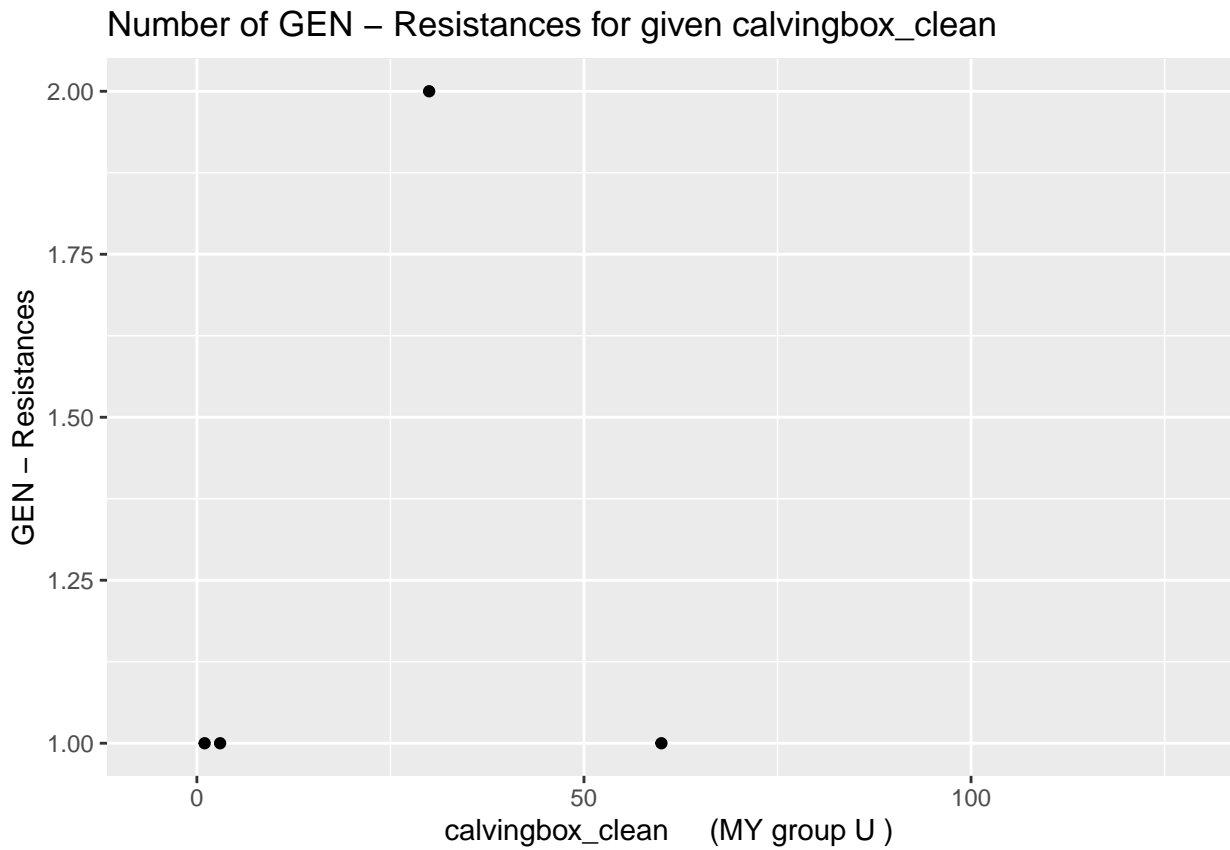
Number of CIP – Resistances for given calvingbox_clean



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

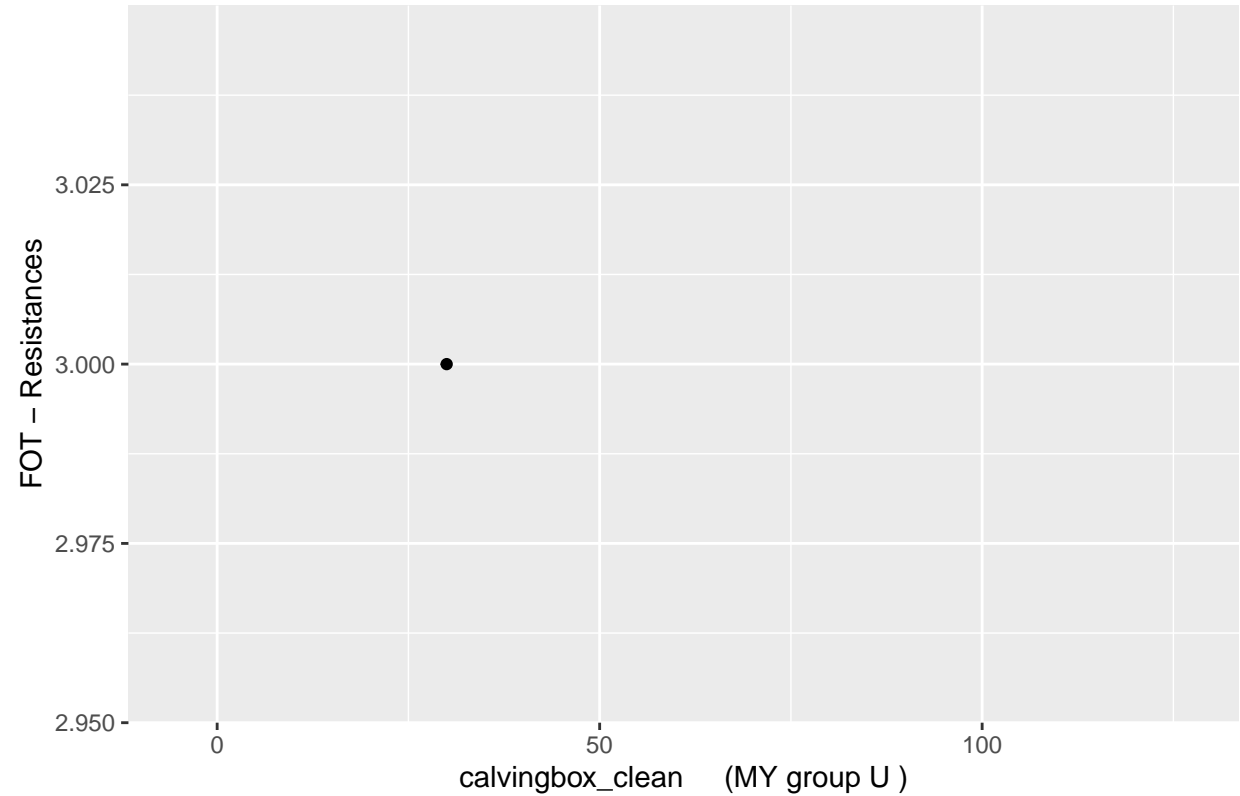


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



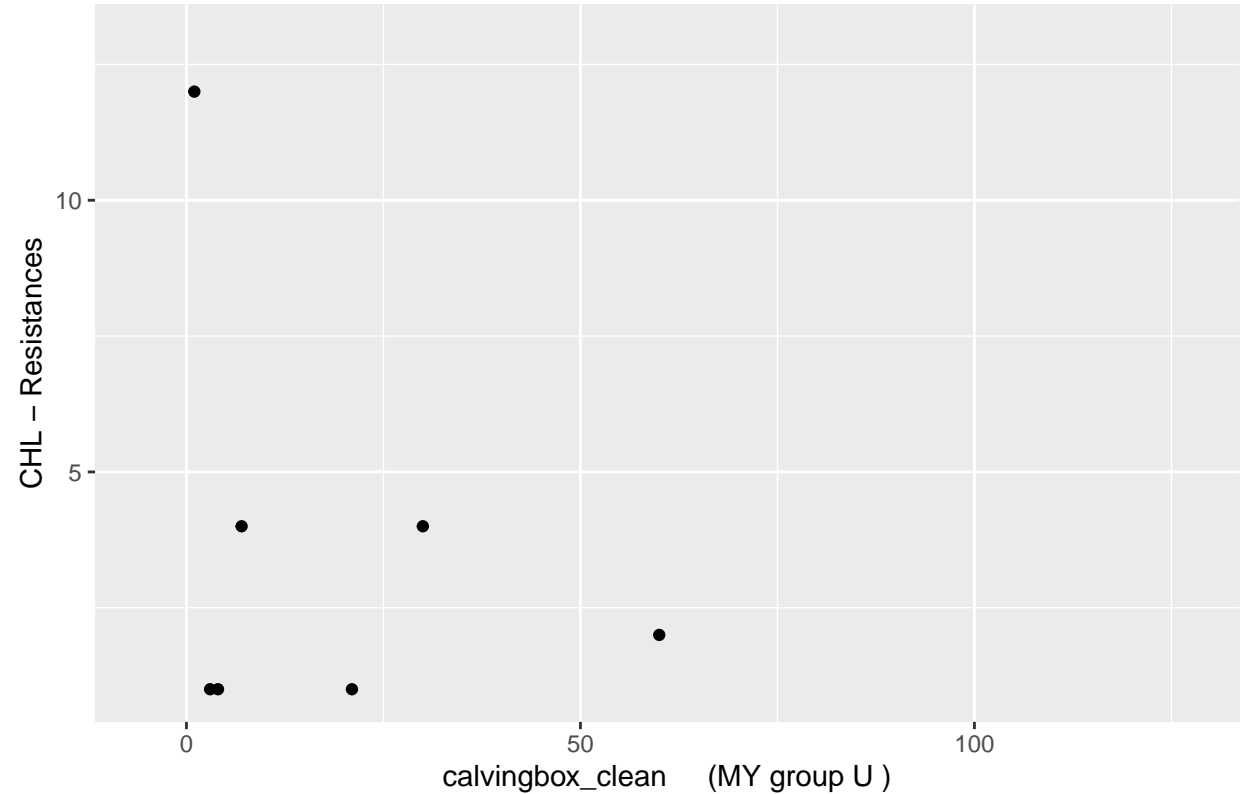
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given calvingbox_clean

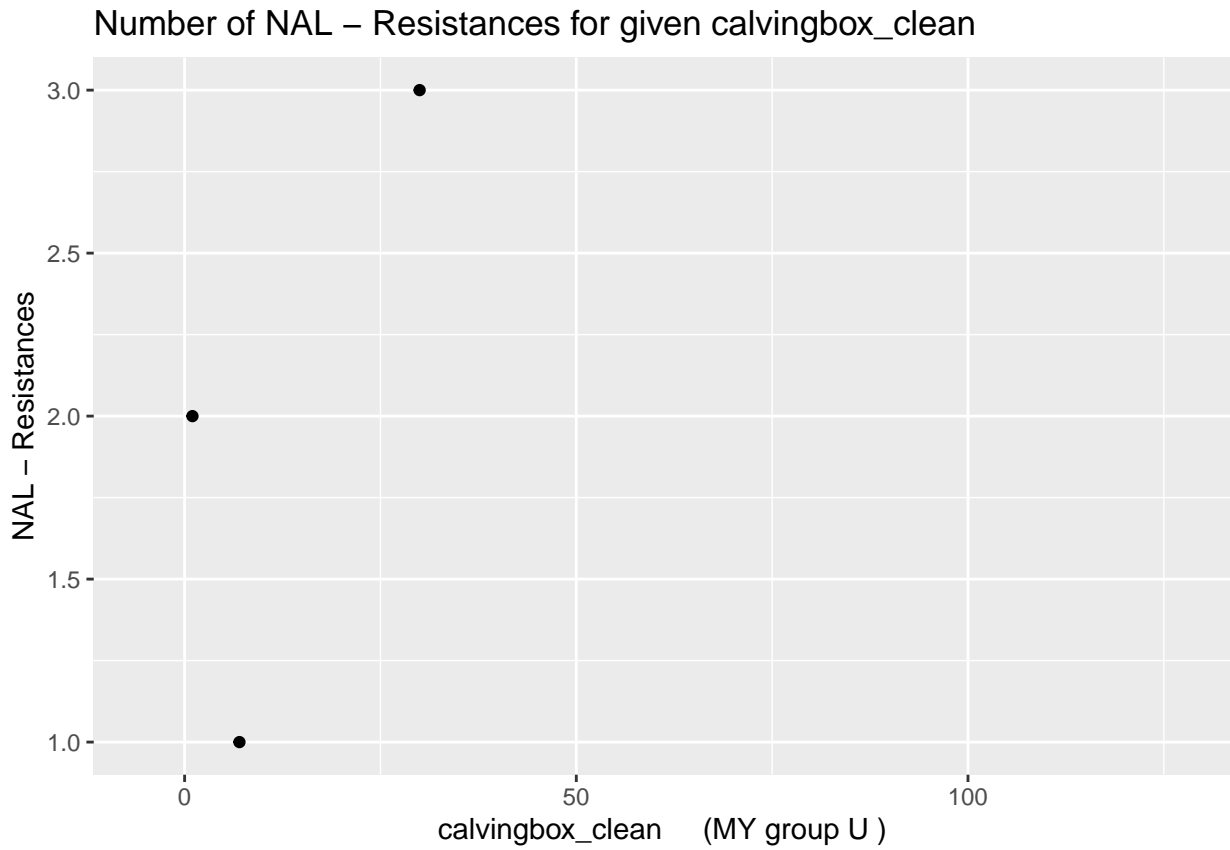


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

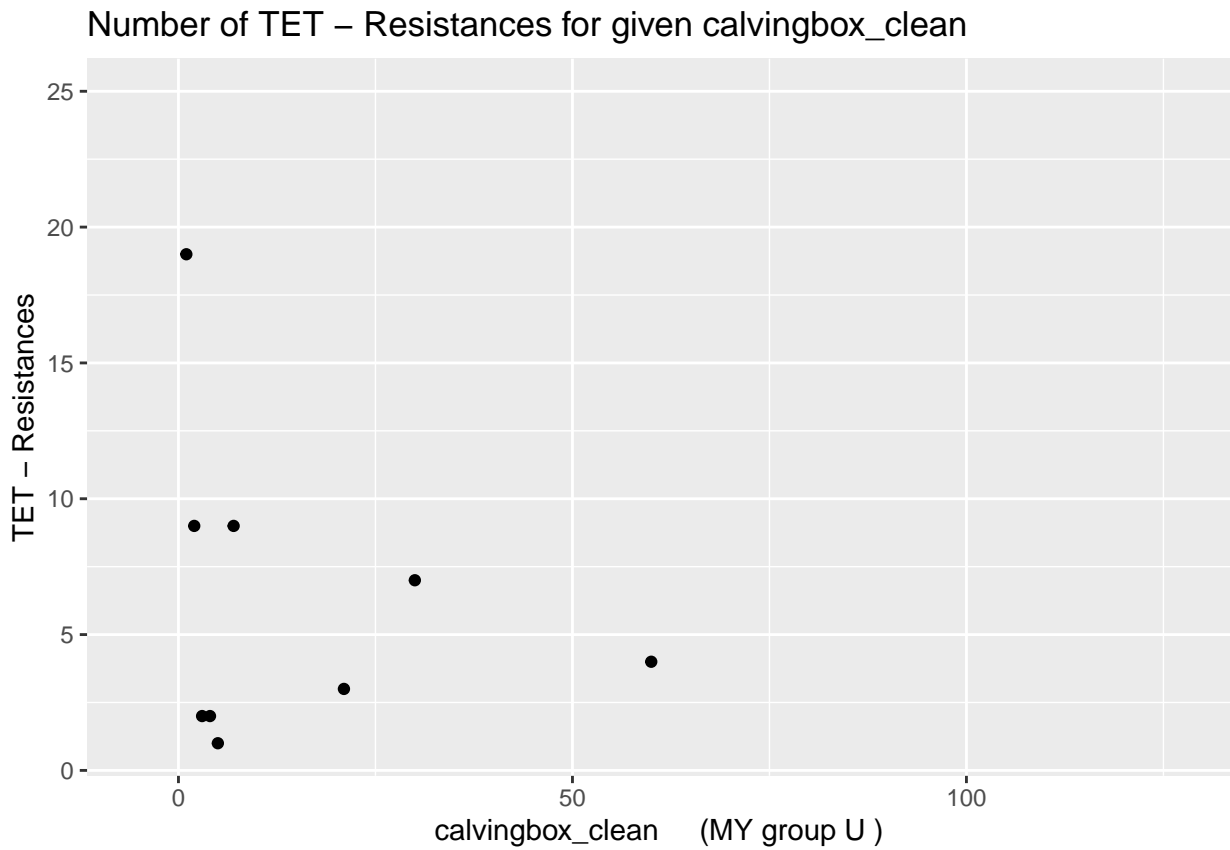
Number of CHL – Resistances for given calvingbox_clean



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

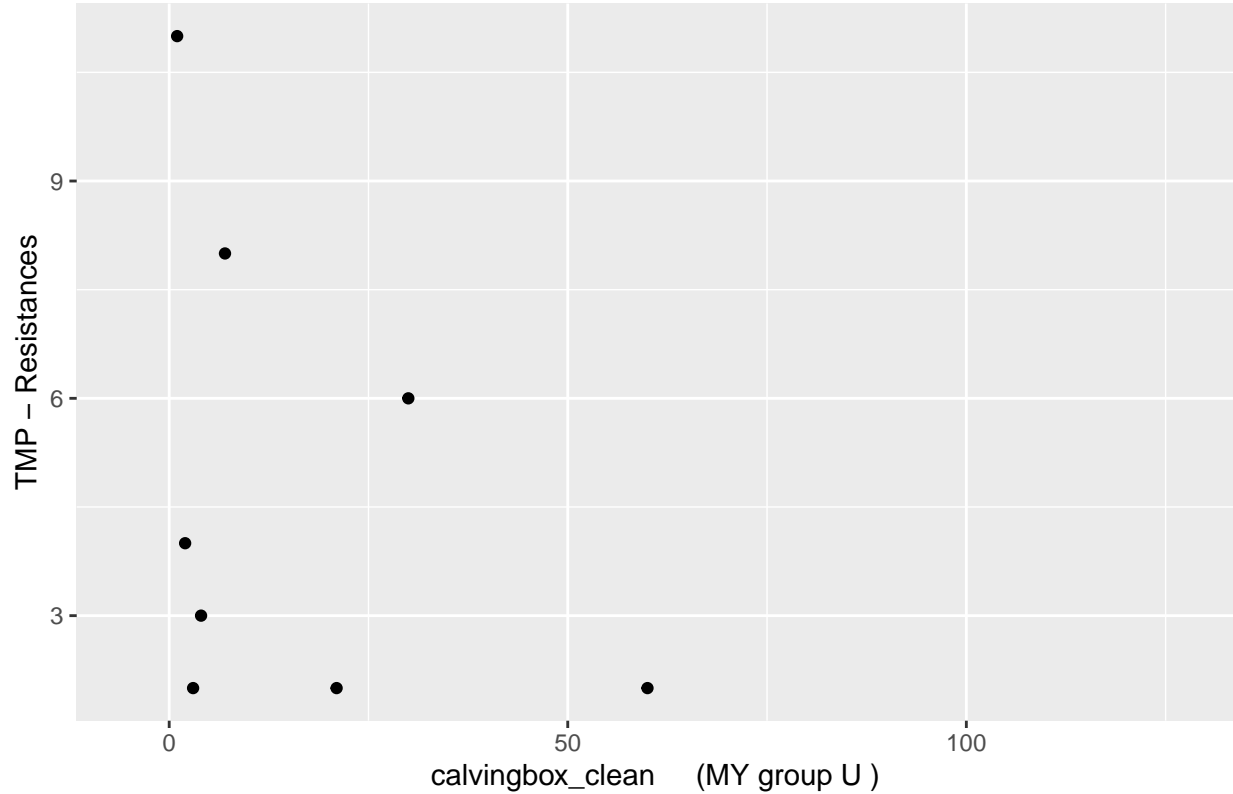



```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



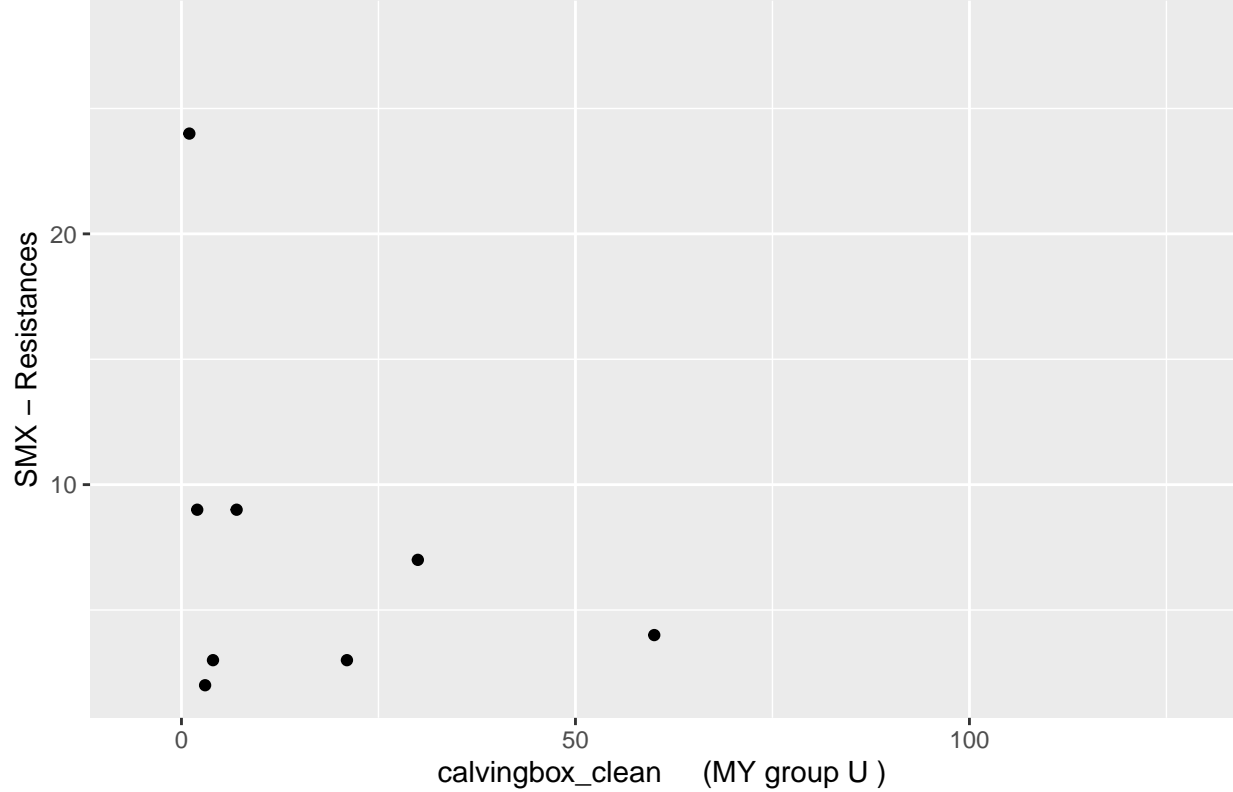
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of TMP – Resistances for given calvingbox_clean



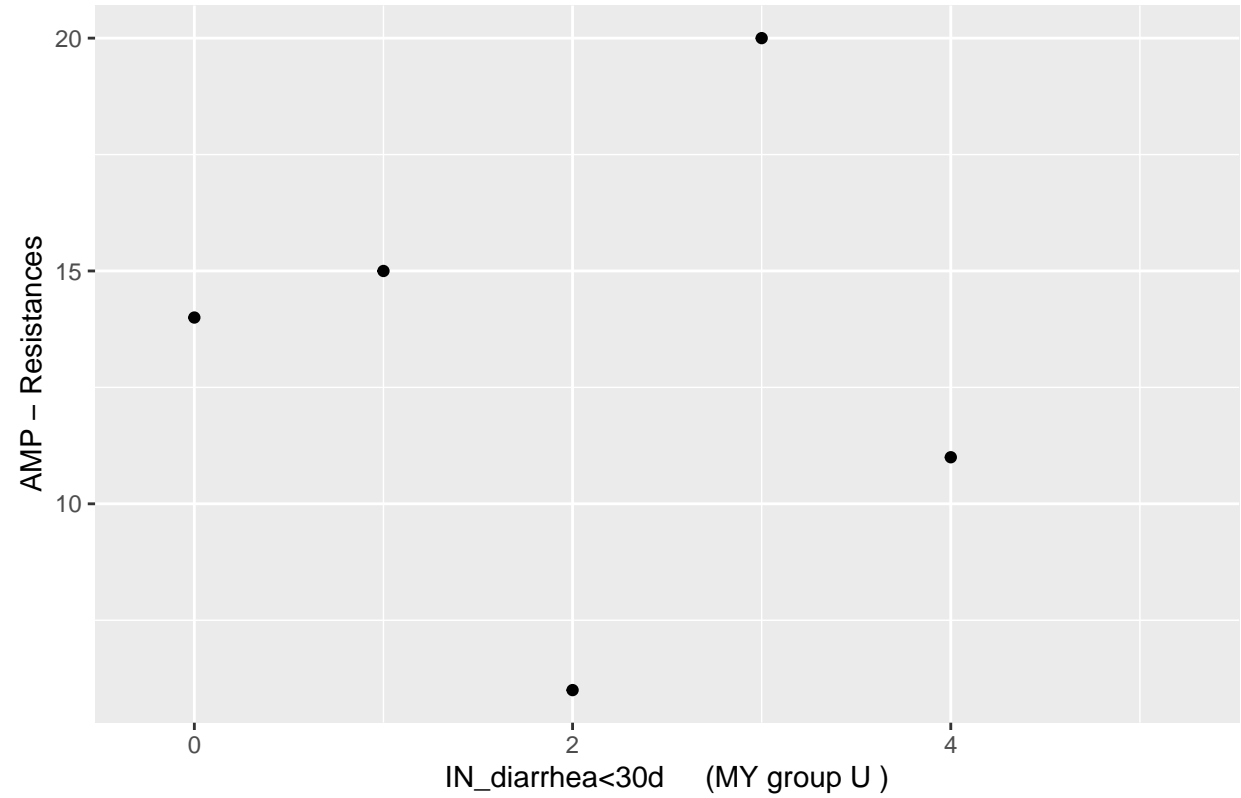
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of SMX – Resistances for given calvingbox_clean



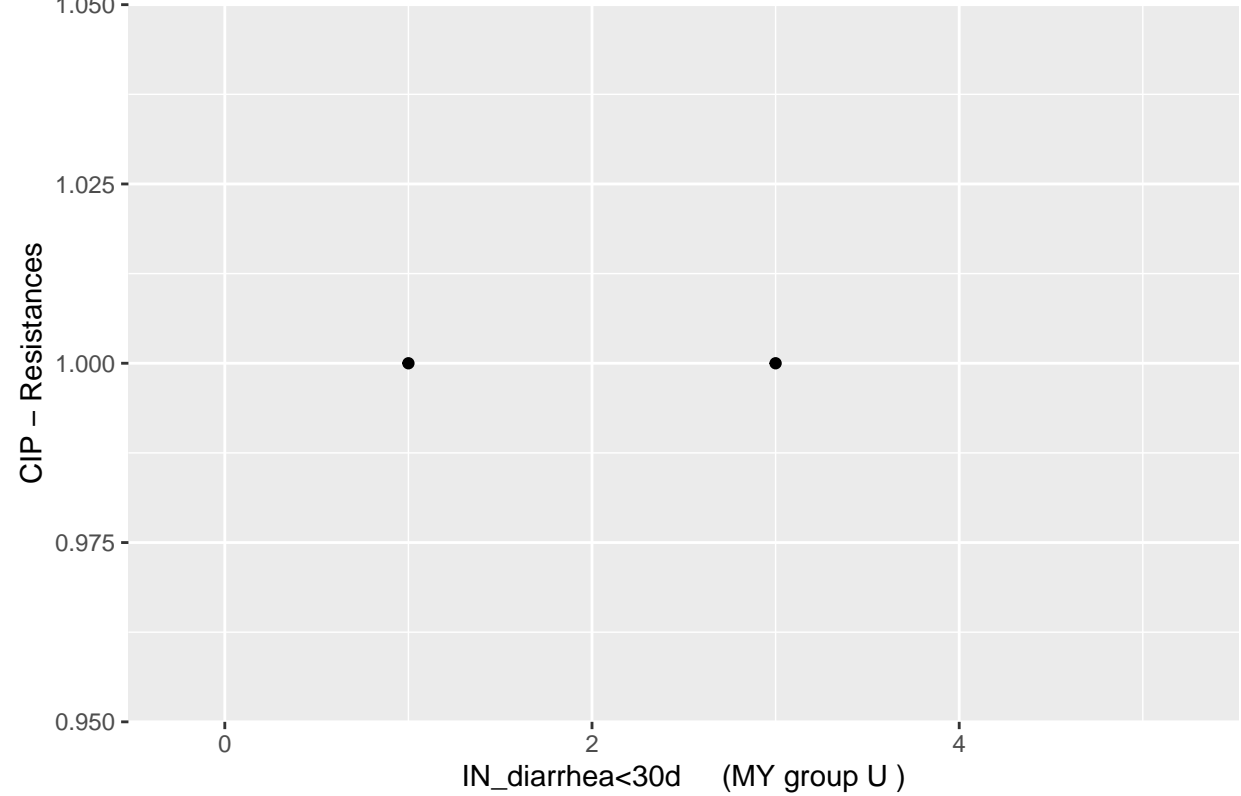
```
## [1] ""  
## [1] "-----"  
## Saving 6.5 x 4.5 in image
```

Number of AMP – Resistances for given IN_diarrhea<30d

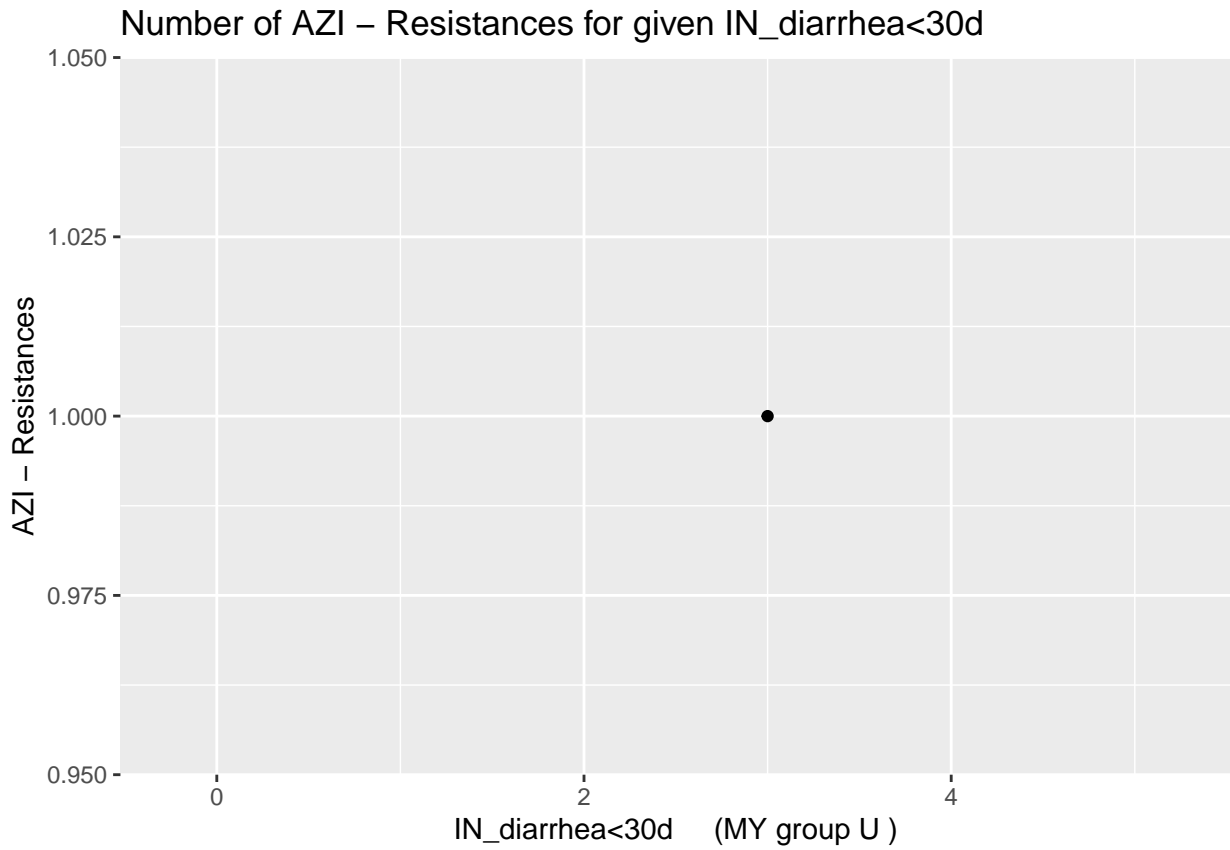


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

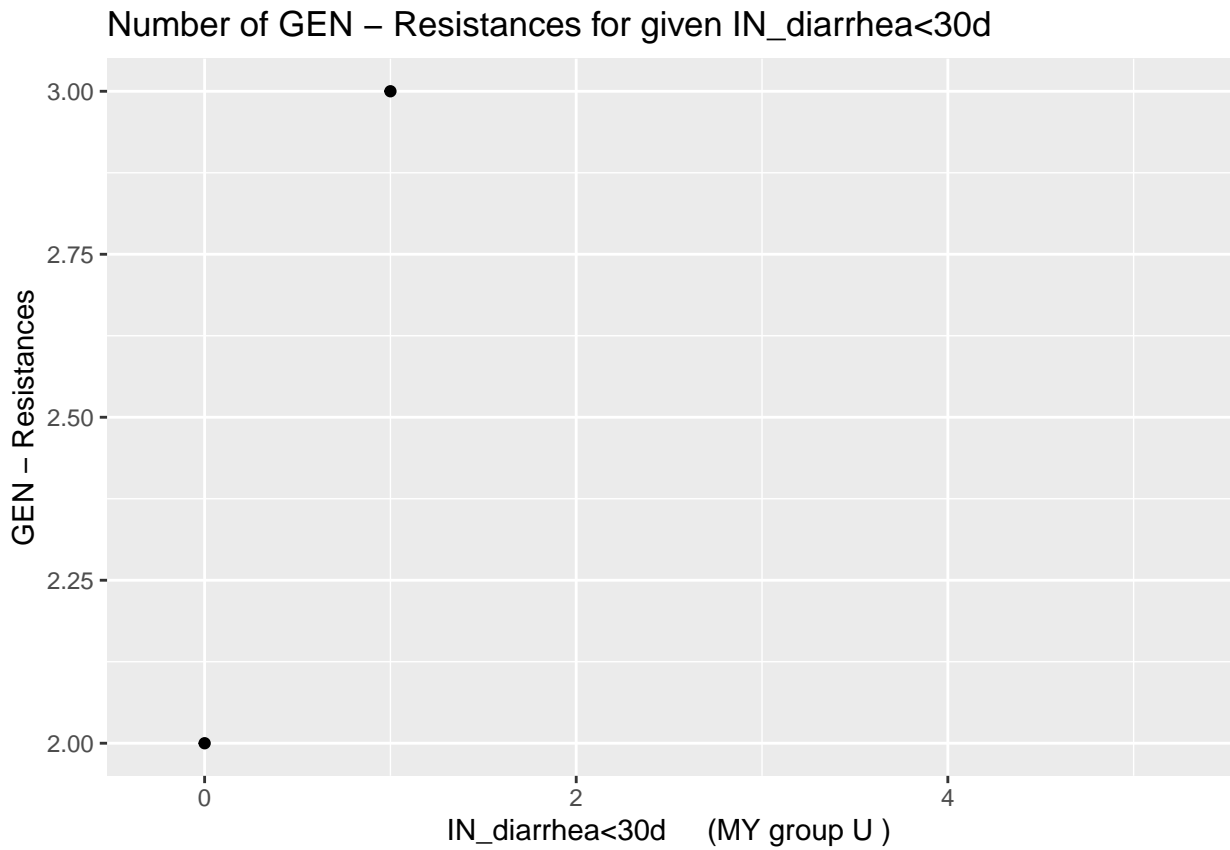
Number of CIP – Resistances for given IN_diarrhea<30d



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

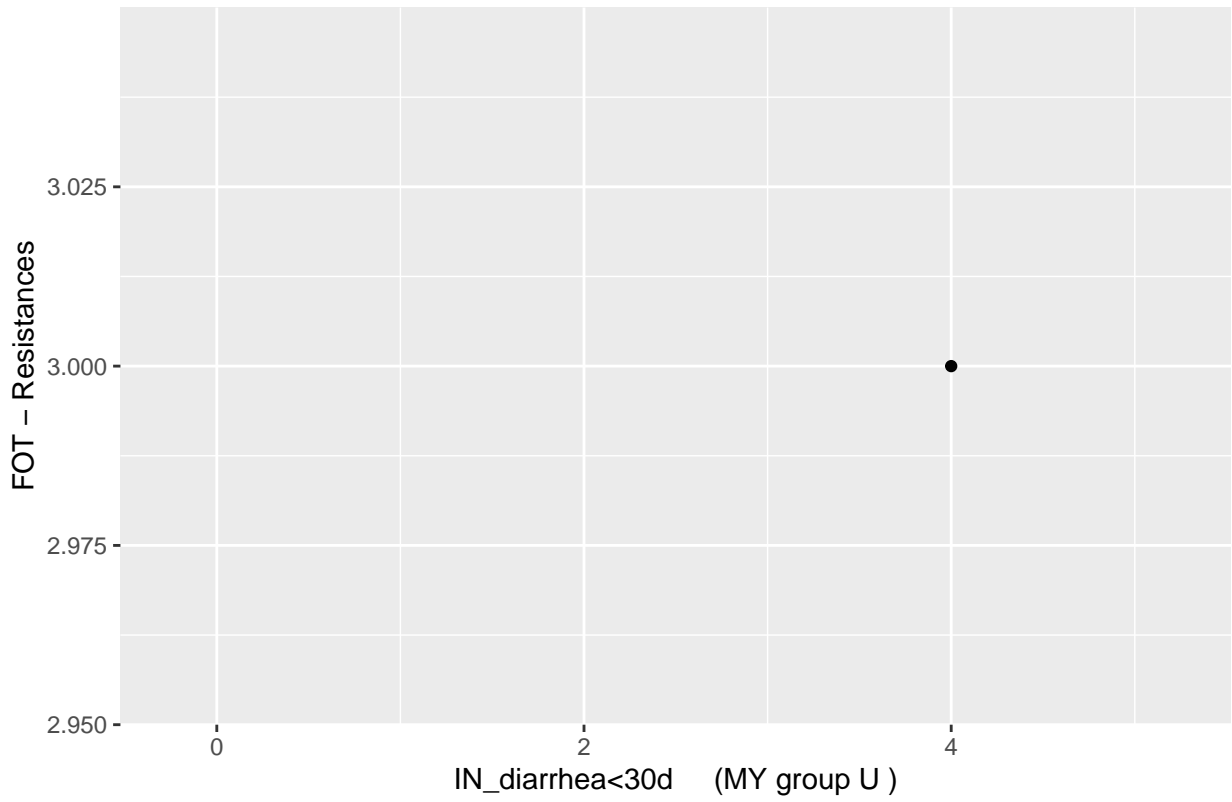


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



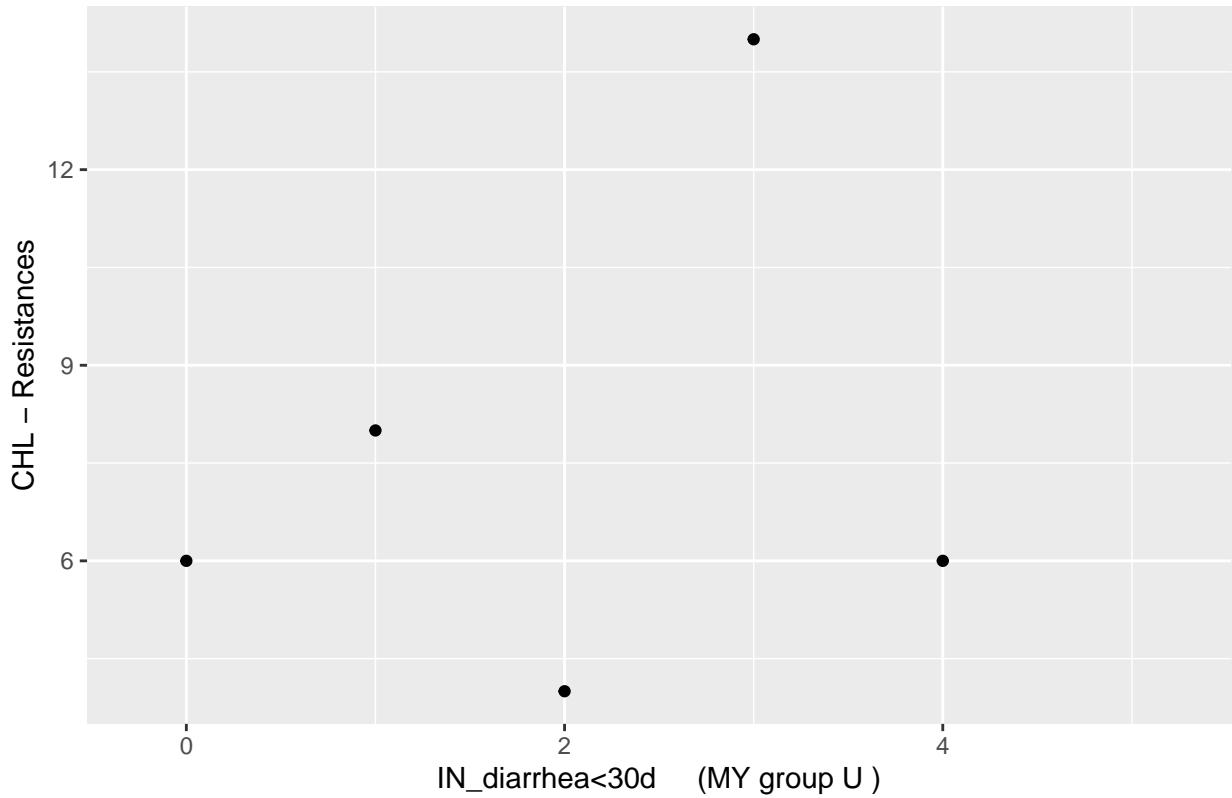
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of FOT – Resistances for given IN_diarrhea<30d

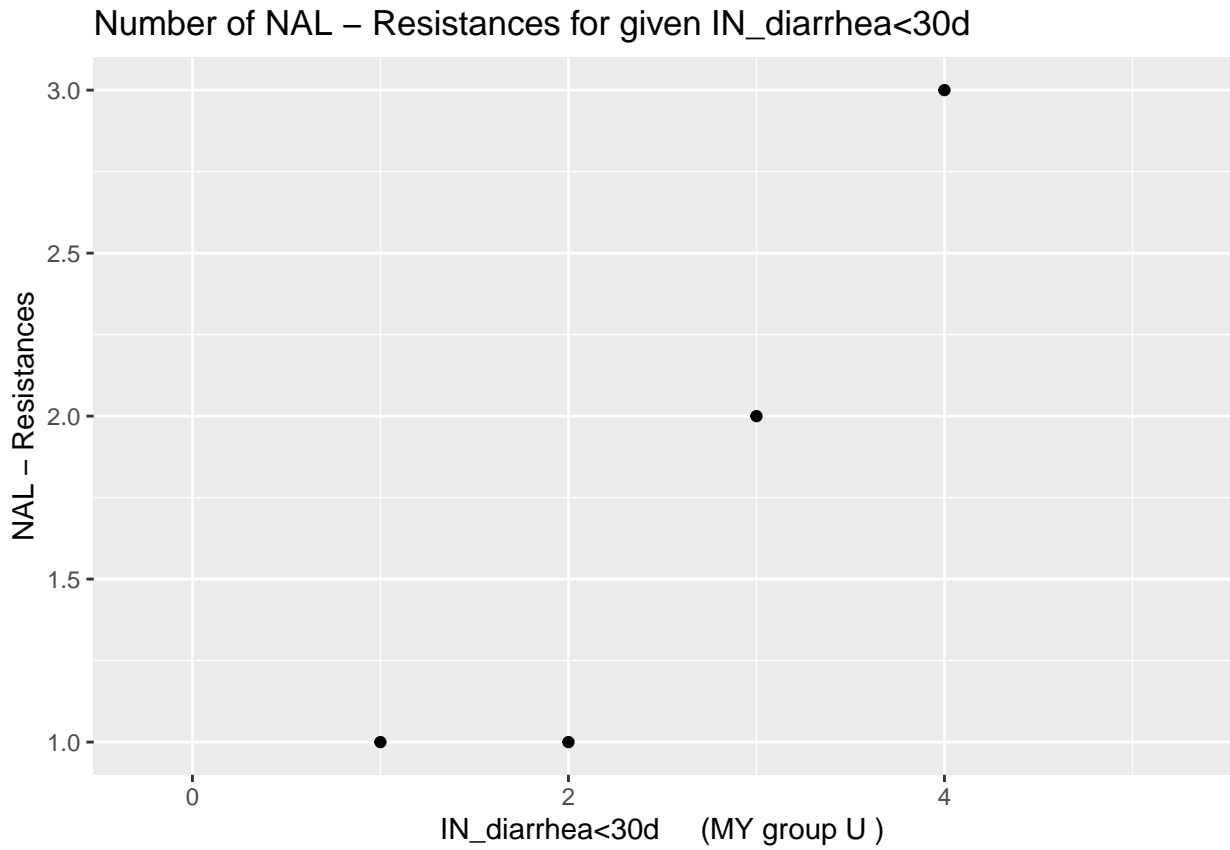


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

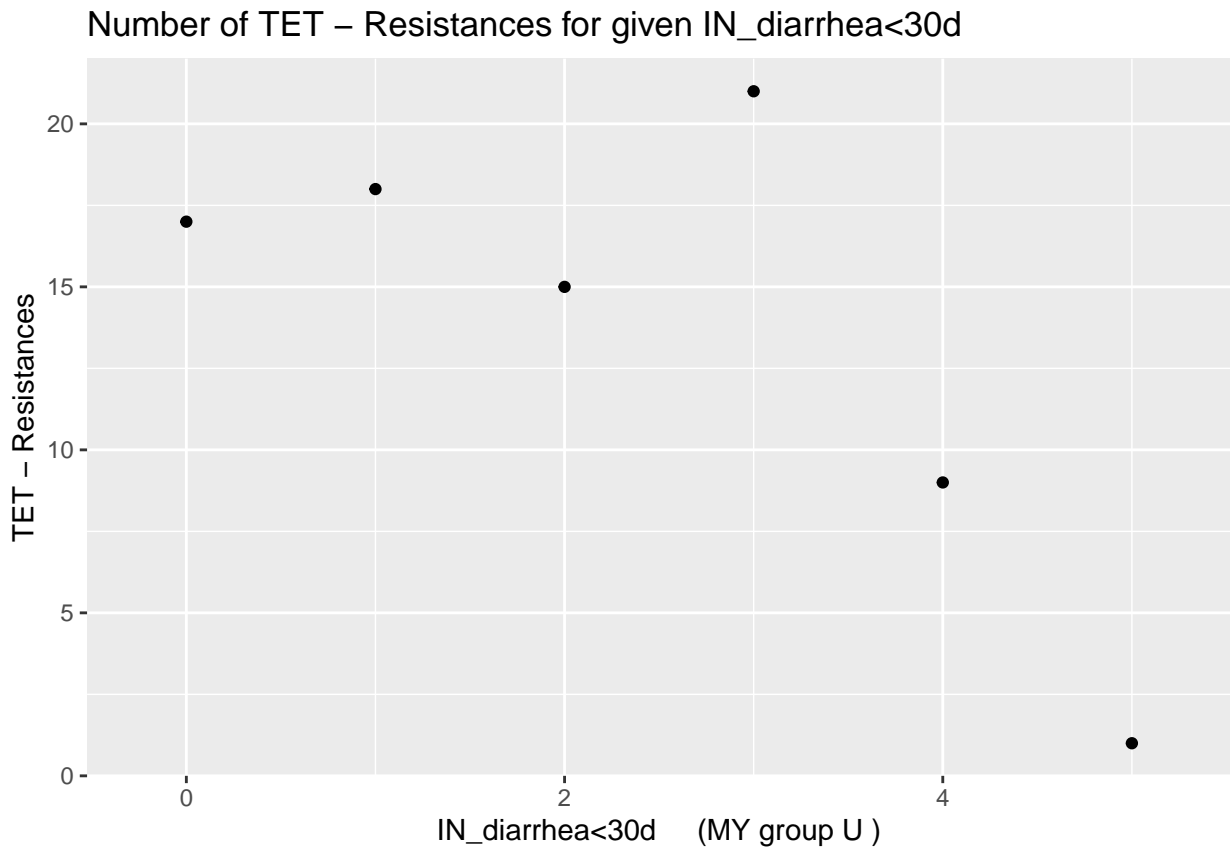
Number of CHL – Resistances for given IN_diarrhea<30d



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

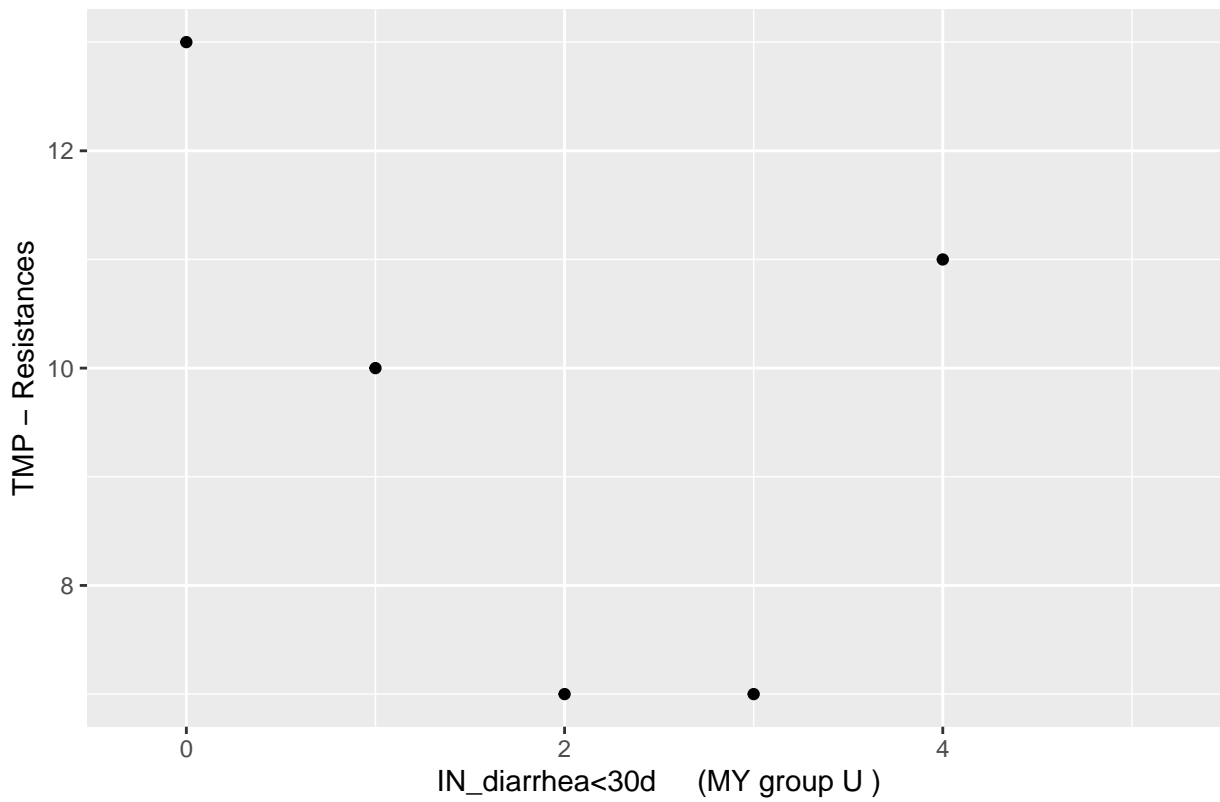


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



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

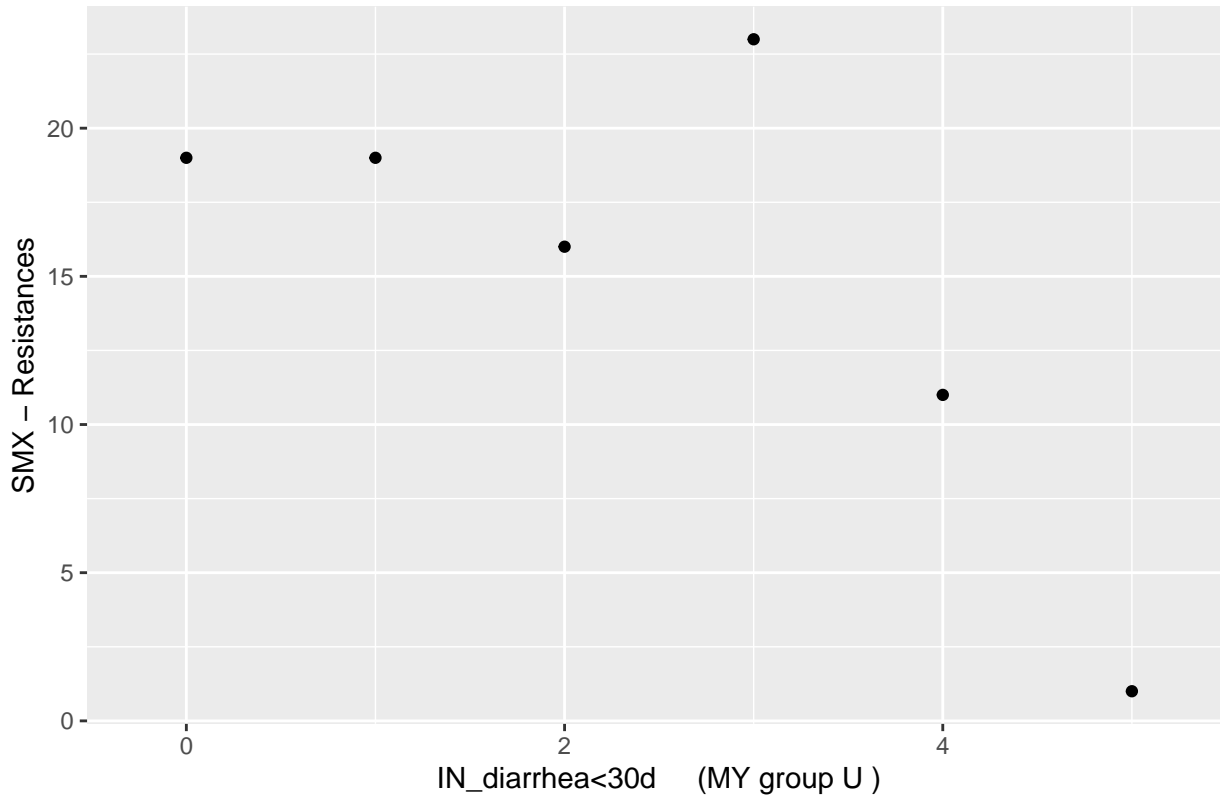
Number of TMP – Resistances for given IN_diarrhea<30d



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

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

Number of SMX – Resistances for given IN_diarrhea<30d



```
## [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

```
# NA warnings interessieren nicht

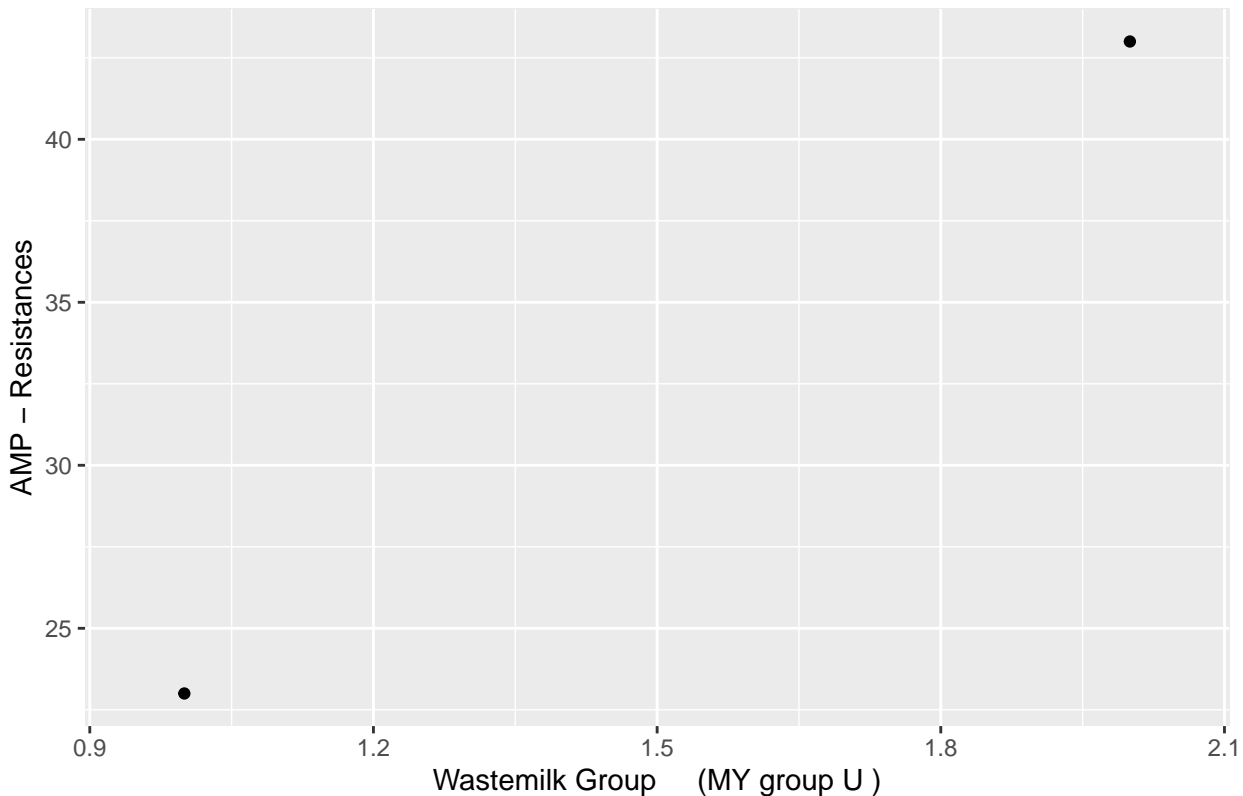
# untersuchte binäre und nominale Variablen

### 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

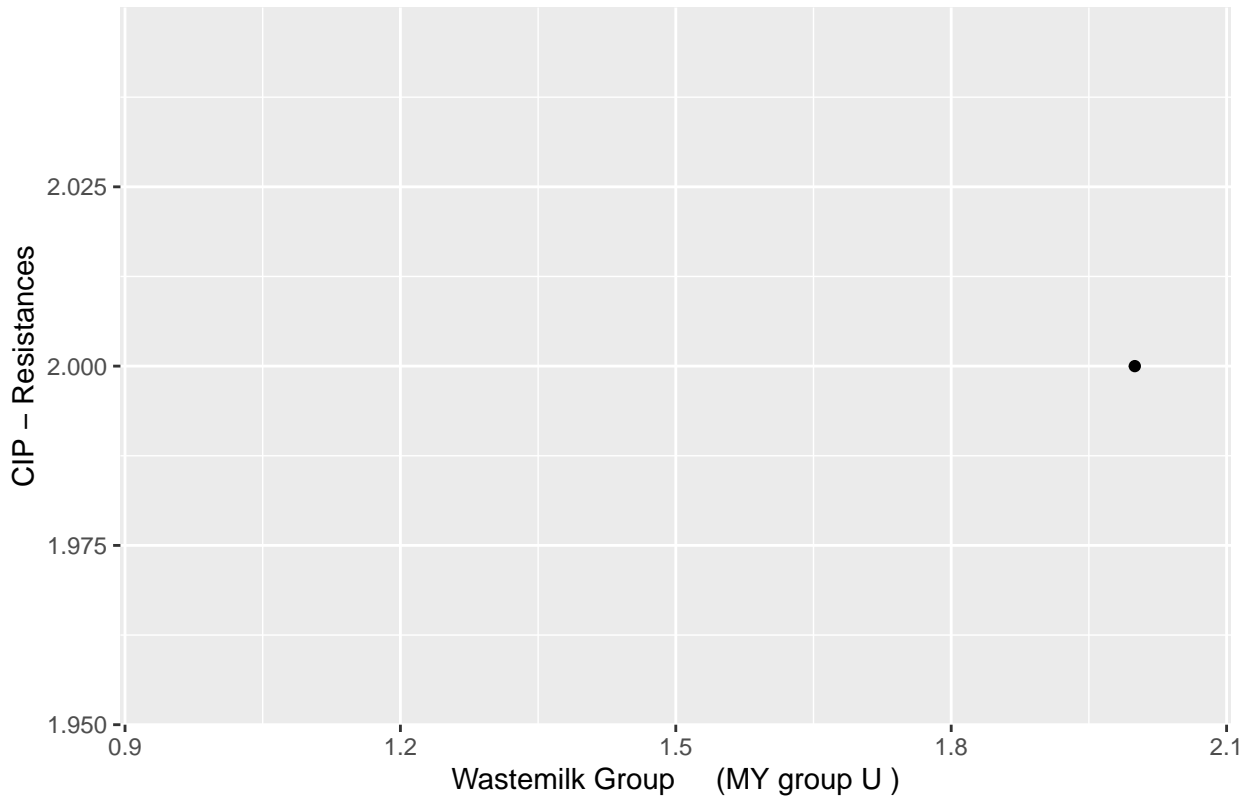
Number of AMP – Resistances for given Wastemilk Group



[1] ""

Saving 6.5 x 4.5 in image

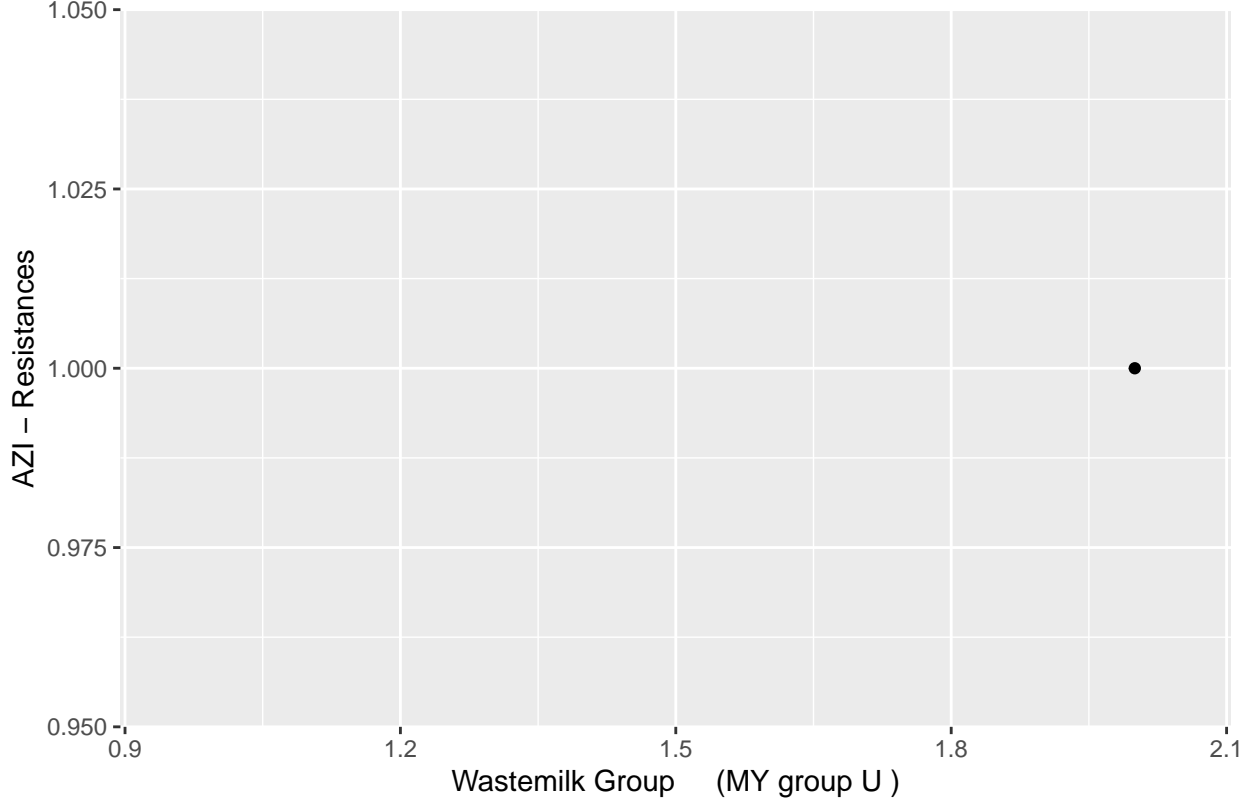
Number of CIP – Resistances for given Wastemilk Group



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

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

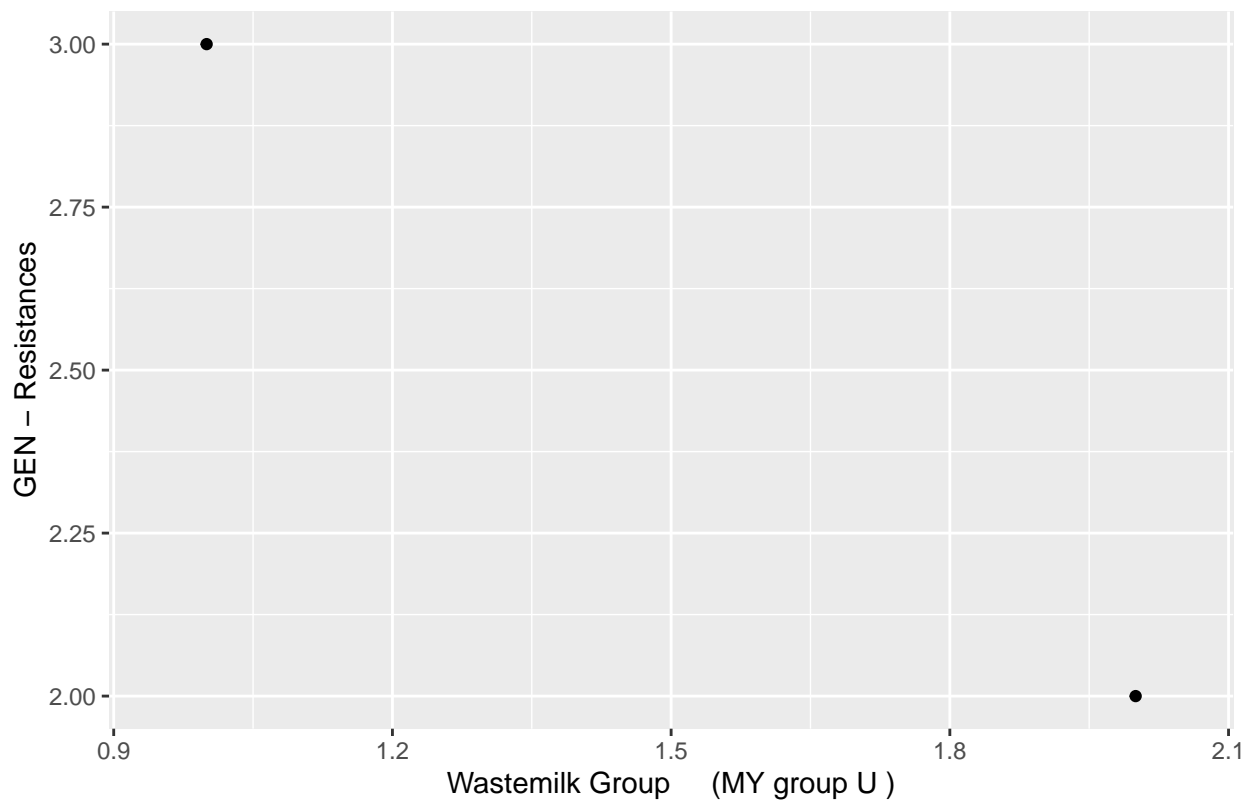
Number of AZI – Resistances for given Wastemilk Group



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

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

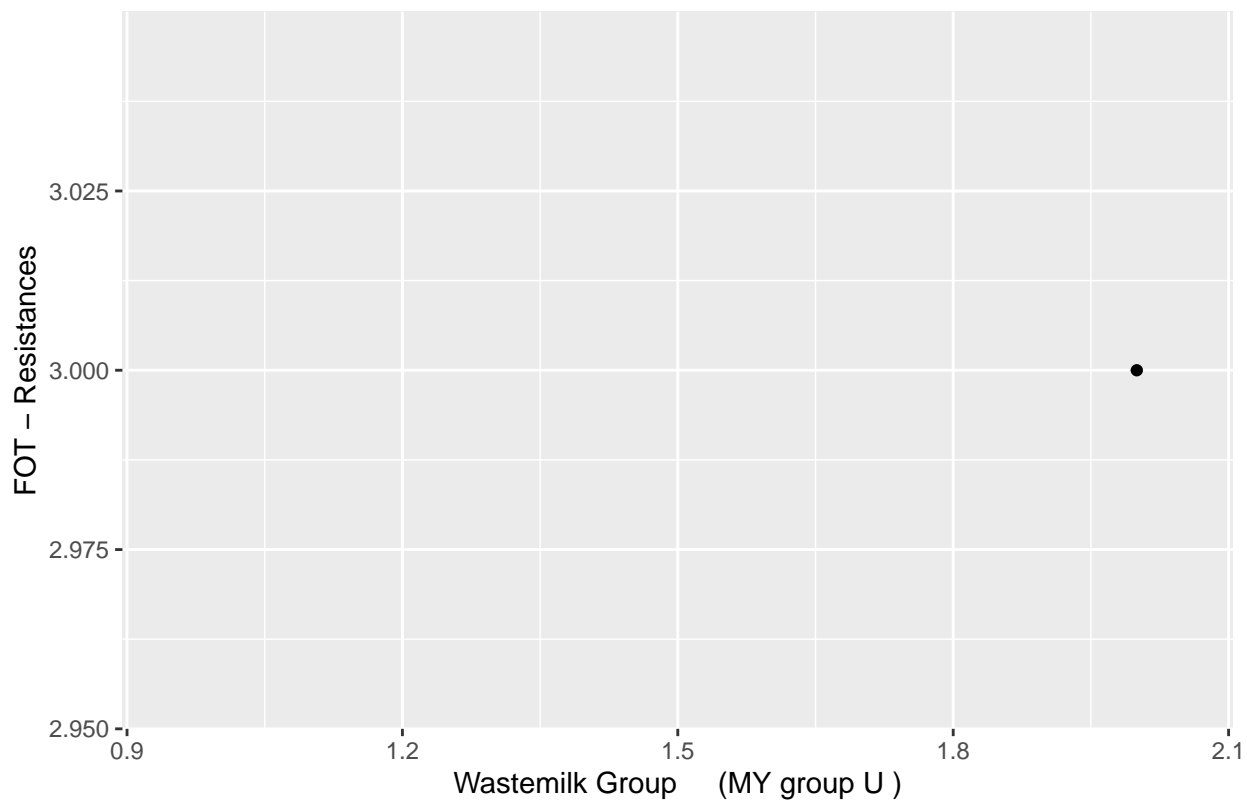
Number of GEN – Resistances for given Wastemilk Group



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

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

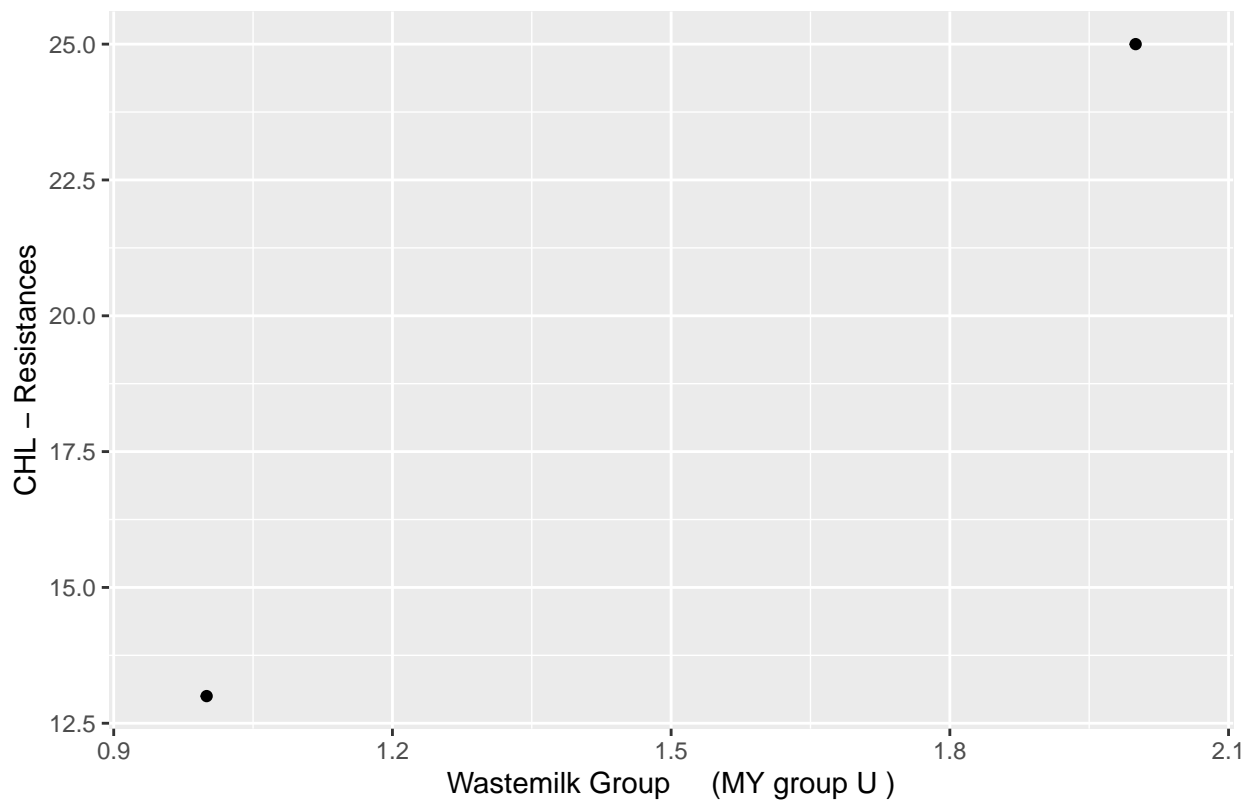
Number of FOT – Resistances for given Wastemilk Group



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

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

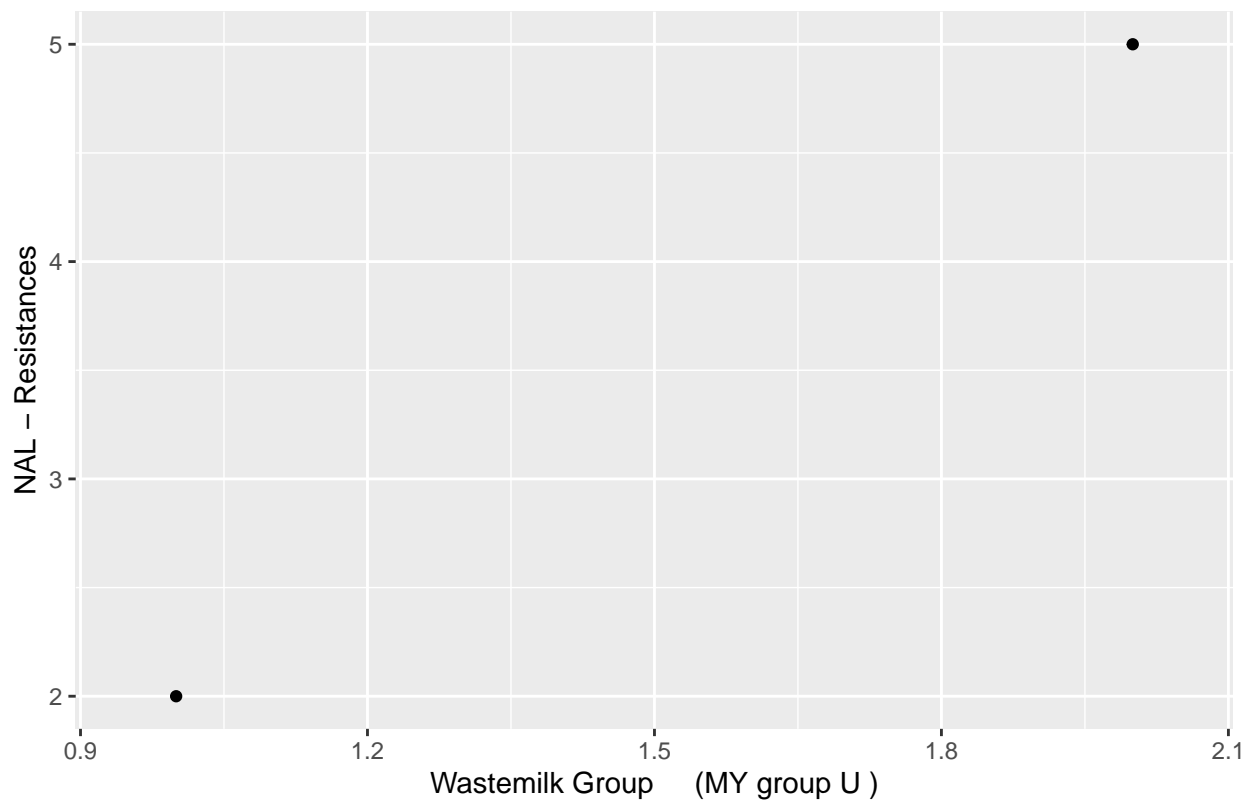
Number of CHL – Resistances for given Wastemilk Group



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

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

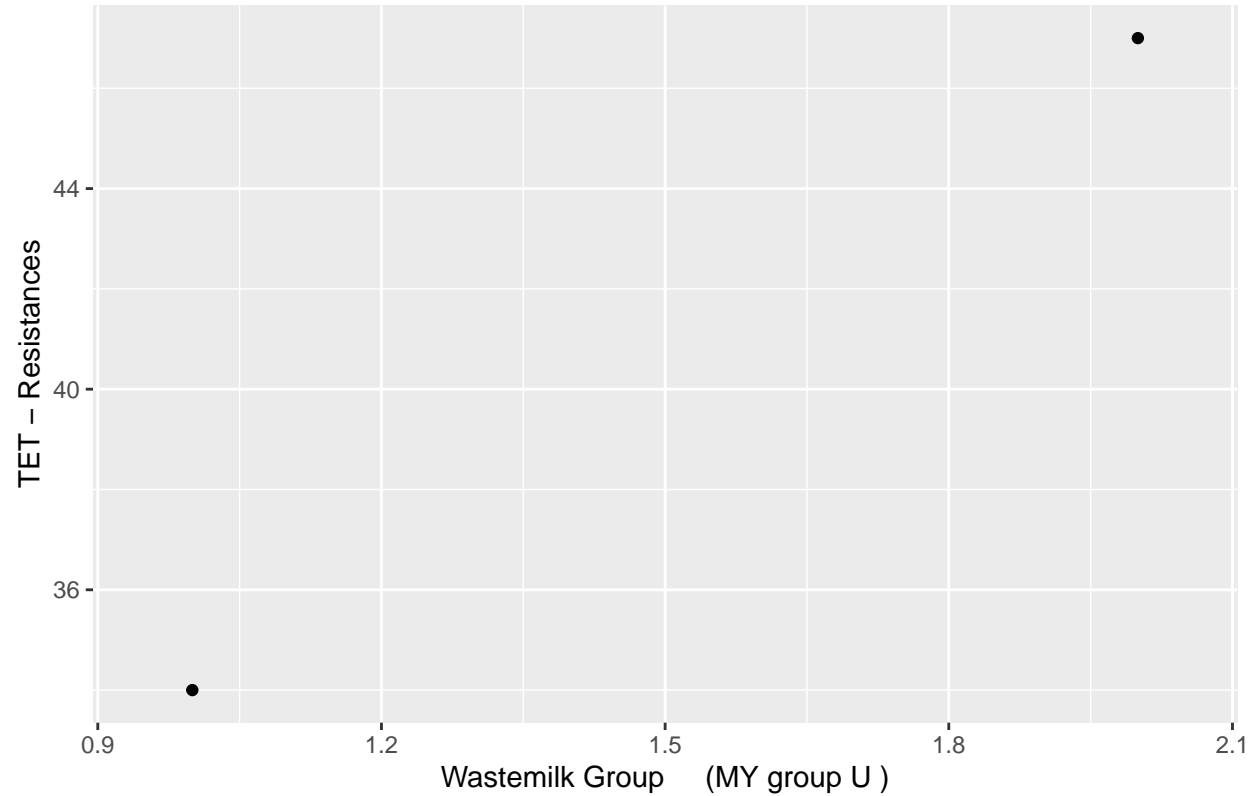
Number of NAL – Resistances for given Wastemilk Group



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

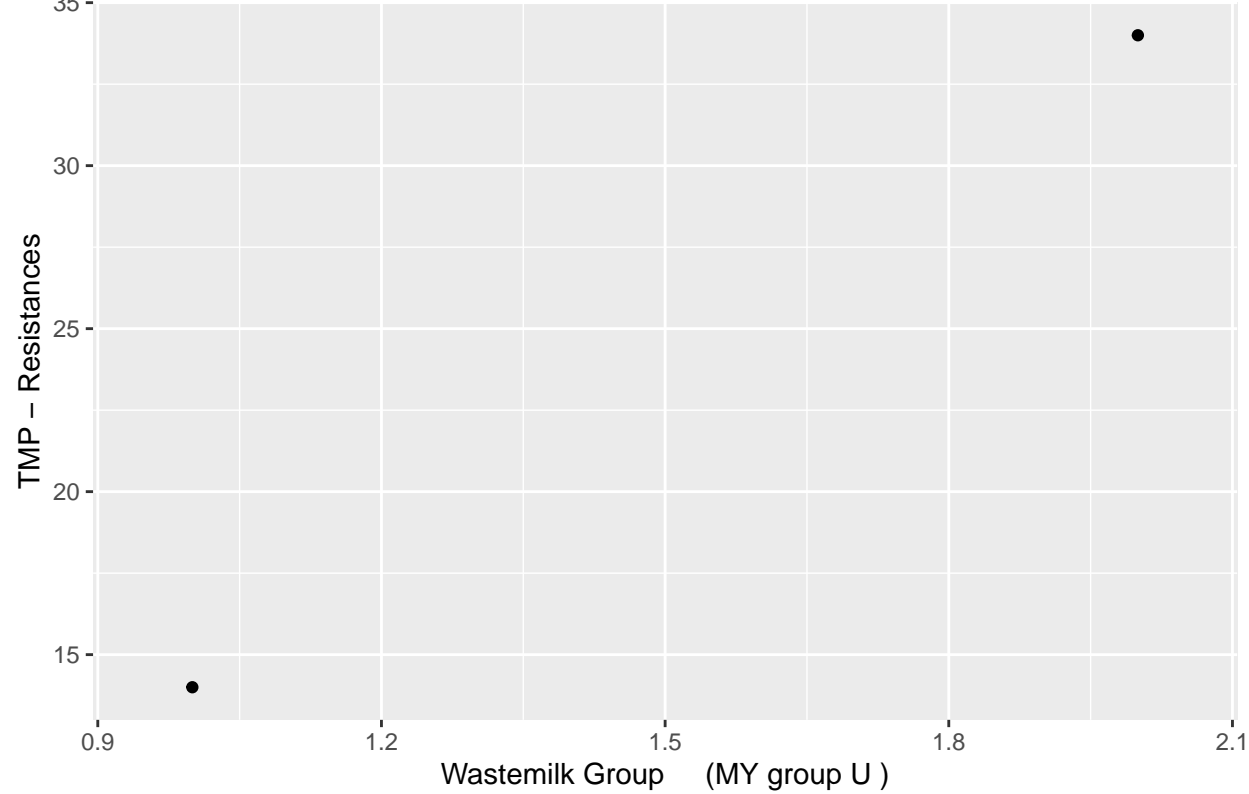
```
## Saving 6.5 x 4.5 in image
```

Number of TET – Resistances for given Wastemilk Group



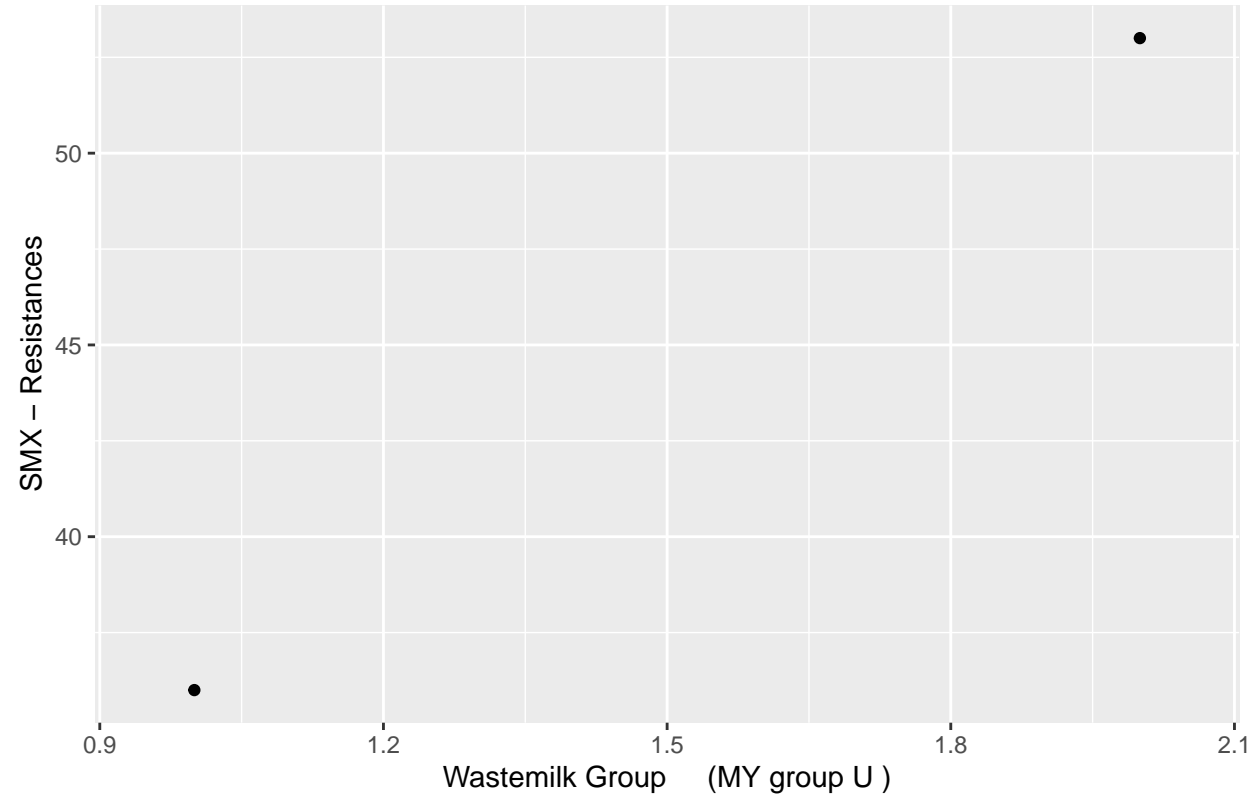
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of TMP – Resistances for given Wastemilk Group



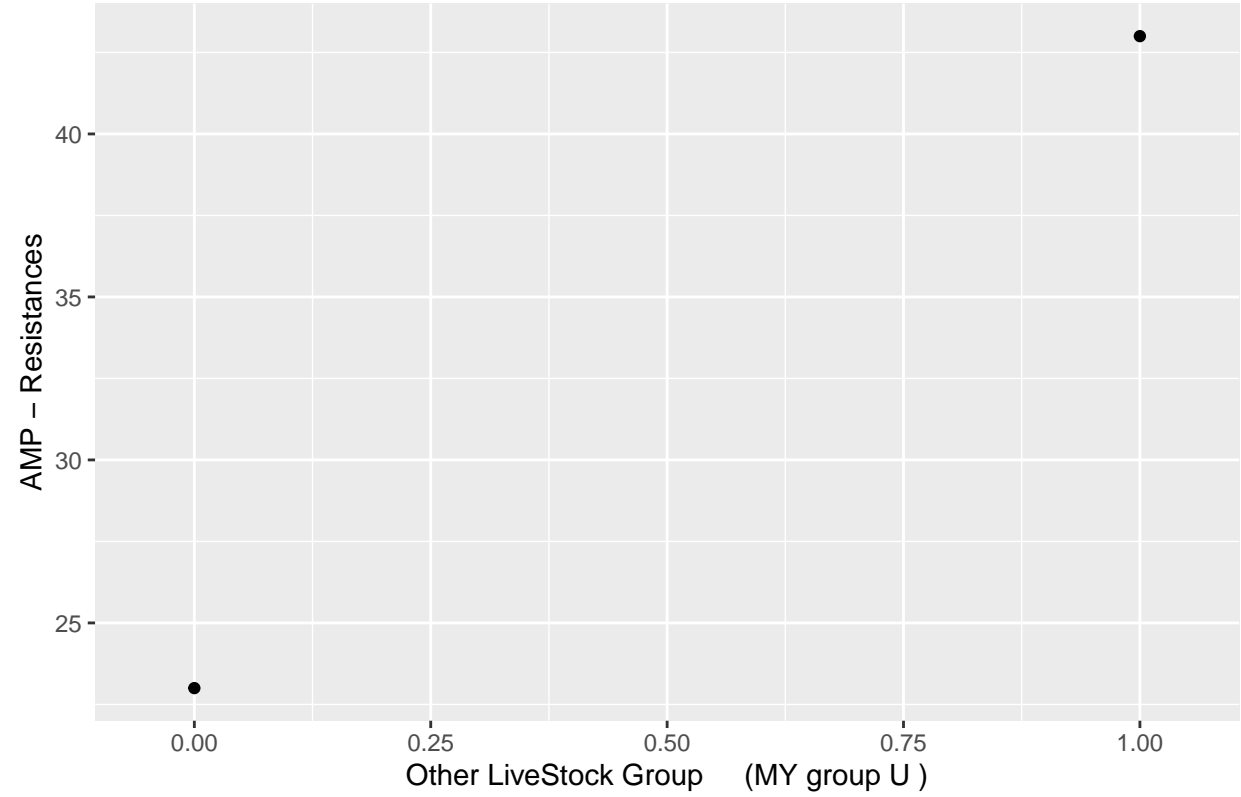
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of SMX – Resistances for given Wastemilk Group

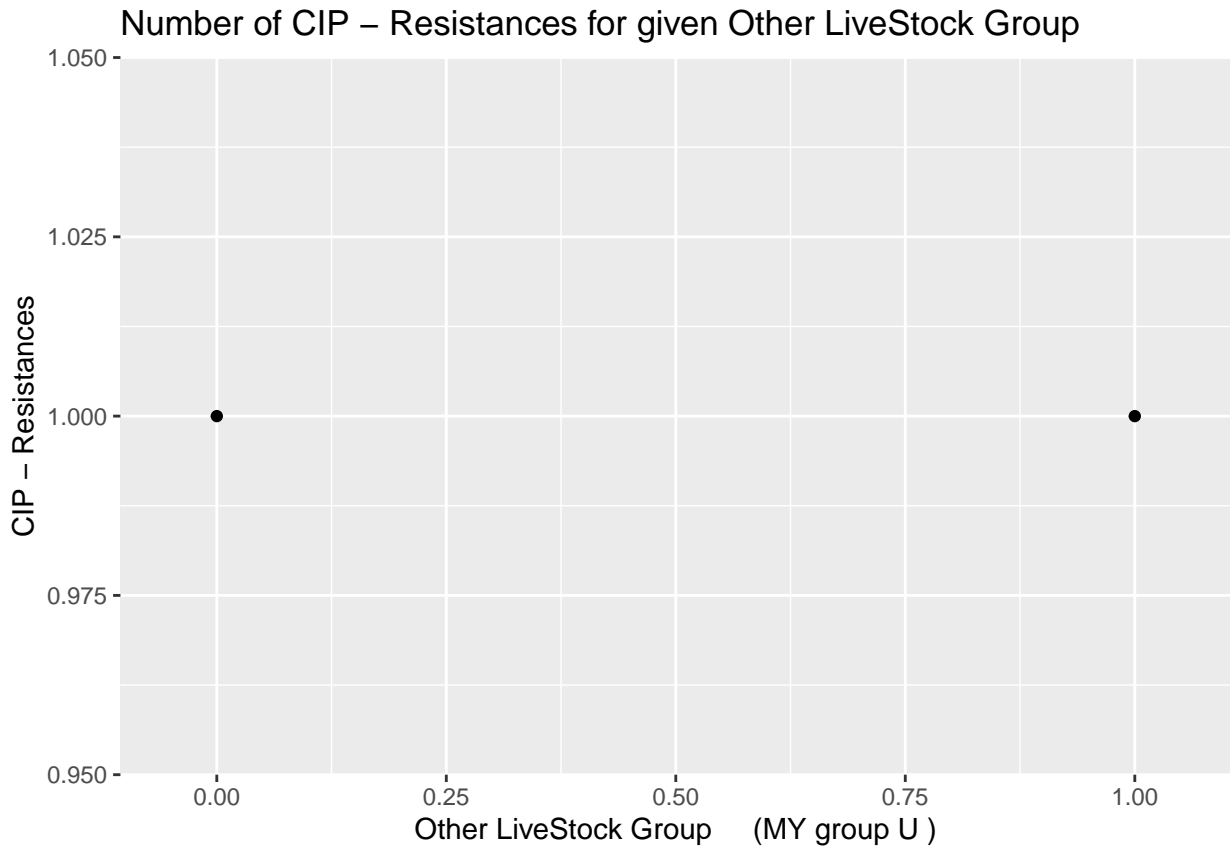


```
## [1] ""
## [1] "-----"
## Saving 6.5 x 4.5 in image
```

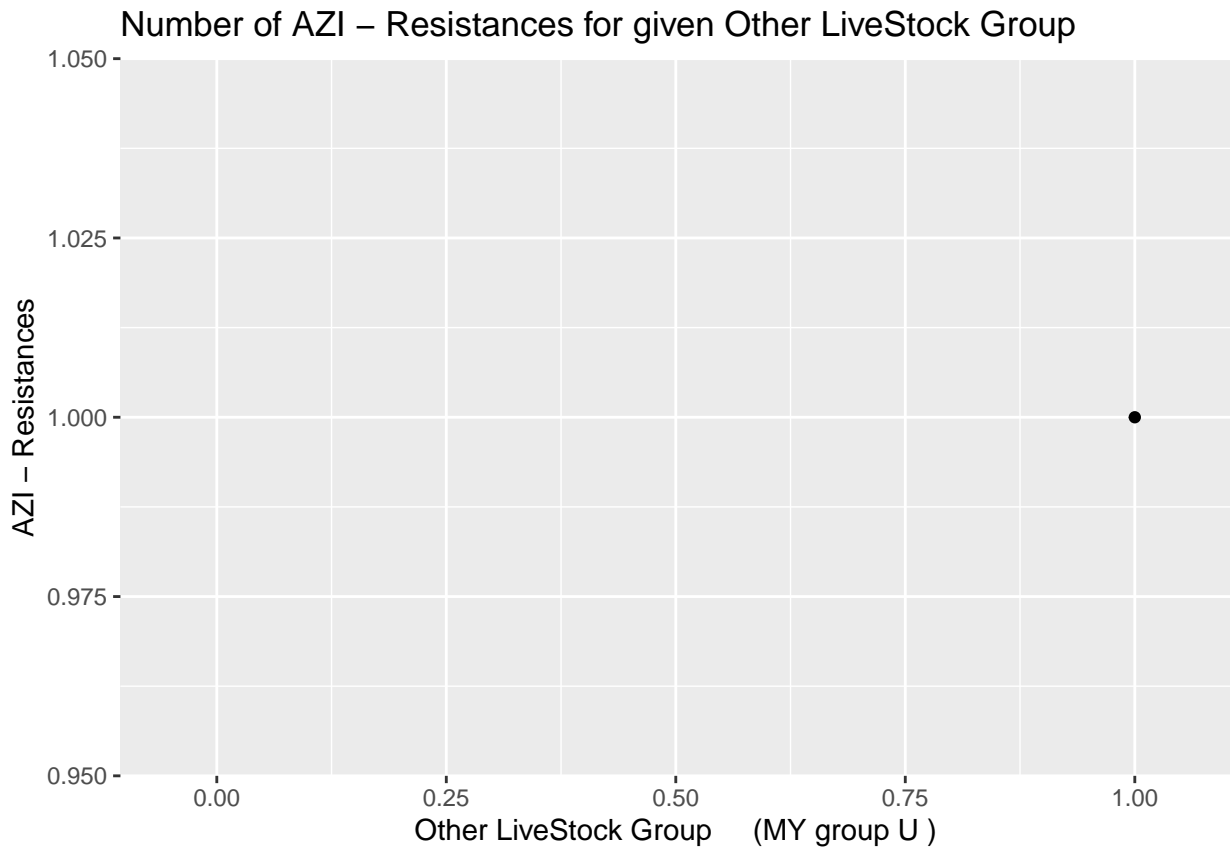
Number of AMP – Resistances for given Other LiveStock Group



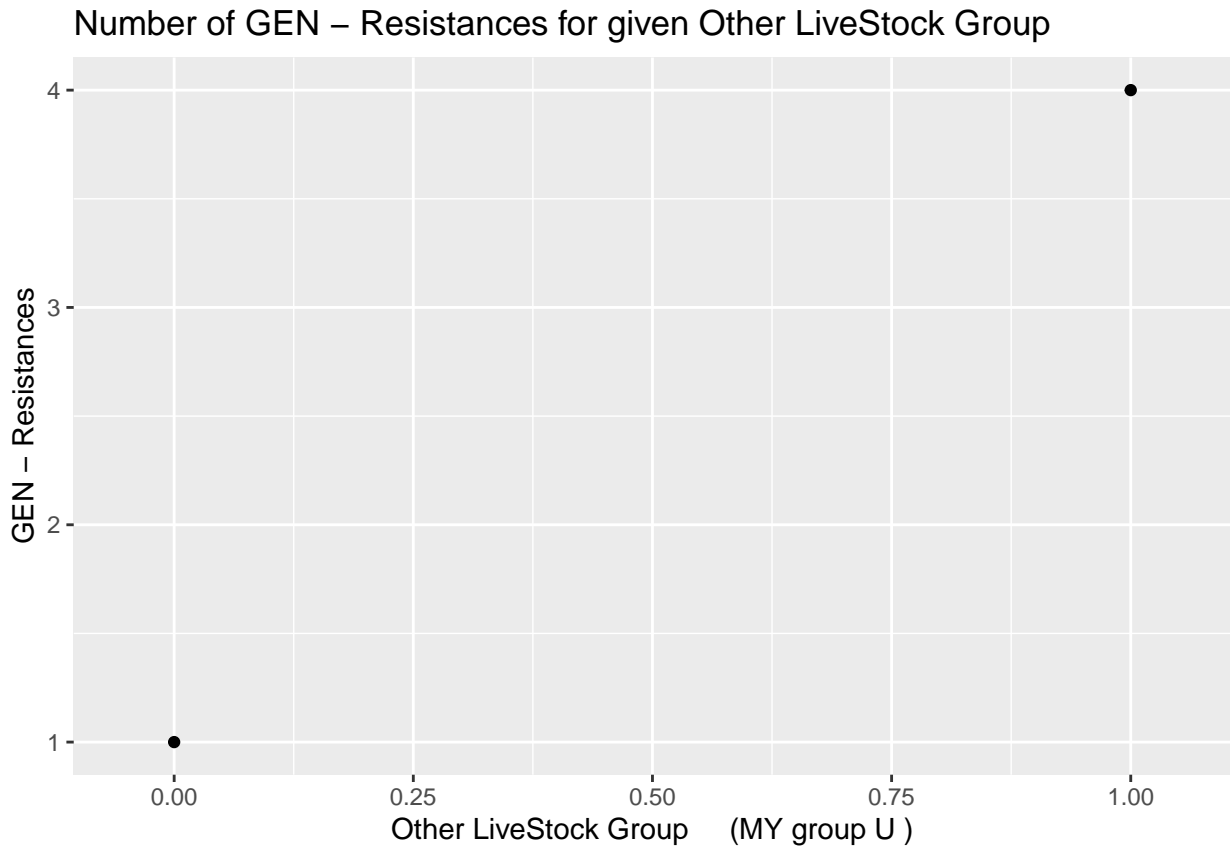
```
## [1] ""
## Saving 6.5 x 4.5 in image
```



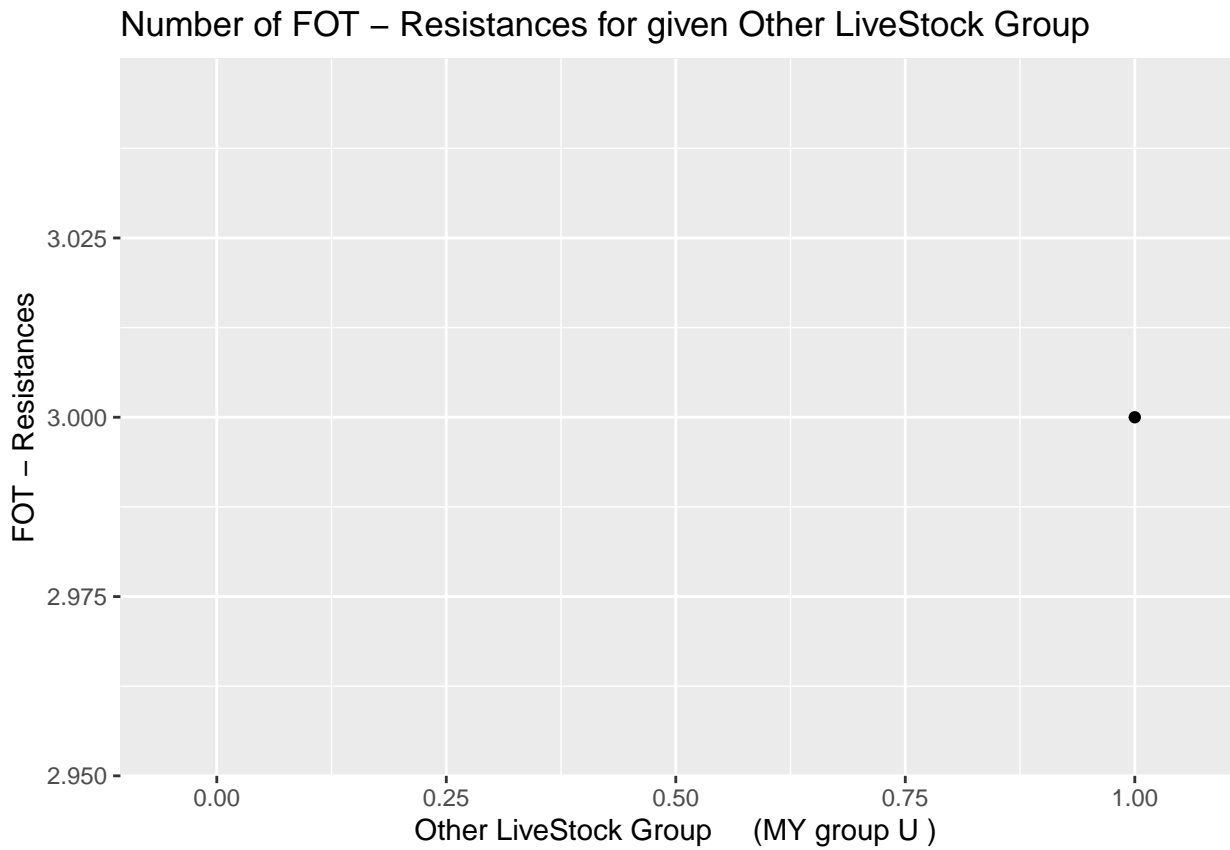
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



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



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



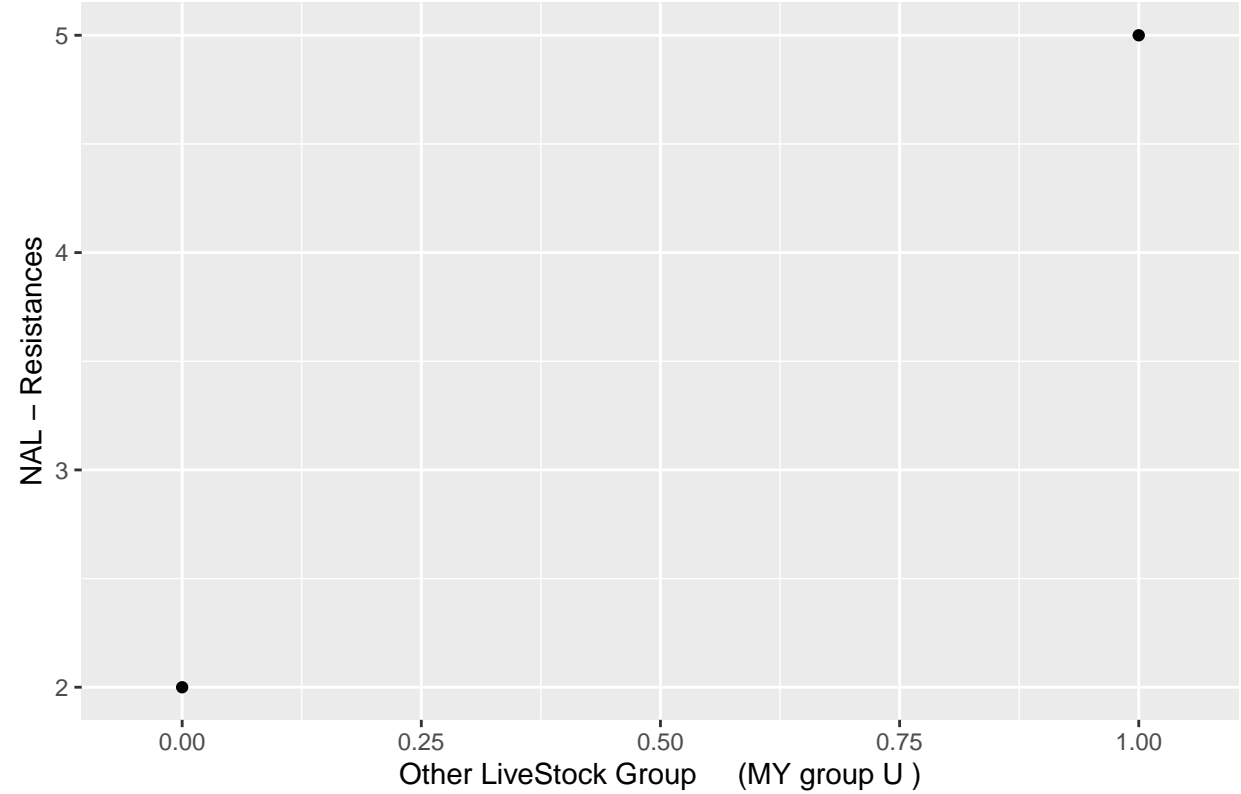
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given Other LiveStock Group



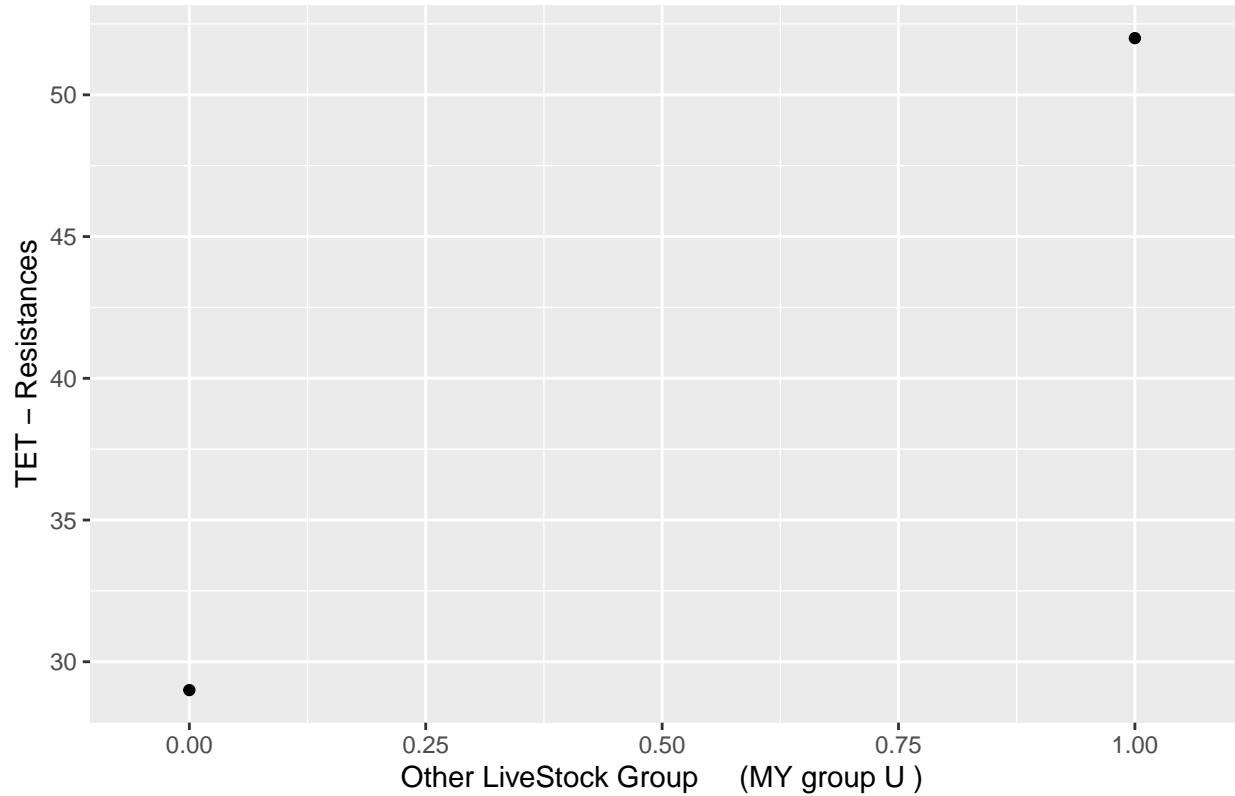
```
## [1] ""
## Saving 6.5 x 4.5 in image
```

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



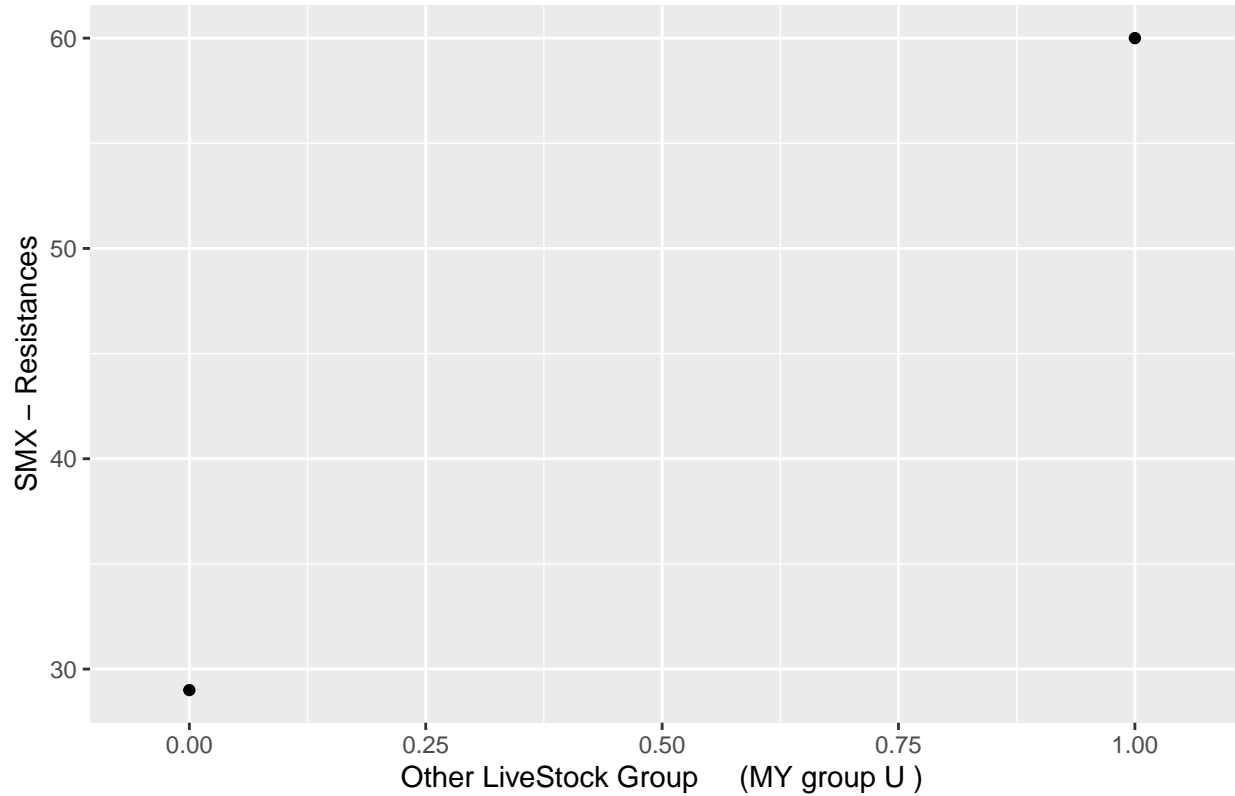
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of TMP – Resistances for given Other LiveStock Group



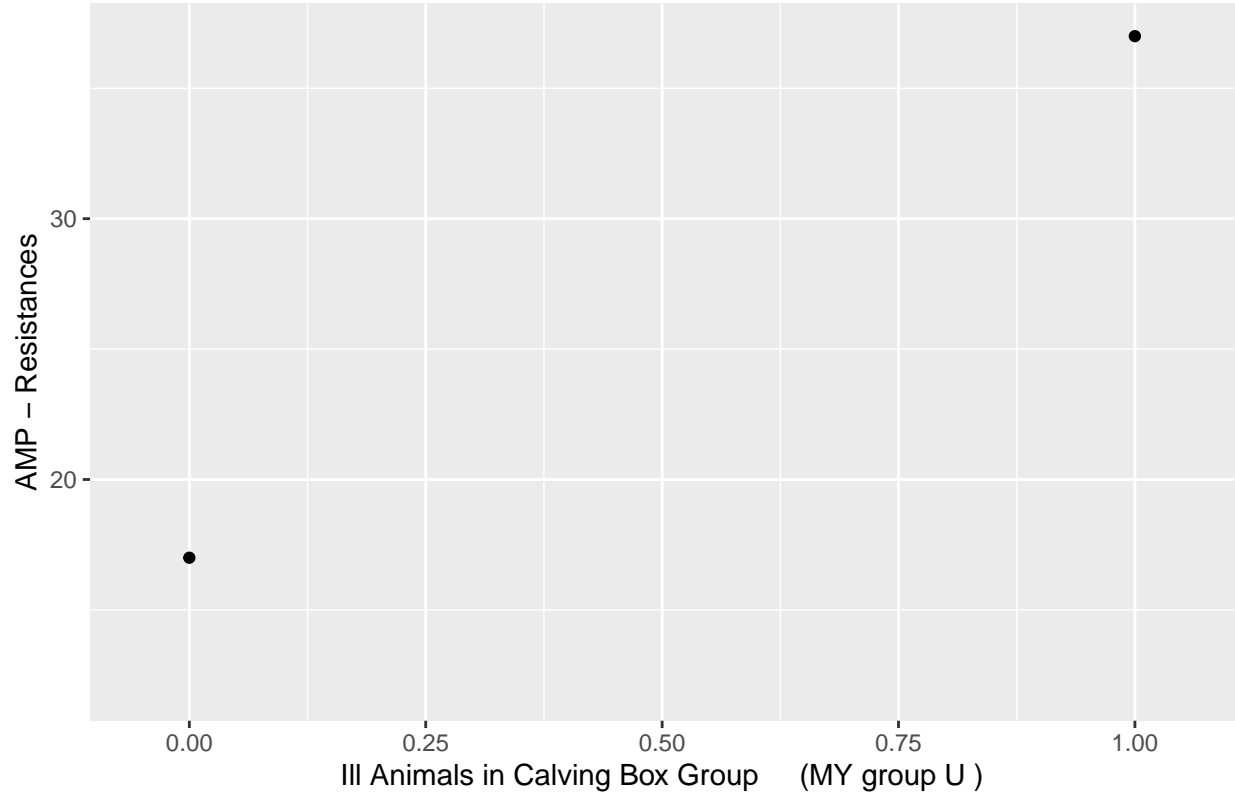
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of SMX – Resistances for given Other LiveStock Group

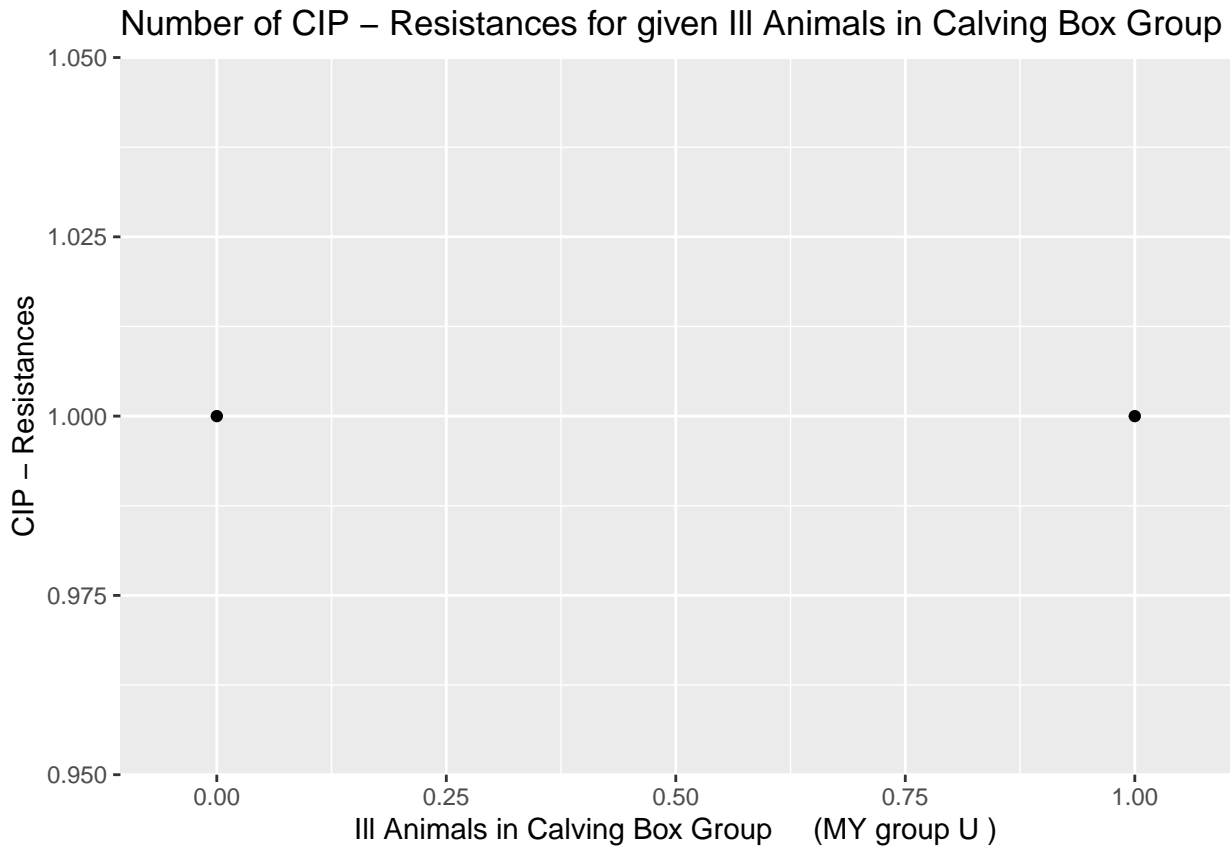


```
## [1] ""
## [1] "-----"
## Saving 6.5 x 4.5 in image
```

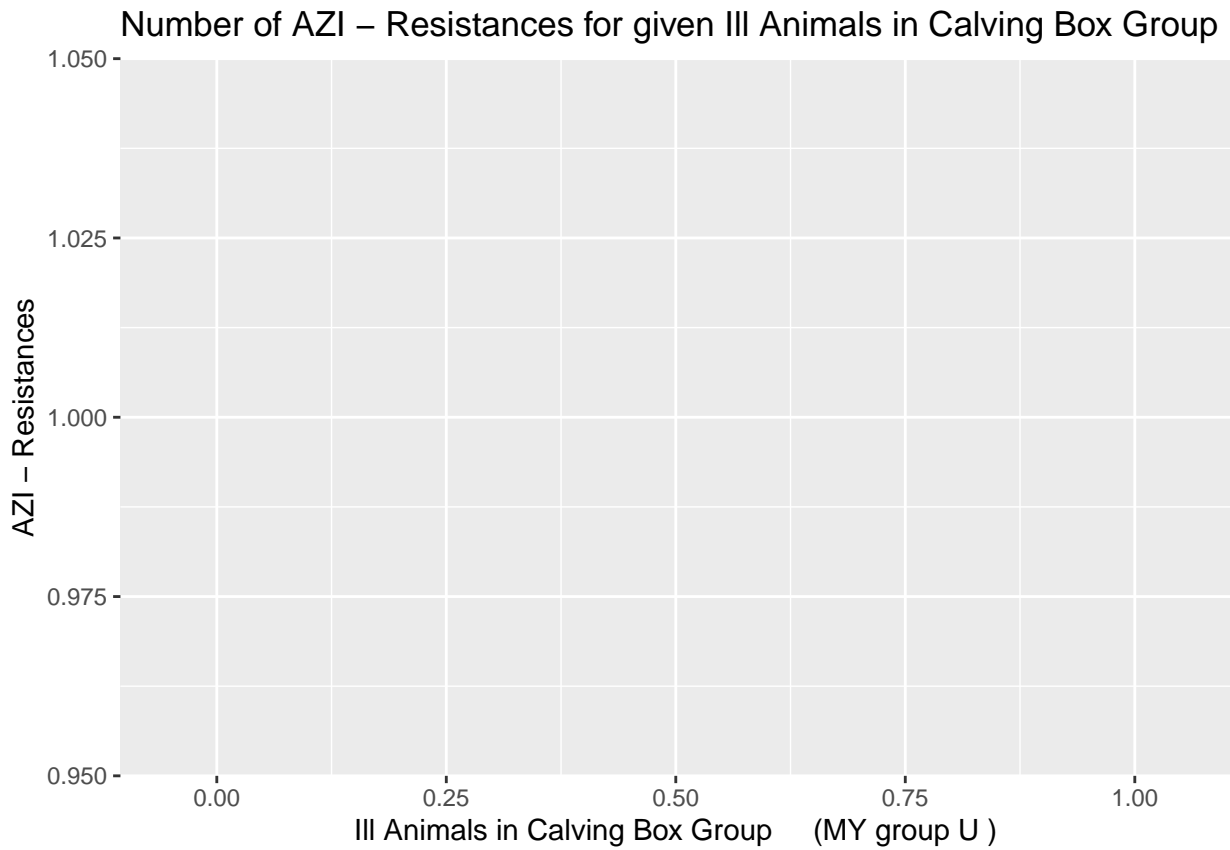
Number of AMP – Resistances for given Ill Animals in Calving Box Group



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

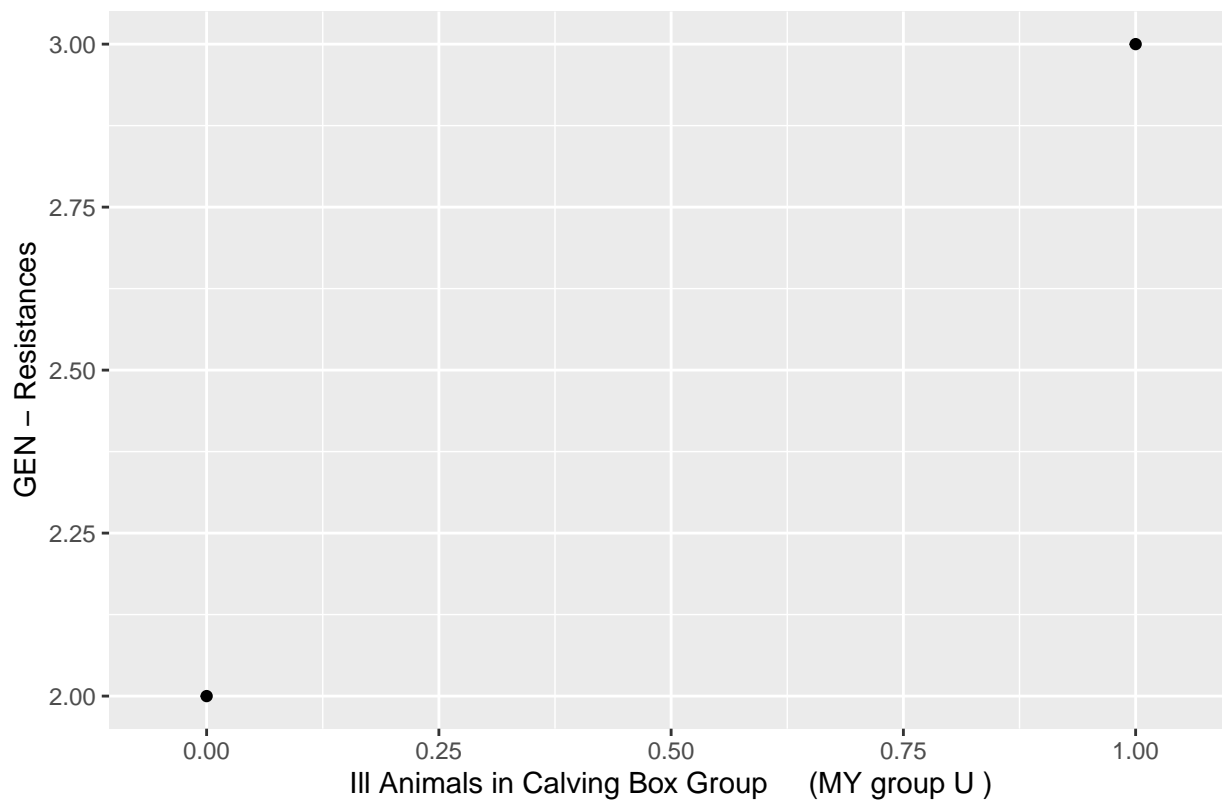


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



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

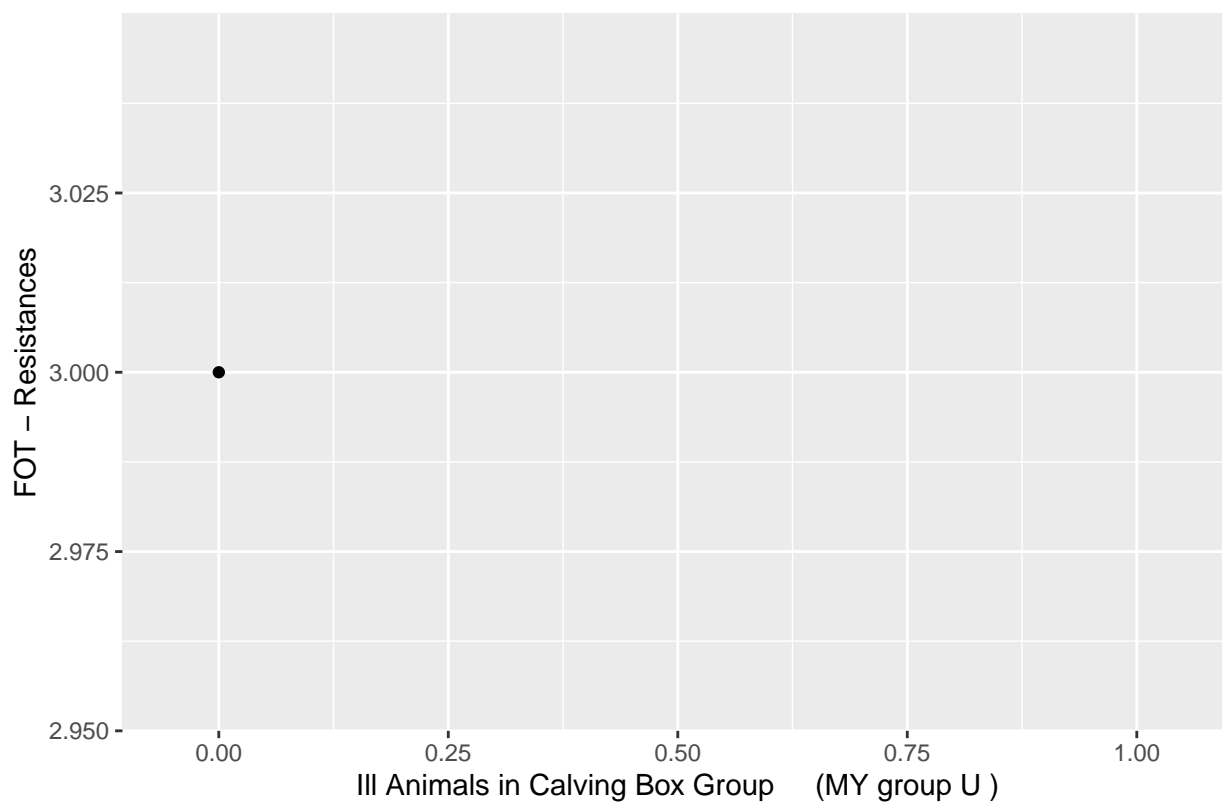
Number of GEN – Resistances for given Ill Animals in Calving Box Group



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

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

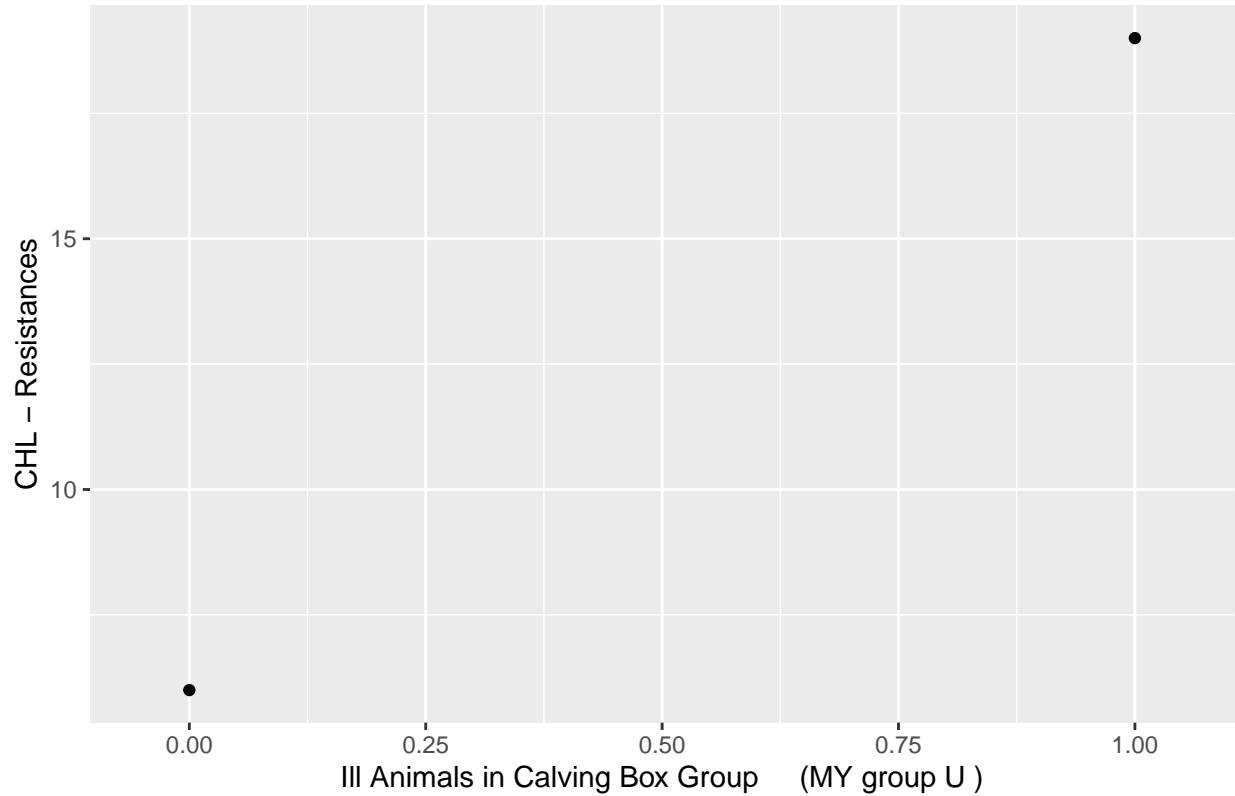
Number of FOT – Resistances for given Ill Animals in Calving Box Group



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

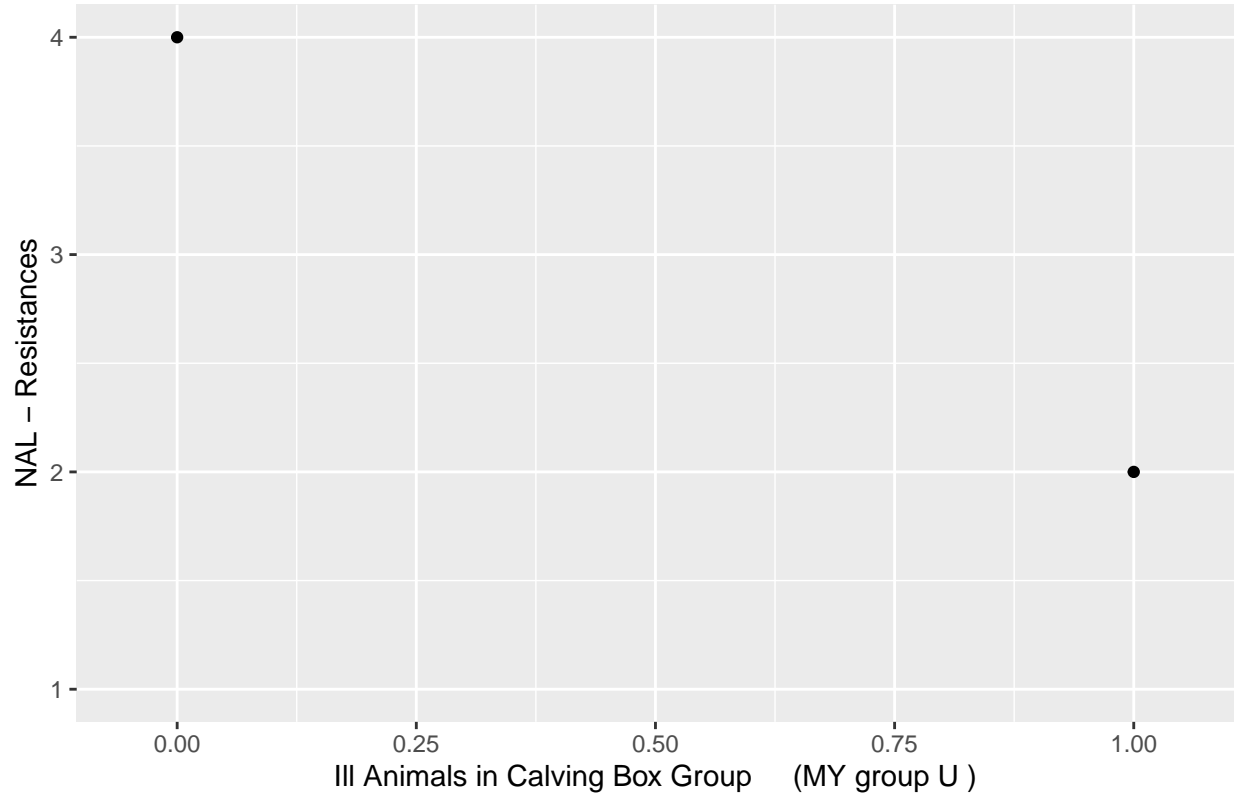
```
## Saving 6.5 x 4.5 in image
```

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



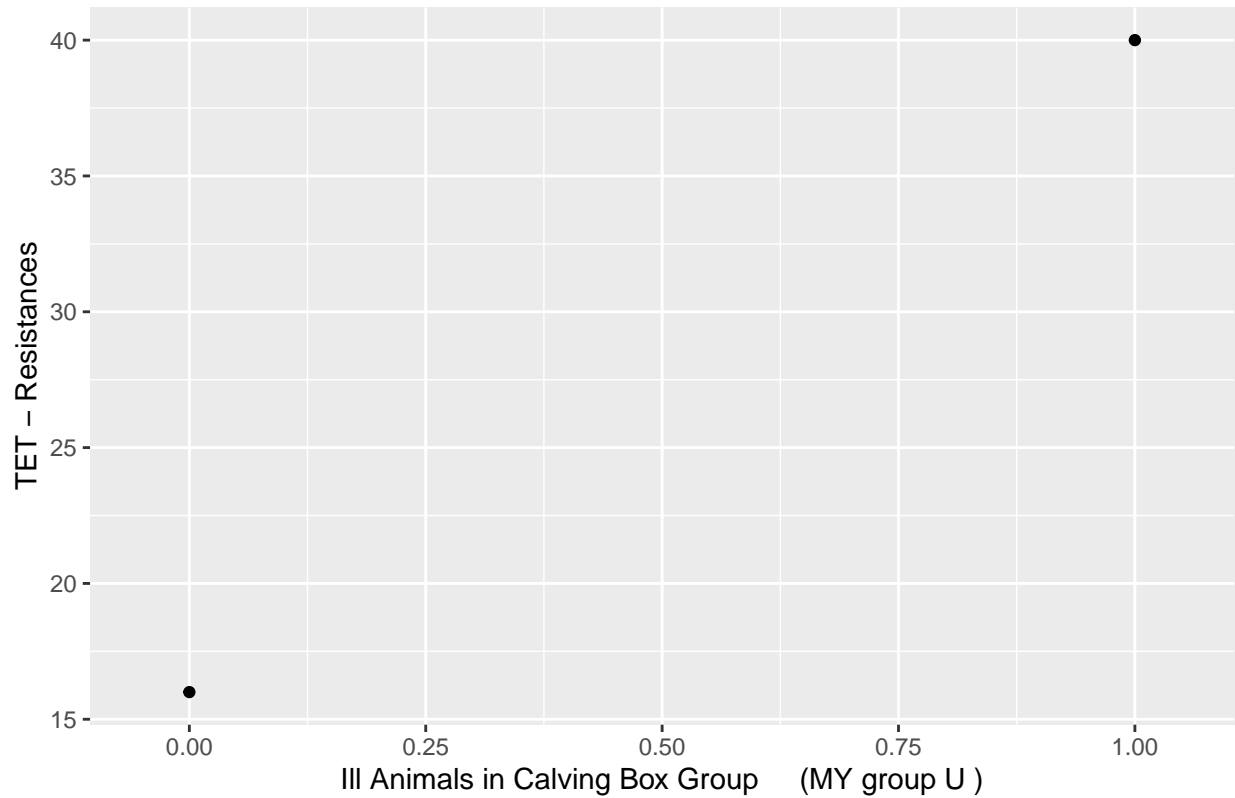
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

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



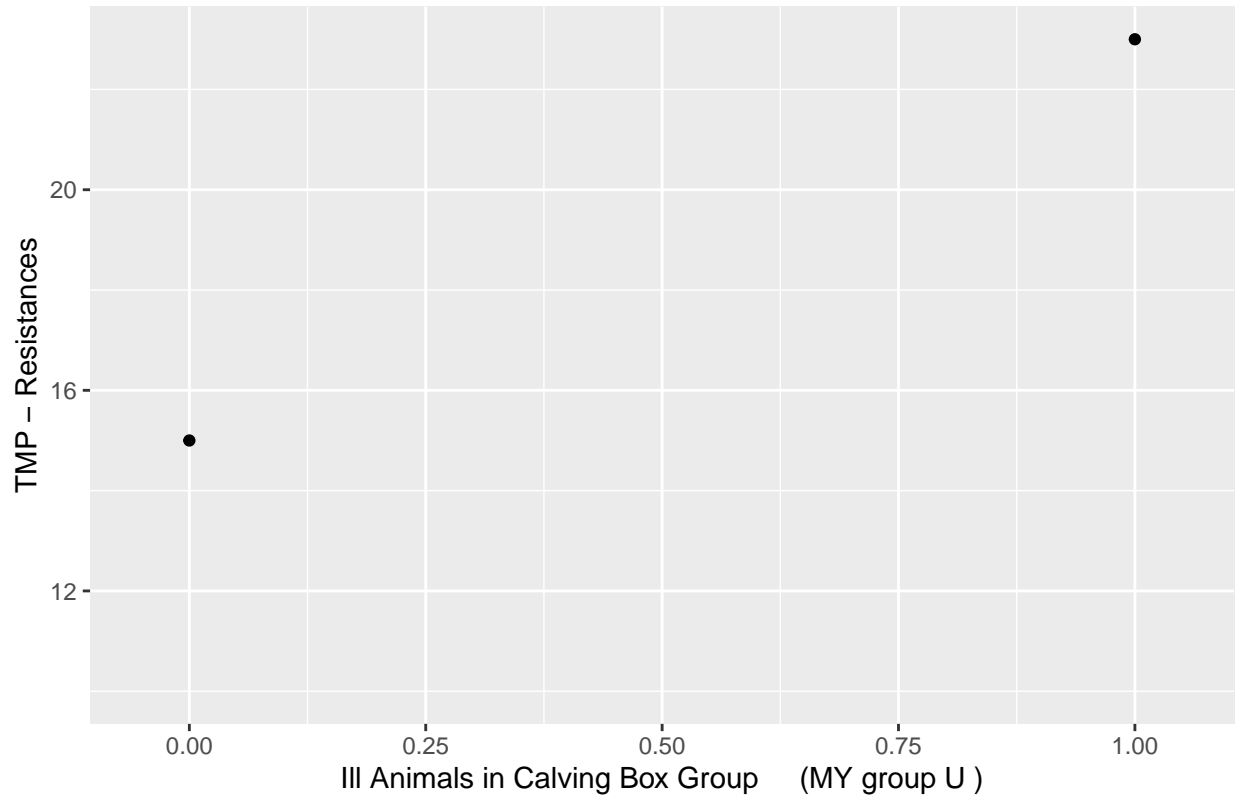
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

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



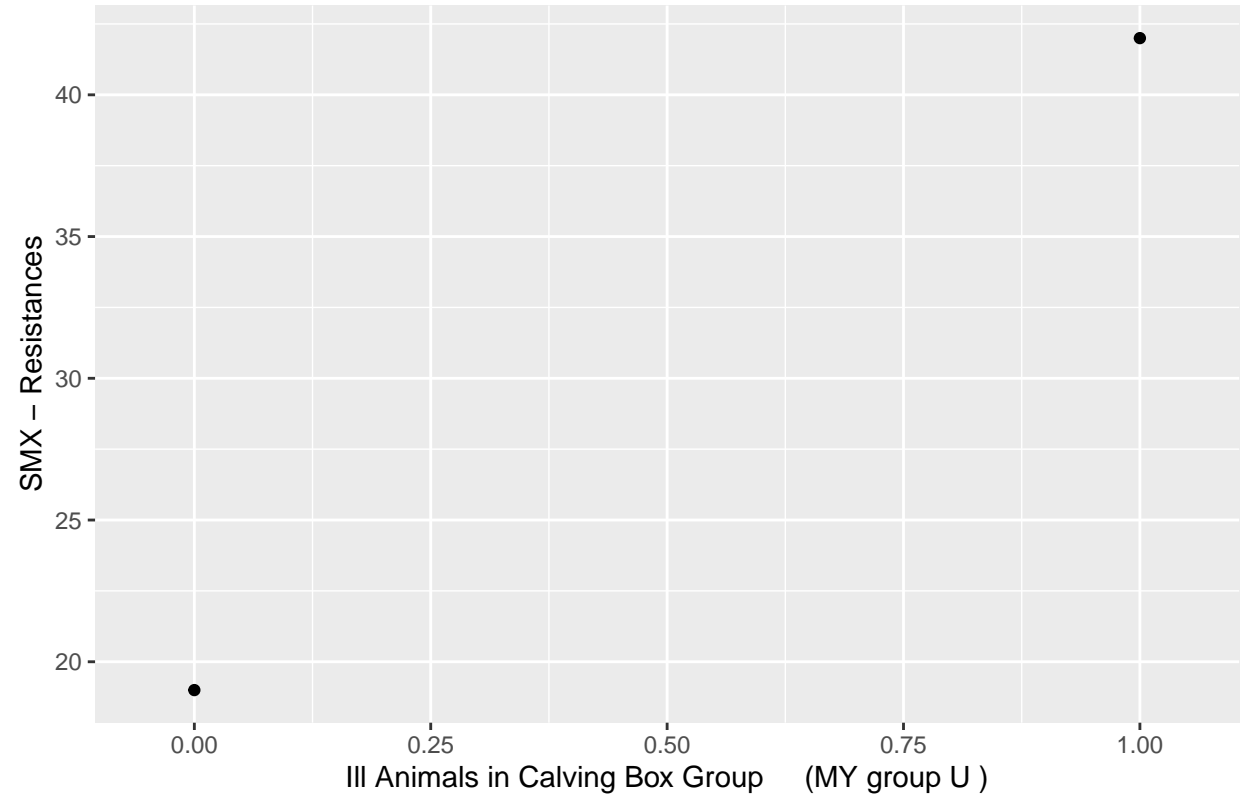
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

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



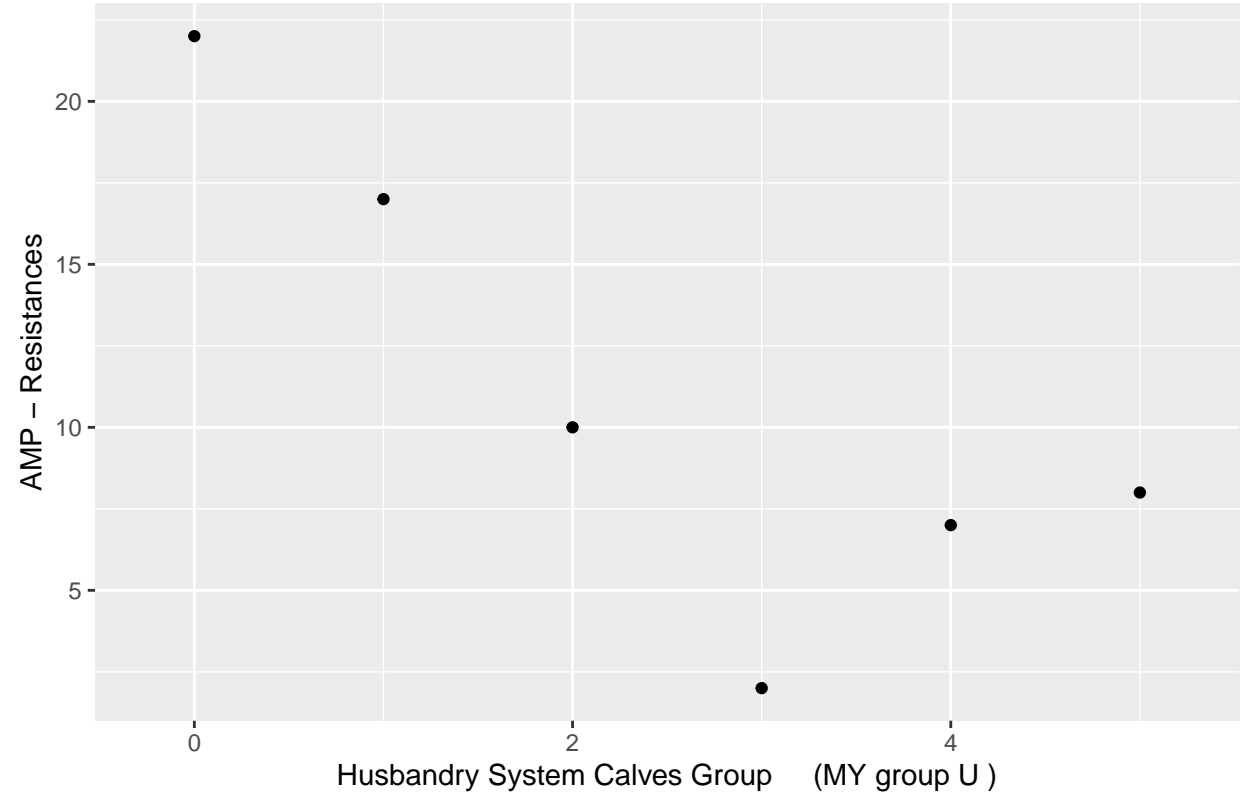
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

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

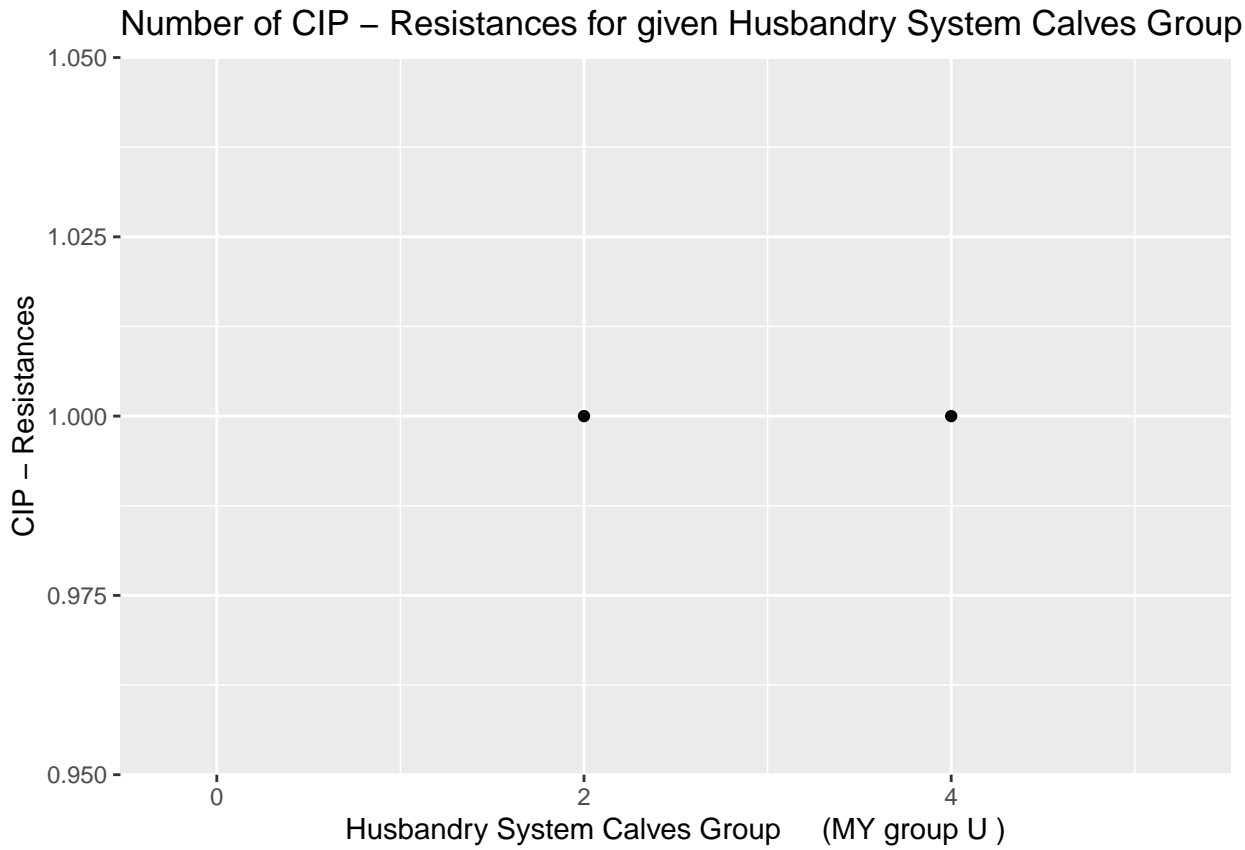


```
## [1] ""
## [1] "-----"
## Saving 6.5 x 4.5 in image
```

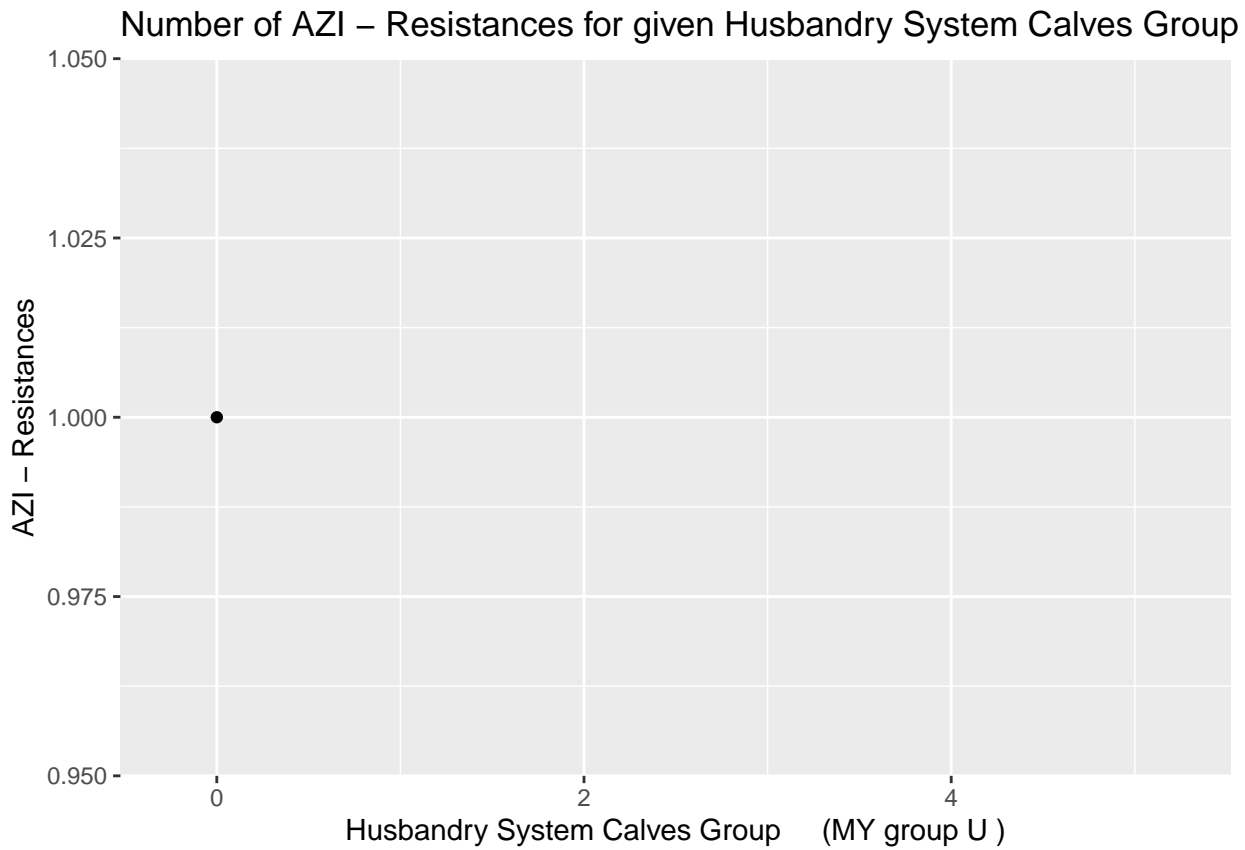
Number of AMP – Resistances for given Husbandry System Calves Group



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

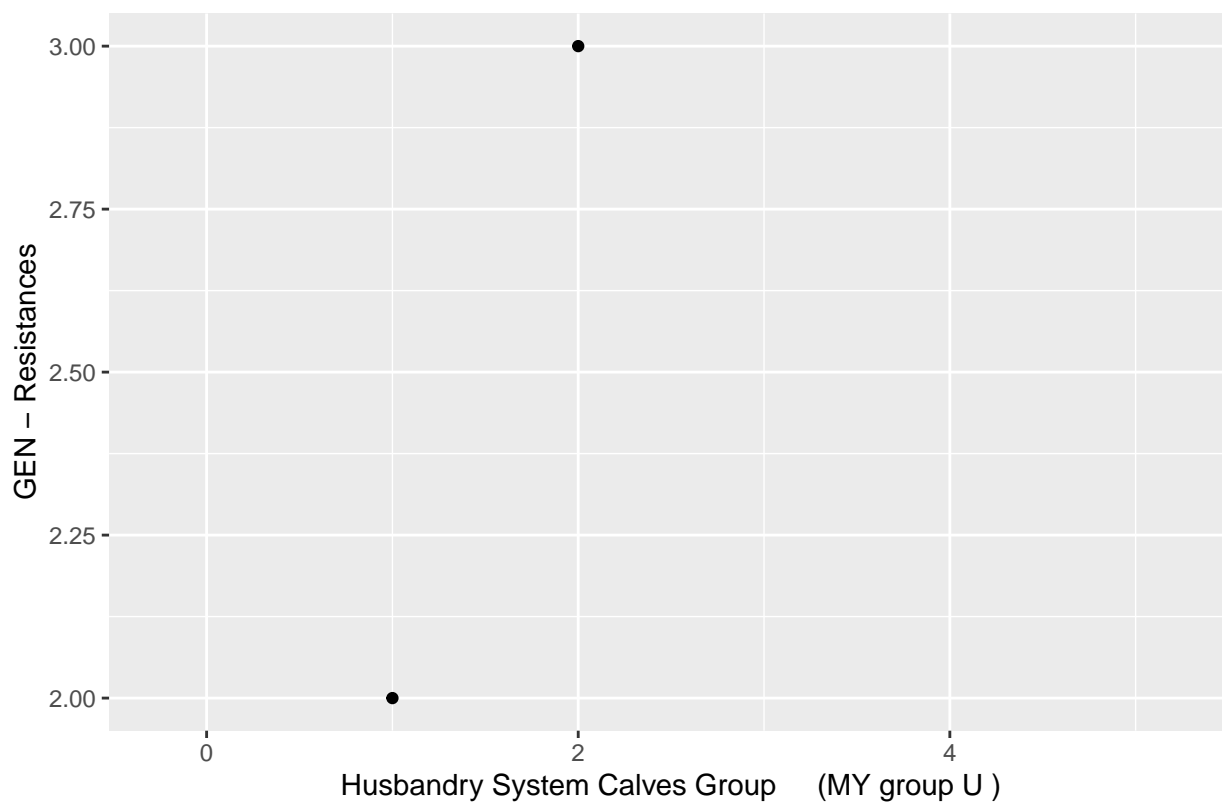


```
## [1] ""  
## Saving 6.5 x 4.5 in image
```



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

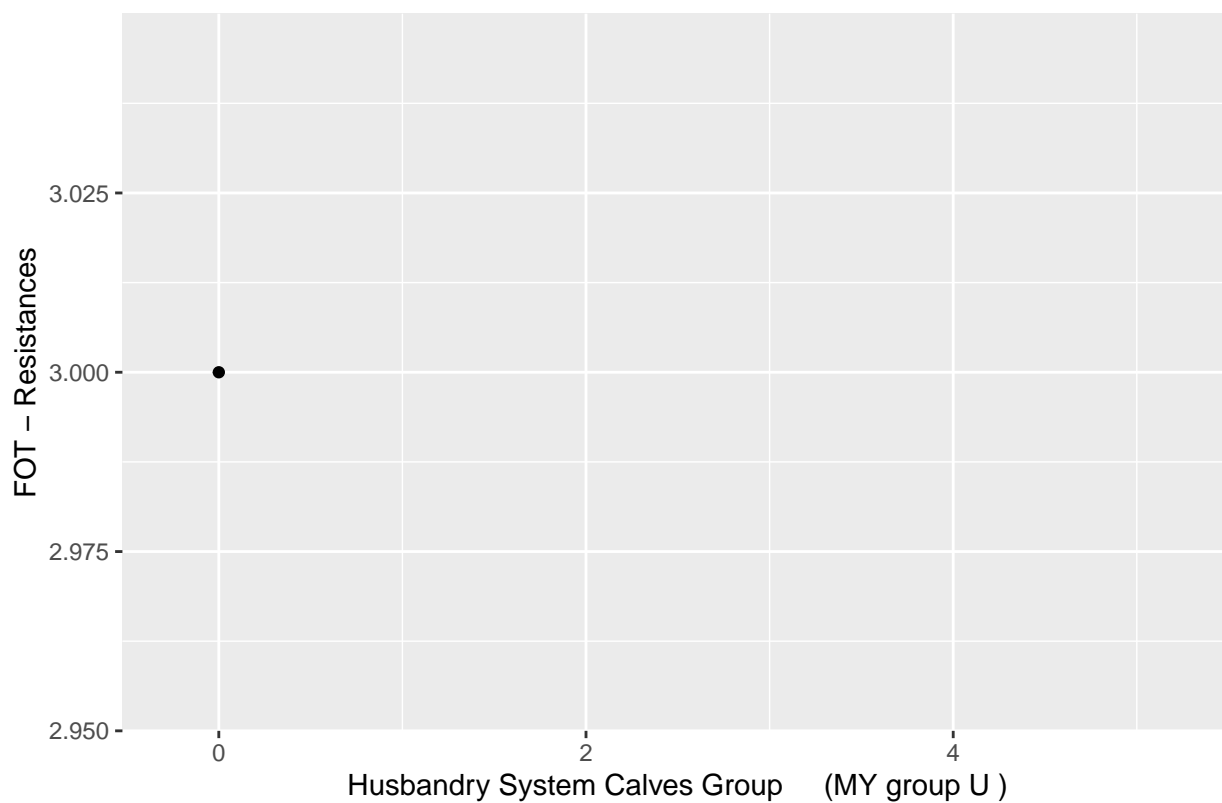

Number of GEN – Resistances for given Husbandry System Calves Group



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

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

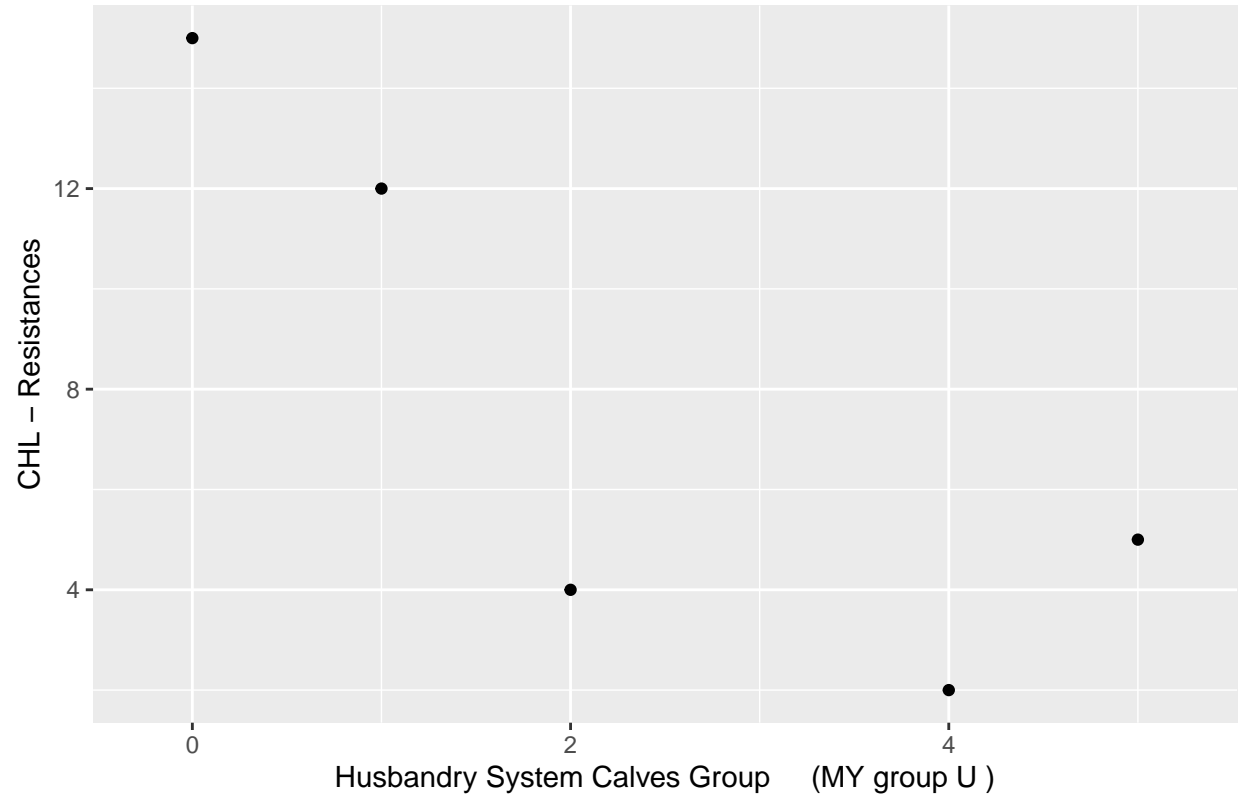
Number of FOT – Resistances for given Husbandry System Calves Group



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

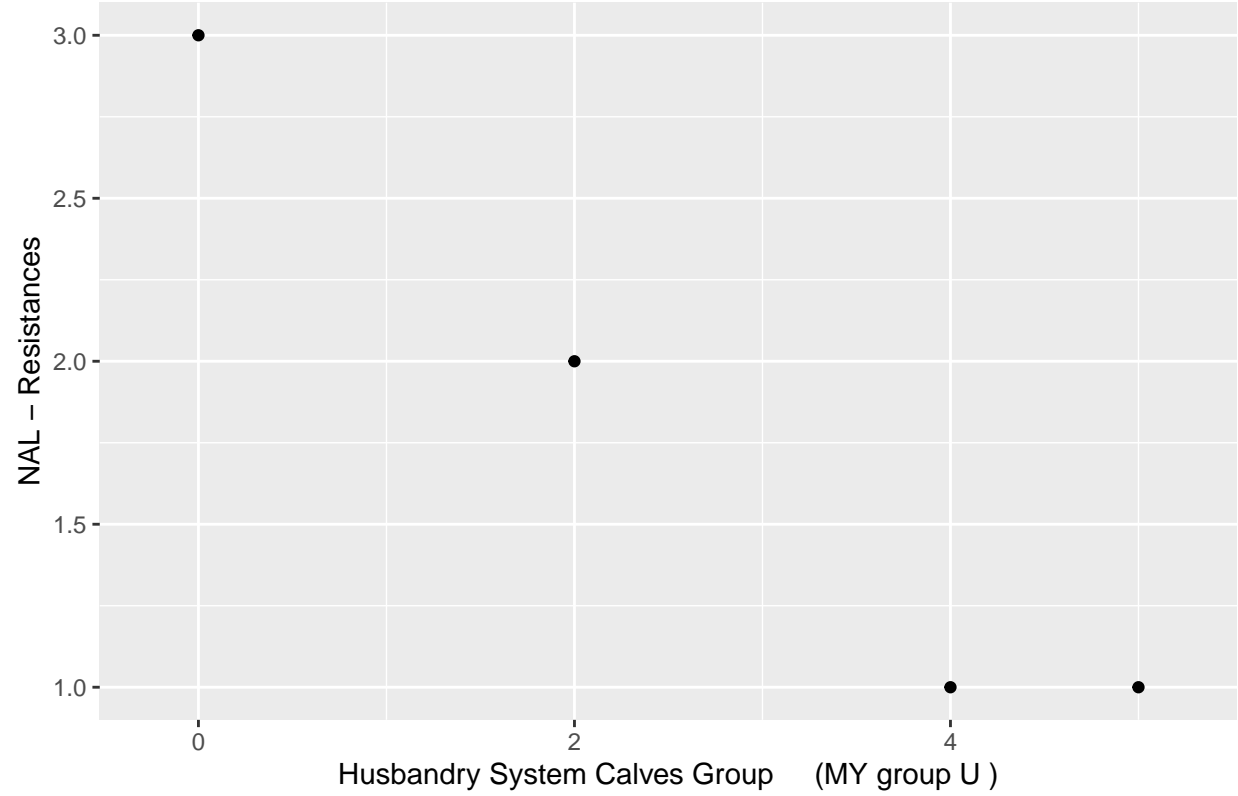
```
## Saving 6.5 x 4.5 in image
```

Number of CHL – Resistances for given Husbandry System Calves Group



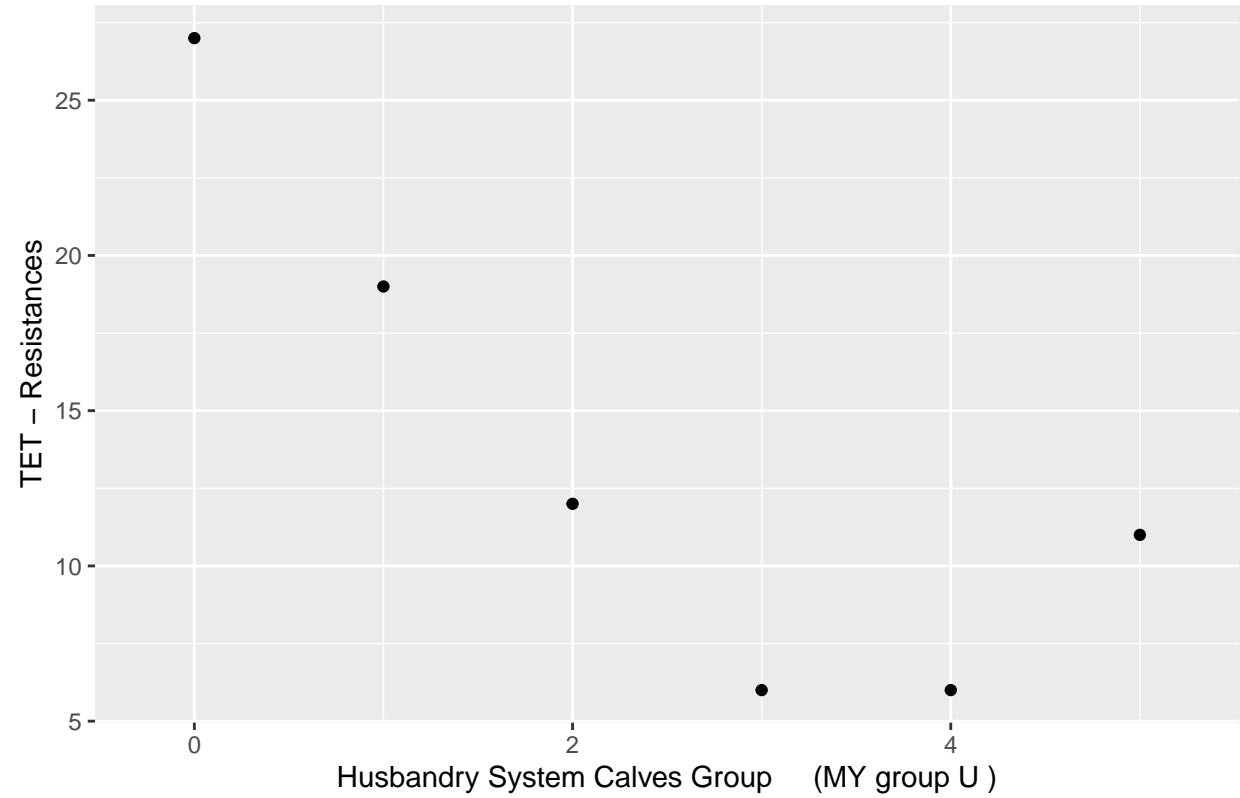
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of NAL – Resistances for given Husbandry System Calves Group



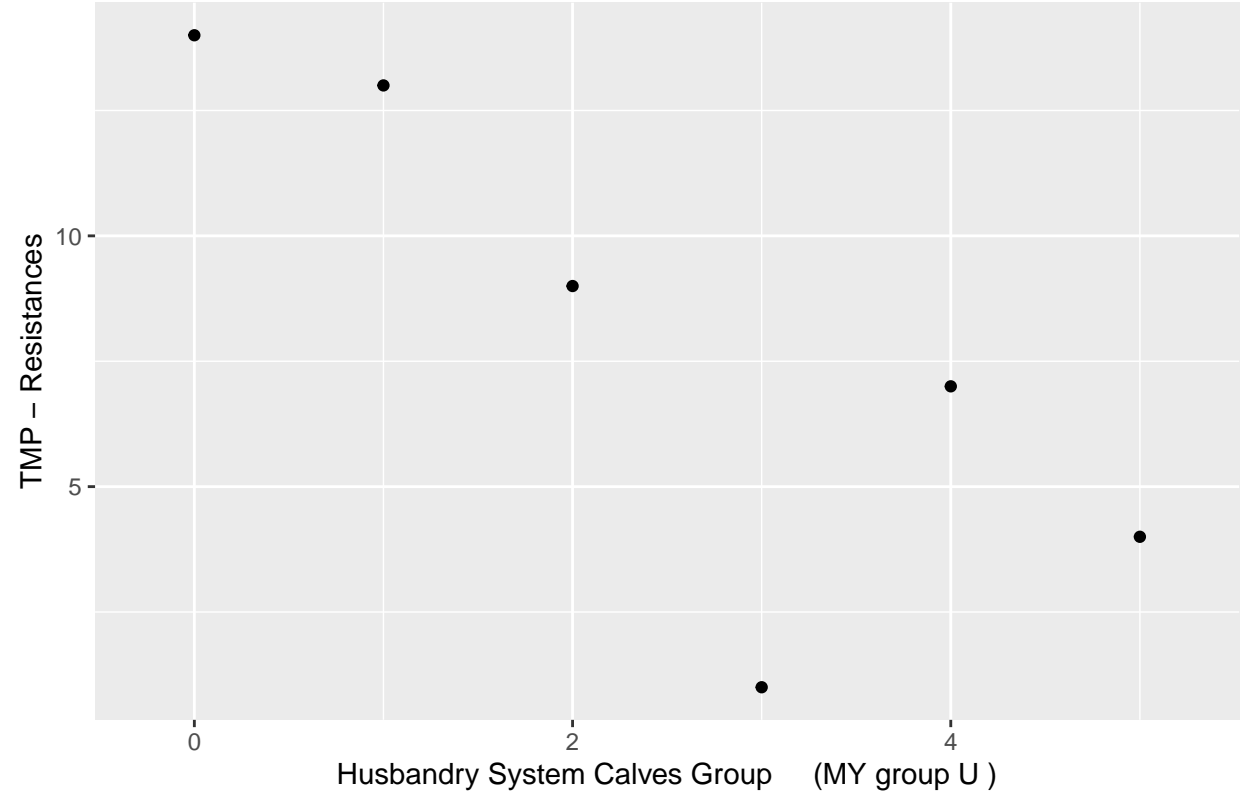
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

Number of TET – Resistances for given Husbandry System Calves Group



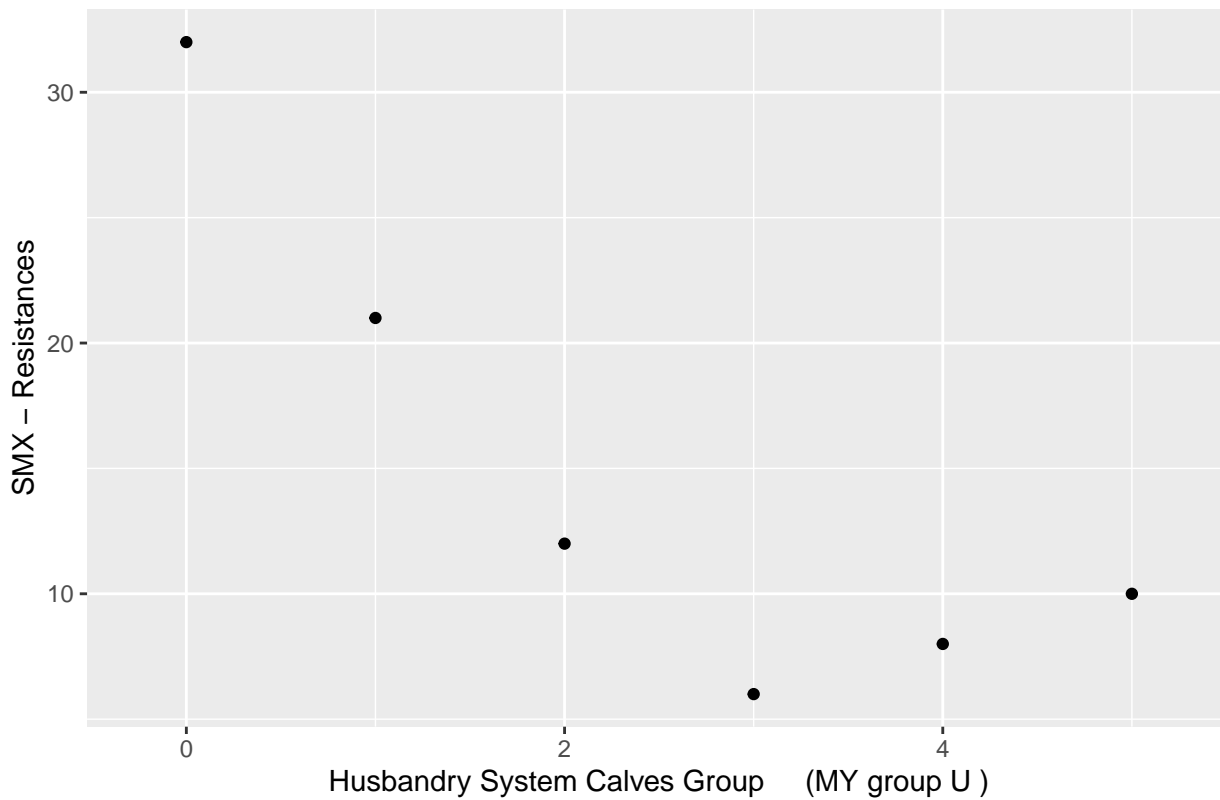
```
## [1] ""  
## Saving 6.5 x 4.5 in image
```

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