Centro de Estatística Aplicada

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Sumário

[1]Número USP: 9795810
[2]Número USP: 9...
[3]Número USP: 9299208

```r
library(matrixStats)
```

```
##
## Attaching package: 'matrixStats'
```

```
## The following object is masked from 'package:plyr':
##
##     count
```

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

```
## The following objects are masked from 'package:robustbase':
##
##     colMedians, rowMedians
```

```r
library(ggplot2)
```

Análise Descritiva

```r
setwd("C:\\Users\\Rodrigo Araujo\\Documents\\IME-USP\\CEA 2")
data = read.csv('dataset_utrassom.csv', sep = ';', dec = ',')
head(data)
```

```
##        SEXO BOLUS.CURVA.ESQ.A BOLUS.CURVA.ESQ.B BOLUS.CURVA.ESQ.K
## 1  Feminino           447.000           -62.674            79.000
## 2  Feminino             5.470           -61.034             0.095
## 3  Feminino             8.225           -62.653             0.041
## 4 Masculino             0.484           -62.457            12.539
## 5  Feminino             2.502           -62.909           123.000
## 6  Feminino            13.633           -67.085             0.039
##   BOLUS.CURVA.ESQ.MSE BOLUS.CURVA.ESQ.TTOPK BOLUS.CURVA.ESQ.AREA
## 1             322.000                25.069                18.624
## 2               1.279                23.930               118.391
## 3              13.834                37.061               372.306
## 4              21.389                29.208                86.211
## 5             907.000                46.060                87.158
## 6              15.700                36.622               425.336
##   BOLUS.CURVA.ESQ.GRAD BOLUS.CURVA.ESQ.ATM BOLUS.CURVA.DIR.A BOLUS.CURVA.DIR.B
## 1               87.000              120.00           107.390           -65.918
## 2                0.268                0.24           105.000           -60.836
## 3                0.764                0.00             4.820           -65.577
## 4                0.440                0.00            -0.126           -63.519
## 5               83.000                0.00           607.000           -63.992
## 6                0.842                0.00             5.348           -64.533
```

```
##   BOLUS.CURVA.DIR.K BOLUS.CURVA.DIR.MSE BOLUS.CURVA.DIR.TTOPK
## 1             0.008              11.100                28.788
## 2             3.192              16.003                21.171
## 3             0.056               4.853                51.953
## 4             4.304              15.369                26.449
## 5             2.137             598.000                53.677
## 6            -0.109              12.045                15.773
##   BOLUS.CURVA.DIR.AREA BOLUS.CURVA.DIR.GRAD BOLUS.CURVA.DIR.ATM
## 1              290.757              626.000               180.0
## 2               78.961                0.416                 0.6
## 3              236.720                0.427                 0.0
## 4               41.857                0.471                 0.0
## 5               35.105               59.000                60.0
## 6              111.946                0.658                 0.0
##   REFIL.CURVA.ESQ.A REFIL.CURVA.ESQ.B REFIL.CURVA.ESQ.K REFIL.CURVA.ESQ.MSE
## 1            -3.411           -47.261           551.000              561.000
## 2             1.171           -55.835             0.083                0.193
## 3                NA                NA                NA                   NA
## 4            -0.029           -49.826             1.315                0.339
## 5             1.730           -60.777           207.000              292.000
## 6                NA                NA                NA                   NA
##   REFIL.CURVA.ESQ.TTOPK REFIL.CURVA.ESQ.AREA REFIL.CURVA.ESQ.GRAD
## 1                 1.919              -55.809              299.000
## 2                15.953               20.191                0.107
## 3                    NA                   NA                   NA
## 4                 2.159                8.476                0.630
## 5                11.035               30.157              175.000
## 6                    NA                   NA                   NA
##   REFIL.CURVA.ESQ.ATM REFIL.CURVA.DIR.A REFIL.CURVA.DIR.B REFIL.CURVA.DIR.K
## 1              48.763            -1.033           -48.978              1.279
## 2              45.836             2.692           -58.837            203.000
## 3                  NA                NA                NA                   NA
## 4              34.314            -1.824           -50.979              0.068
## 5              58.163             1.988           -63.550              2.369
## 6                  NA             1.320           -57.677              0.112
##   REFIL.CURVA.DIR.MSE REFIL.CURVA.DIR.TTOPK REFIL.CURVA.DIR.AREA
## 1             956.000                18.607              -36.415
## 2             194.000                 9.476               66.809
## 3                  NA                    NA                   NA
## 4               0.097                 3.119              -25.610
## 5               2.048                26.686               45.167
## 6               1.463                 8.570              -22.646
##   REFIL.CURVA.DIR.GRAD REFIL.CURVA.DIR.ATM Controle
## 1               27.000              37.025        0
## 2              331.000              35.702        0
## 3                   NA                  NA        0
## 4               0.302              29.354        0
## 5              189.000              60.440        0
## 6               0.419              40.575        0
```

Medidas Resumo

```
## Medias
data1 = data[, -1]
colMeans(data1, na.rm = TRUE)
```

```
##     BOLUS.CURVA.ESQ.A     BOLUS.CURVA.ESQ.B     BOLUS.CURVA.ESQ.K
##            -16.223870            -61.172522             11.351126
##   BOLUS.CURVA.ESQ.MSE BOLUS.CURVA.ESQ.TTOPK  BOLUS.CURVA.ESQ.AREA
##             60.280609             28.576565             96.885870
##  BOLUS.CURVA.ESQ.GRAD   BOLUS.CURVA.ESQ.ATM     BOLUS.CURVA.DIR.A
##             50.820913             46.990435             40.054417
##     BOLUS.CURVA.DIR.B     BOLUS.CURVA.DIR.K   BOLUS.CURVA.DIR.MSE
##            -63.496375              7.418708             35.479583
## BOLUS.CURVA.DIR.TTOPK  BOLUS.CURVA.DIR.AREA  BOLUS.CURVA.DIR.GRAD
##             31.673292             95.724292             90.639792
##   BOLUS.CURVA.DIR.ATM     REFIL.CURVA.ESQ.A     REFIL.CURVA.ESQ.B
##             50.045000            -10.038087            -54.270609
##     REFIL.CURVA.ESQ.K   REFIL.CURVA.ESQ.MSE REFIL.CURVA.ESQ.TTOPK
##             63.435613             62.491045              7.676696
##  REFIL.CURVA.ESQ.AREA  REFIL.CURVA.ESQ.GRAD   REFIL.CURVA.ESQ.ATM
##             13.507304             27.436500             47.795136
##     REFIL.CURVA.DIR.A     REFIL.CURVA.DIR.B     REFIL.CURVA.DIR.K
##             14.756583            -52.000792             16.034000
##   REFIL.CURVA.DIR.MSE REFIL.CURVA.DIR.TTOPK  REFIL.CURVA.DIR.AREA
##             52.986042             23.322167             -3.740375
##  REFIL.CURVA.DIR.GRAD   REFIL.CURVA.DIR.ATM               Controle
##             39.768512             38.508792              0.360000
```

```
#install.packages('matrixStats')
require(matrixStats)

paste(colnames(data1), colSds(as.matrix(data1), na.rm = TRUE))
```

```
##  [1] "BOLUS.CURVA.ESQ.A 227.483308423498"
##  [2] "BOLUS.CURVA.ESQ.B 2.93601224405369"
##  [3] "BOLUS.CURVA.ESQ.K 29.2747761305347"
##  [4] "BOLUS.CURVA.ESQ.MSE 196.002319652725"
##  [5] "BOLUS.CURVA.ESQ.TTOPK 7.5477075618187"
##  [6] "BOLUS.CURVA.ESQ.AREA 116.505325312663"
##  [7] "BOLUS.CURVA.ESQ.GRAD 131.081623982198"
##  [8] "BOLUS.CURVA.ESQ.ATM 117.16614029497"
##  [9] "BOLUS.CURVA.DIR.A 124.324443301603"
## [10] "BOLUS.CURVA.DIR.B 3.39840816716476"
## [11] "BOLUS.CURVA.DIR.K 12.4904215457082"
## [12] "BOLUS.CURVA.DIR.MSE 120.21694881227"
## [13] "BOLUS.CURVA.DIR.TTOPK 10.9141330810666"
## [14] "BOLUS.CURVA.DIR.AREA 88.2201267253282"
## [15] "BOLUS.CURVA.DIR.GRAD 194.351835637684"
## [16] "BOLUS.CURVA.DIR.ATM 108.566232919977"
## [17] "REFIL.CURVA.ESQ.A 31.9805914436085"
```

```
## [18] "REFIL.CURVA.ESQ.B 4.44522710064228"
## [19] "REFIL.CURVA.ESQ.K 182.504082175611"
## [20] "REFIL.CURVA.ESQ.MSE 145.389970627595"
## [21] "REFIL.CURVA.ESQ.TTOPK 7.13554209213404"
## [22] "REFIL.CURVA.ESQ.AREA 60.5533105096318"
## [23] "REFIL.CURVA.ESQ.GRAD 72.6566569307806"
## [24] "REFIL.CURVA.ESQ.ATM 52.6494504527874"
## [25] "REFIL.CURVA.DIR.A 77.8185679557804"
## [26] "REFIL.CURVA.DIR.B 12.469889414032"
## [27] "REFIL.CURVA.DIR.K 74.2101756657928"
## [28] "REFIL.CURVA.DIR.MSE 196.720207298607"
## [29] "REFIL.CURVA.DIR.TTOPK 75.3997817864831"
## [30] "REFIL.CURVA.DIR.AREA 58.2695096806081"
## [31] "REFIL.CURVA.DIR.GRAD 95.2952704549269"
## [32] "REFIL.CURVA.DIR.ATM 9.66680339224272"
## [33] "Controle 0.489897948556636"
```

```
#colSds(as.matrix(data[, -1]), na.rm = TRUE)
```

Análise das curvas bolus lado esquerdo

Criando a função gamma para simulação das curvas

```
data2 = data[-c(11, 12),]

rownames(data2) <- seq(1, 23)

# simulação da função gamma
simulacao <- function(A, B, k){

  (A*(1 + (-1*exp(-1*k*x))) + B)

}
```

Aplicação da função gamma usando os parâmetros em função dos paciêntes.

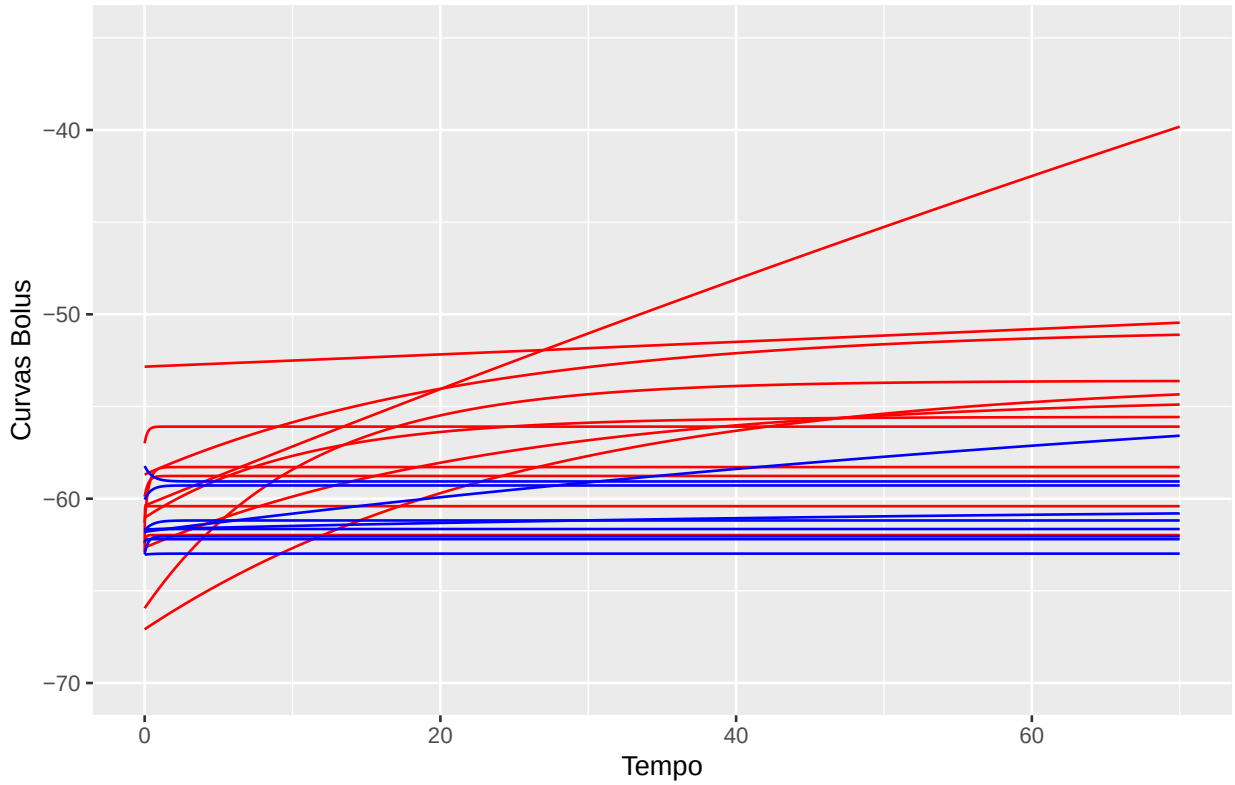
```
x <- seq(0, 70, 0.01)

data_y <- data.frame('y' = rep(0, 7001))

for (i in 1:nrow(data2)){

  y_1 <- simulacao(data2[i, 2], data2[i, 3], data2[i, 4])
  data_y <- cbind(data_y, y_1)

}

curvas = rep('curva', ncol(data_y))
curvas2 = seq(0, 23)
curvas2 = as.character(curvas2)
names_data_y <- paste(curvas, curvas2)
```

```
colnames(data_y) <- names_data_y
data_y$X <- x
```

Gerando as curvas para todos os paciêntes.

```
ggplot(data_y, aes(X)) +
  geom_line(aes(y=`curva 1`), colour="red") +
  geom_line(aes(y=`curva 2`), colour="red") +
  geom_line(aes(y=`curva 3`), colour="red") +
  geom_line(aes(y=`curva 4`), colour="red") +
  geom_line(aes(y=`curva 5`), colour="red") +
  geom_line(aes(y=`curva 6`), colour="red") +
  geom_line(aes(y=`curva 7`), colour="red") +
  geom_line(aes(y=`curva 8`), colour="red") +
  geom_line(aes(y=`curva 9`), colour="red") +
  geom_line(aes(y=`curva 10`), colour="red") +
  geom_line(aes(y=`curva 11`), colour="red") +
  geom_line(aes(y=`curva 12`), colour="red") +
  geom_line(aes(y=`curva 13`), colour="red") +
  geom_line(aes(y=`curva 14`), colour="red") +
  geom_line(aes(y=`curva 15`), colour="blue") +
  geom_line(aes(y=`curva 16`), colour="blue") +
  geom_line(aes(y=`curva 17`), colour="blue") +
  geom_line(aes(y=`curva 18`), colour="blue") +
  geom_line(aes(y=`curva 19`), colour="blue") +
  geom_line(aes(y=`curva 20`), colour="blue") +
  geom_line(aes(y=`curva 21`), colour="blue") +
  geom_line(aes(y=`curva 22`), colour="blue") +
  geom_line(aes(y=`curva 23`), colour="blue") +
  ylim(-70, -35) +
  xlab("Tempo") + ylab("Curvas Bolus")
```

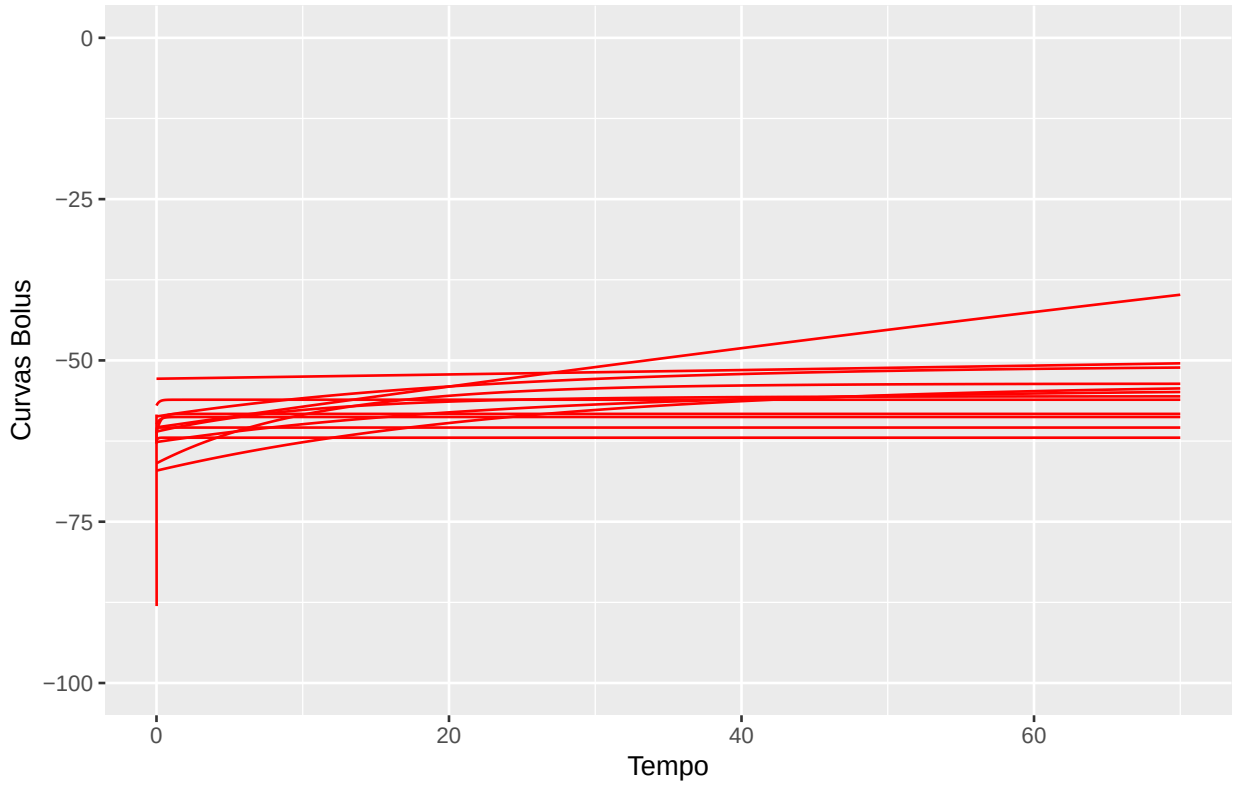
```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```



Grupo dos pacientes

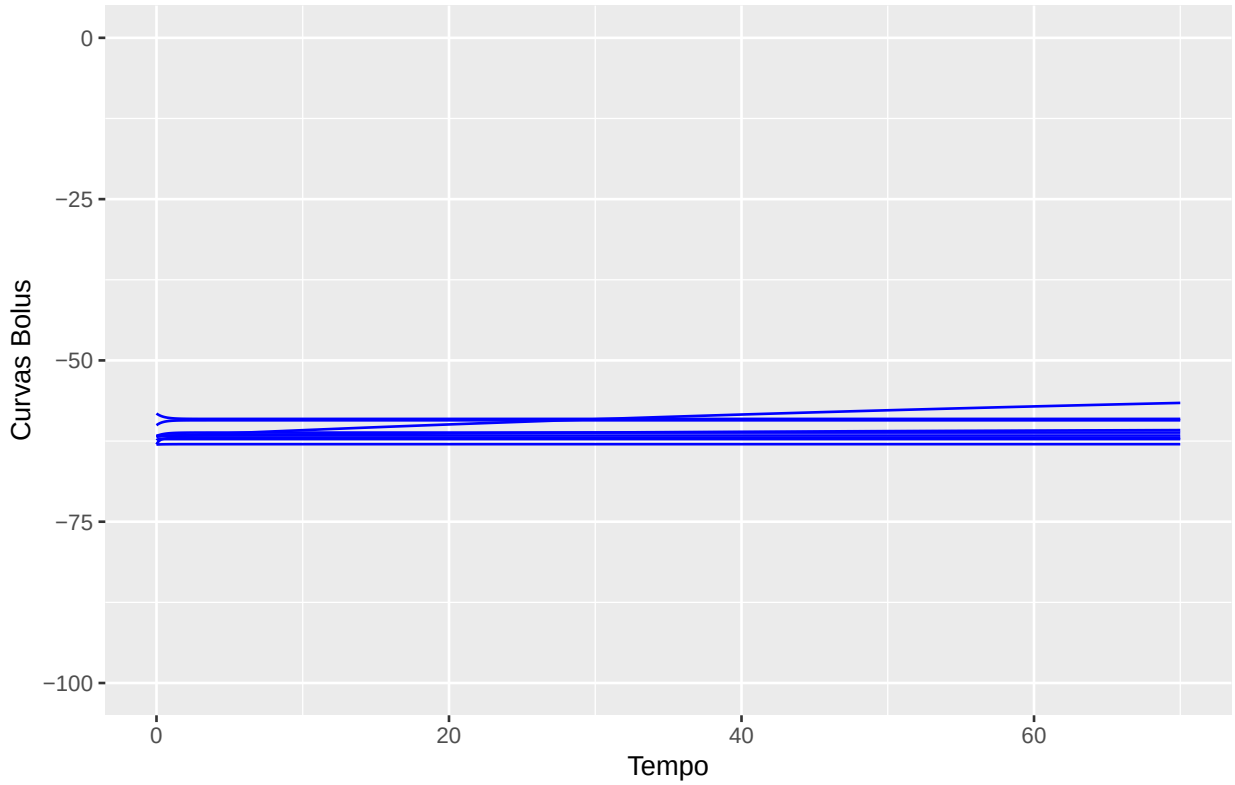
```
ggplot(data_y, aes(X)) +
  geom_line(aes(y=`curva 1`), colour="red") +
  geom_line(aes(y=`curva 2`), colour="red") +
  geom_line(aes(y=`curva 3`), colour="red") +
  geom_line(aes(y=`curva 4`), colour="red") +
  geom_line(aes(y=`curva 5`), colour="red") +
  geom_line(aes(y=`curva 6`), colour="red") +
  geom_line(aes(y=`curva 7`), colour="red") +
  geom_line(aes(y=`curva 8`), colour="red") +
  geom_line(aes(y=`curva 9`), colour="red") +
  geom_line(aes(y=`curva 10`), colour="red") +
  geom_line(aes(y=`curva 11`), colour="red") +
  geom_line(aes(y=`curva 12`), colour="red") +
  geom_line(aes(y=`curva 13`), colour="red") +
  geom_line(aes(y=`curva 14`), colour="red") +
  ylim(-100, 0) +
  xlab("Tempo") + ylab("Curvas Bolus")
```

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```



Grupo controle

```
ggplot(data_y, aes(X)) +
  geom_line(aes(y=‘curva 15‘), colour="blue") +
  geom_line(aes(y=‘curva 16‘), colour="blue") +
  geom_line(aes(y=‘curva 17‘), colour="blue") +
  geom_line(aes(y=‘curva 18‘), colour="blue") +
  geom_line(aes(y=‘curva 19‘), colour="blue") +
  geom_line(aes(y=‘curva 20‘), colour="blue") +
  geom_line(aes(y=‘curva 21‘), colour="blue") +
  geom_line(aes(y=‘curva 22‘), colour="blue") +
  geom_line(aes(y=‘curva 23‘), colour="blue") +
  ylim(-100, 0) +
  xlab("Tempo") + ylab("Curvas Bolus")
```



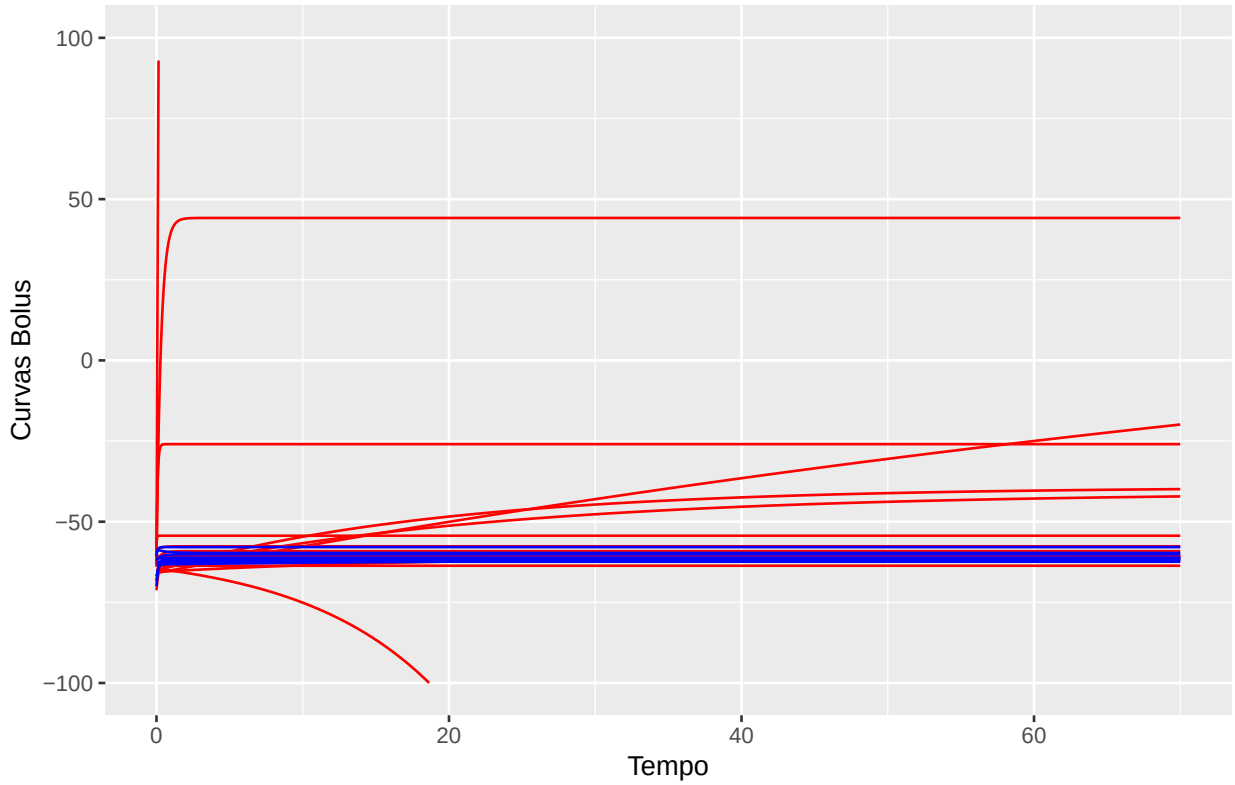
Análise das curvas bolus lado direito

Aplicação da função gamma usando os parâmetros em função dos paciêntes.

```
data2 = data[-c(16),]

rownames(data2) <- seq(1, 24)

x <- seq(0, 70, 0.01)

data_y <- data.frame('y' = rep(0, 7001))

for (i in 1:nrow(data2)){

  y_1 <- simulacao(data2[i, 10], data2[i, 11], data2[i, 12])
  data_y <- cbind(data_y, y_1)

}

curvas = rep('curva', ncol(data_y))
curvas2 = seq(0, 24)
curvas2 = as.character(curvas2)
names_data_y <- paste(curvas, curvas2)
colnames(data_y) <- names_data_y
data_y$X <- x
```

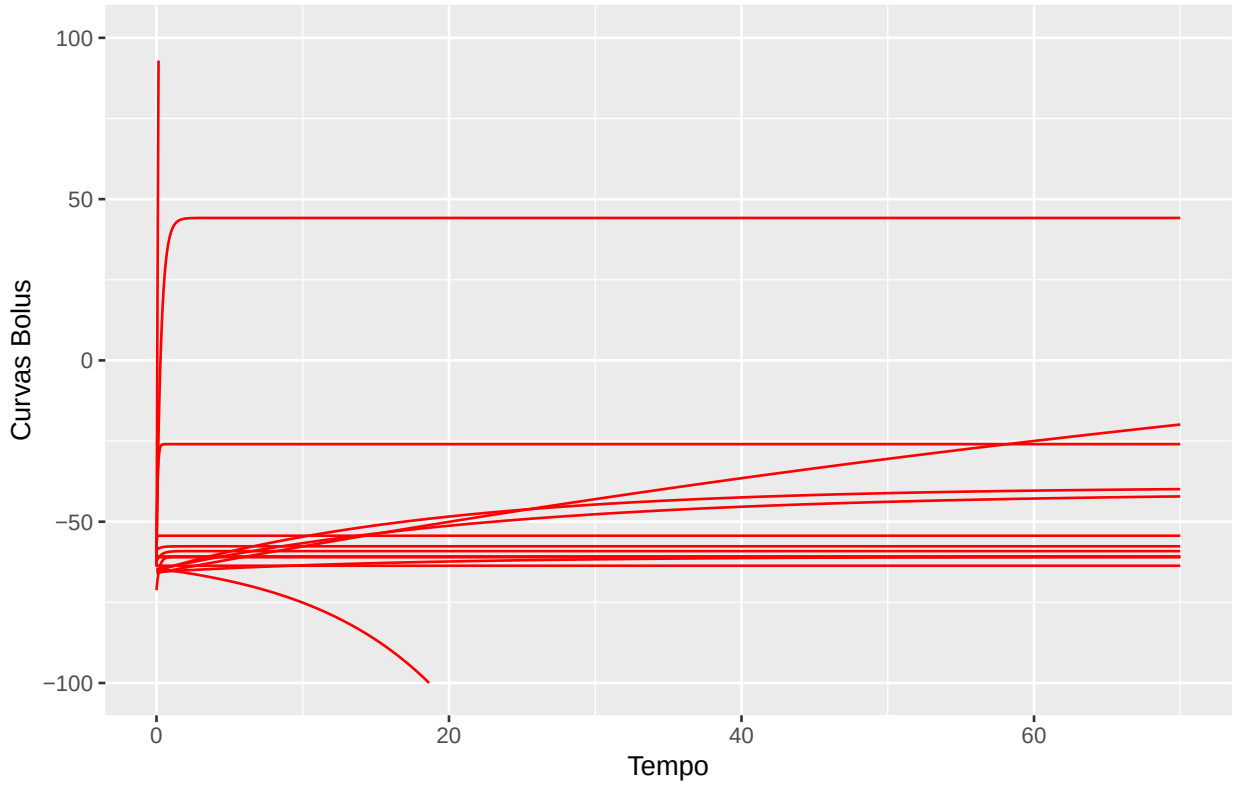
Gerando as curvas para todos os paciêntes.

```
ggplot(data_y, aes(X)) +
  geom_line(aes(y=`curva 1`), colour="red") +
  geom_line(aes(y=`curva 2`), colour="red") +
  geom_line(aes(y=`curva 3`), colour="red") +
  geom_line(aes(y=`curva 4`), colour="red") +
  geom_line(aes(y=`curva 5`), colour="red") +
  geom_line(aes(y=`curva 6`), colour="red") +
  geom_line(aes(y=`curva 7`), colour="red") +
  geom_line(aes(y=`curva 8`), colour="red") +
  geom_line(aes(y=`curva 9`), colour="red") +
  geom_line(aes(y=`curva 10`), colour="red") +
  geom_line(aes(y=`curva 11`), colour="red") +
  geom_line(aes(y=`curva 12`), colour="red") +
  geom_line(aes(y=`curva 13`), colour="red") +
  geom_line(aes(y=`curva 14`), colour="red") +
  geom_line(aes(y=`curva 15`), colour="red") +
  geom_line(aes(y=`curva 16`), colour="blue") +
  geom_line(aes(y=`curva 17`), colour="blue") +
  geom_line(aes(y=`curva 18`), colour="blue") +
  geom_line(aes(y=`curva 19`), colour="blue") +
  geom_line(aes(y=`curva 20`), colour="blue") +
  geom_line(aes(y=`curva 21`), colour="blue") +
  geom_line(aes(y=`curva 22`), colour="blue") +
  geom_line(aes(y=`curva 23`), colour="blue") +
  geom_line(aes(y=`curva 24`), colour="blue") +
  ylim(-100, 100) +
  xlab("Tempo") + ylab("Curvas Bolus")
```



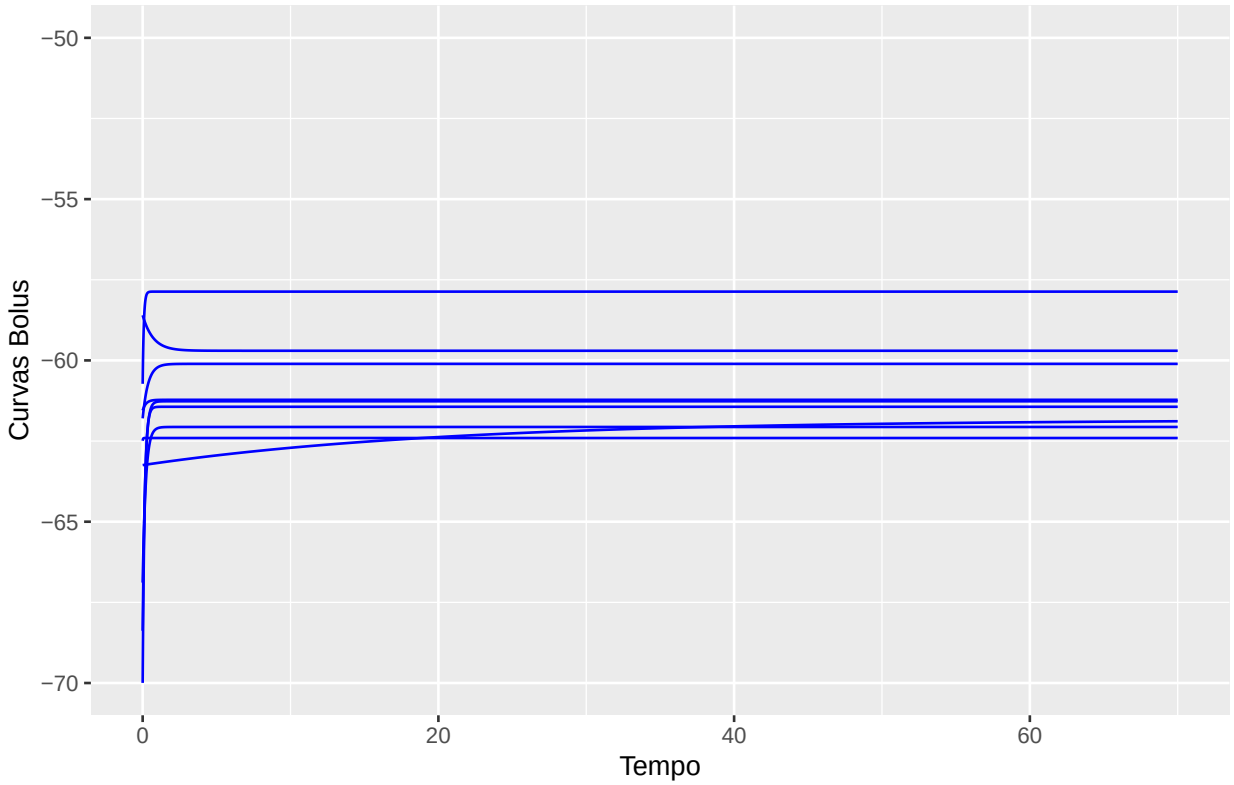
Grupo dos pacientes

```
ggplot(data_y, aes(X)) +
  geom_line(aes(y=‘curva 1‘), colour="red") +
  geom_line(aes(y=‘curva 2‘), colour="red") +
  geom_line(aes(y=‘curva 3‘), colour="red") +
  geom_line(aes(y=‘curva 4‘), colour="red") +
  geom_line(aes(y=‘curva 5‘), colour="red") +
  geom_line(aes(y=‘curva 6‘), colour="red") +
  geom_line(aes(y=‘curva 7‘), colour="red") +
  geom_line(aes(y=‘curva 8‘), colour="red") +
  geom_line(aes(y=‘curva 9‘), colour="red") +
  geom_line(aes(y=‘curva 10‘), colour="red") +
  geom_line(aes(y=‘curva 11‘), colour="red") +
  geom_line(aes(y=‘curva 12‘), colour="red") +
  geom_line(aes(y=‘curva 13‘), colour="red") +
  geom_line(aes(y=‘curva 14‘), colour="red") +
  geom_line(aes(y=‘curva 15‘), colour="red") +
  ylim(-100, 100) +
  xlab("Tempo") + ylab("Curvas Bolus")
```



Grupo controle

```
ggplot(data_y, aes(X)) +
  geom_line(aes(y=‘curva 16‘), colour="blue") +
  geom_line(aes(y=‘curva 17‘), colour="blue") +
  geom_line(aes(y=‘curva 18‘), colour="blue") +
  geom_line(aes(y=‘curva 19‘), colour="blue") +
  geom_line(aes(y=‘curva 20‘), colour="blue") +
  geom_line(aes(y=‘curva 21‘), colour="blue") +
  geom_line(aes(y=‘curva 22‘), colour="blue") +
  geom_line(aes(y=‘curva 23‘), colour="blue") +
  geom_line(aes(y=‘curva 24‘), colour="blue") +
  ylim(-70, -50) +
  xlab("Tempo") + ylab("Curvas Bolus")
```


−50
−55
−60
−65
−70
Curvas Bolus
0
20
40
60
Tempo