Regressão não linear para parâmetros placentares em R

Tratamento e exploração do dataset

Imports

```r
library(summarytools)
library(dplyr)
library(ggplot2)
library(gridExtra)
library(moments)
library(stats)
library(knitr)
library(tidyr)
```

Carregamento, verificação e tratamento dos dados

Download e carregamento do dataset:

```r
#ler os dados
placenta = read.csv(file = 'dataset_placenta.csv', header = T, sep = ';', dec = '.')
head(placenta)
```

```
##              local NumeroProcesso Procassoc Obstetriccontext MaternalAge GA
## 1           Tâmega         538962    538963                3        32.9 12
## 2    Douro e Vouga         659636    659637                2        41.4 15
## 3       Matosinhos         619283    619284                3        33.9 12
## 4 Barreiro/Montijo         714063    714064                3        33.6 12
## 5            Viseu         861774    861776                9        43.4 13
## 6           Tâmega         828537    828538                1        30.1 12
##   IG_grouped Fetalweight Fetalgender Fetalpathology Pregnancyoutcome
## 1          1        15.7           1              0                0
## 2          1        15.0           1             12                3
## 3          1        16.9           1              2                0
## 4          1        25.3           1              1                0
## 5          1        16.0           0             12                3
## 6          1        16.0           1              0                3
##   Placentalshape Placentalweight Diameter1 Diameter2 Placentalthickness
## 1              0              76         7         5                2.8
## 2              0              72         7         7                1.5
## 3              0              72         6         5                2.0
## 4              0              96        12         8                2.0
## 5              0              60         9         5                2.5
## 6              0              60         7         4                2.5
```

```
##   UCvesselsnumber UClenght UCdiameter UCinsertiontype Maternalpathology ratio
## 1               3        9        0.2               0                 0  0.21
## 2               3        6        0.3               0                 0  0.21
## 3               3        8        0.2               0                 0  0.23
## 4               3       10        0.4               0                 0  0.26
## 5               3        4        0.4               0                 0  0.27
## 6               3        6        0.5               1                10  0.27
##   ratio2 Placental_vol log_vol Informacoes
## 1   4.84          98.0    1.99
## 2   4.80          73.5    1.87
## 3   4.26          60.0    1.78
## 4   3.79         192.0    2.28
## 5   3.75         112.5    2.05
## 6   3.75          70.0    1.85
```

```r
#Nomes das colunas
names(placenta)
```

```
##  [1] "local"              "NumeroProcesso"     "Procassoc"
##  [4] "Obstetriccontext"   "MaternalAge"        "GA"
##  [7] "IG_grouped"         "Fetalweight"        "Fetalgender"
## [10] "Fetalpathology"     "Pregnancyoutcome"   "Placentalshape"
## [13] "Placentalweight"    "Diameter1"          "Diameter2"
## [16] "Placentalthickness" "UCvesselsnumber"    "UClenght"
## [19] "UCdiameter"         "UCinsertiontype"    "Maternalpathology"
## [22] "ratio"              "ratio2"             "Placental_vol"
## [25] "log_vol"            "Informacoes"
```

Variáveis

local: Local de recolha da placenta

NumeroProcesso: Número associado ao paciente

Procassoc: Número de processo

Obstetriccontext: Contexto obstétrico

MaternalAge: Idade maternal

GA: Idade gestacional

IG_grouped: Idade gestacional agrupada

Fetalweightg: Peso ao nascer

Fetalgender: Género do feto

Fetalpathology: Patologia do feto

Pregnancyoutcome: Resultado da gravidez

Placentalshape: Forma da placenta

Placentalweight: Peso da placenta

Diameter1: Menor valor do diámetro da placenta

Diameter2: Maior valor do diámetro da placenta

Placentalthickness: Espessura da placenta

UCvesselsnumber: Número de vasos cordão

UClenght: Tamanho do cordão

UCdiameter: Diámetro do cordão

UCinsertiontype: Tipo de inserção do cordão

Maternalpathology: Patologia materna

ratio: Rácio do peso ao nascimento/placentar -> Fetalweight/Placentalweight

ratio2: Rácio peso placentar -> Placentalweight/Fetalweight

Placental_vol: Volume da placenta

log_vol: Logarítmo do volume da placenta

Informação preliminar do dataset

```
str(placenta)
```

```
## 'data.frame':    2092 obs. of  26 variables:
##  $ local             : chr  "Tâmega" "Douro e Vouga" "Matosinhos" "Barreiro/Montijo" ...
##  $ NumeroProcesso    : chr  "538962" "659636" "619283" "714063" ...
##  $ Procassoc         : chr  "538963" "659637" "619284" "714064" ...
##  $ Obstetriccontext  : int  3 2 3 3 9 1 2 1 2 3 ...
##  $ MaternalAge       : num  32.9 41.4 33.9 33.6 43.4 30.1 32 29 35.1 36.1 ...
##  $ GA                : int  12 15 12 12 13 12 14 12 15 12 ...
##  $ IG_grouped        : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ Fetalweight       : num  15.7 15 16.9 25.3 16 16 24 9.3 12 6 ...
##  $ Fetalgender       : int  1 1 1 1 0 1 1 1 1 1 ...
##  $ Fetalpathology    : num  0 12 2 1 12 0 9 1 1 0 ...
##  $ Pregnancyoutcome  : int  0 3 0 0 3 3 0 0 0 0 ...
##  $ Placentalshape    : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ Placentalweight   : num  76 72 72 96 60 60 88 33 41 20 ...
##  $ Diameter1         : num  7 7 6 12 9 7 8 6 6.5 6 ...
##  $ Diameter2         : num  5 7 5 8 5 4 6 5 5 6 ...
##  $ Placentalthickness: num  2.8 1.5 2 2 2.5 2.5 2 1 1.3 0.5 ...
##  $ UCvesselsnumber   : int  3 3 3 3 3 3 NA 3 NA 3 ...
##  $ UClenght          : num  9 6 8 10 4 6 9 2 15 1.5 ...
##  $ UCdiameter        : num  0.2 0.3 0.2 0.4 0.4 0.5 0.3 0.2 0.1 0.3 ...
##  $ UCinsertiontype   : int  0 0 0 0 0 1 0 1 0 1 ...
##  $ Maternalpathology : num  0 0 0 0 0 10 0 0 0 0 ...
##  $ ratio             : num  0.21 0.21 0.23 0.26 0.27 0.27 0.27 0.28 0.29 0.3 ...
##  $ ratio2            : num  4.84 4.8 4.26 3.79 3.75 3.75 3.67 3.55 3.42 3.33 ...
##  $ Placental_vol     : num  98 73.5 60 192 112.5 ...
##  $ log_vol           : num  1.99 1.87 1.78 2.28 2.05 1.85 1.98 1.48 1.63 1.26 ...
##  $ Informacoes       : chr  "" "" "" "" ...
```

```
#Dimensão
dim(placenta)
```

```
## [1] 2092   26
```

```r
#Tipo de classe das variáveis
unlist(lapply(placenta,class))
```

```
##               local     NumeroProcesso          Procassoc   Obstetriccontext
##         "character"        "character"        "character"          "integer"
##         MaternalAge                 GA         IG_grouped        Fetalweight
##           "numeric"          "integer"          "integer"          "numeric"
##         Fetalgender     Fetalpathology  Pregnancyoutcome      Placentalshape
##           "integer"          "numeric"          "integer"          "integer"
##     Placentalweight          Diameter1          Diameter2 Placentalthickness
##           "numeric"          "numeric"          "numeric"          "numeric"
##     UCvesselsnumber          UClenght         UCdiameter    UCinsertiontype
##           "integer"          "numeric"          "numeric"          "integer"
##   Maternalpathology              ratio             ratio2      Placental_vol
##           "numeric"          "numeric"          "numeric"          "numeric"
##             log_vol        Informacoes
##           "numeric"        "character"
```

```r
#Tipo de valor das variávies
unlist(lapply(placenta,typeof))
```

```
##               local     NumeroProcesso          Procassoc   Obstetriccontext
##         "character"        "character"        "character"          "integer"
##         MaternalAge                 GA         IG_grouped        Fetalweight
##            "double"          "integer"          "integer"           "double"
##         Fetalgender     Fetalpathology  Pregnancyoutcome      Placentalshape
##           "integer"           "double"          "integer"          "integer"
##     Placentalweight          Diameter1          Diameter2 Placentalthickness
##            "double"           "double"           "double"           "double"
##     UCvesselsnumber          UClenght         UCdiameter    UCinsertiontype
##           "integer"           "double"           "double"          "integer"
##   Maternalpathology              ratio             ratio2      Placental_vol
##            "double"           "double"           "double"           "double"
##             log_vol        Informacoes
##            "double"        "character"
```

Seleção das variáveis a serem utilizadas no estudo. Estas variáveis incluíram "local", "GA" (idade gestacional), "MaternalAge" (idade da mãe), "Obstetriccontext" (paridade da mãe), "Fetalweight" (peso fetal), "Fetalgender" (género fetal), "Placentalweight" (peso placentar), "Diameter1" (diâmetro 1), "Diameter2" (diâmetro 2), "Placentalthickness" (espessura placentar) e "Placentalshape" (forma placentar).

```r
placenta_data <- placenta[, c("local","GA", "MaternalAge", "Fetalweight", "Fetalgender", "Placentalweig
```

Tratamento dos valores omissos

```r
#Verificação da hipótese de existir dados em falta
sum(is.na(placenta_data))
```

```
## [1] 22
```

```r
#remover Na
data_clean <- na.exclude(placenta_data)

#verificar se foram removidos os Na
sum(is.na(data_clean))
```

```
## [1] 0
```

```r
dim(data_clean)
```

```
## [1] 2073   11
```

Encontraram-se 22 valores omissos (1,1% dos dados totais) em diversas colunas. Dada a quantidade mínima e ausência de um padrão destes valores, optou-se por remover todos os casos com valores omissos para pelo menos uma variável.

Tratamento de linhas duplicadas

```r
#Verificar se existe linhas duplicadas
any(duplicated(data_clean))
```

```
## [1] TRUE
```

```r
#remover linhas dulicadas
data <- unique(data_clean)
any(duplicated(data))
```

```
## [1] FALSE
```

```r
#verificar dimensão
dim(data)
```

```
## [1] 2066   11
```

Foram encontradas 7 linhas duplicadas, que foram removidas.

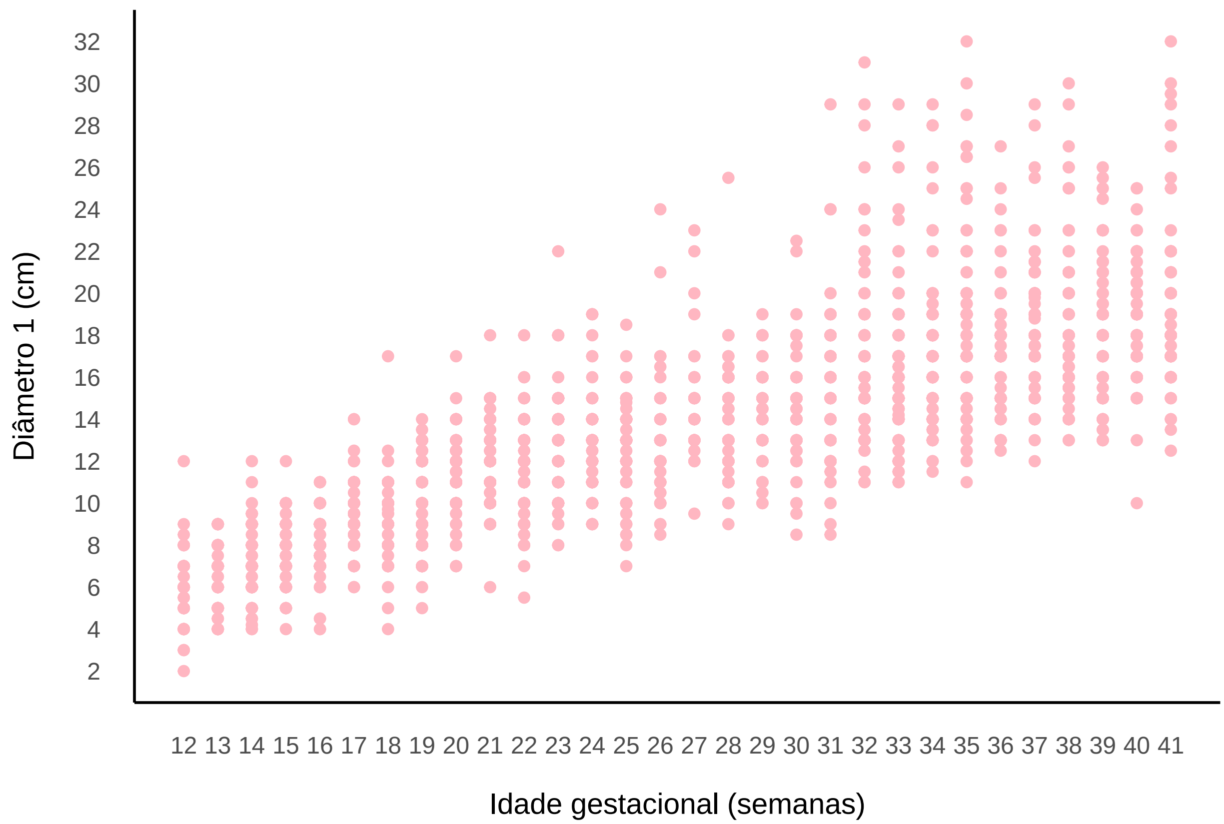
Visualização dos dados

Análise visual dos dados para verificar se existe necessidade de mais algum tratamento dos dados

Gráficos de dispersão

Diâmetro 1

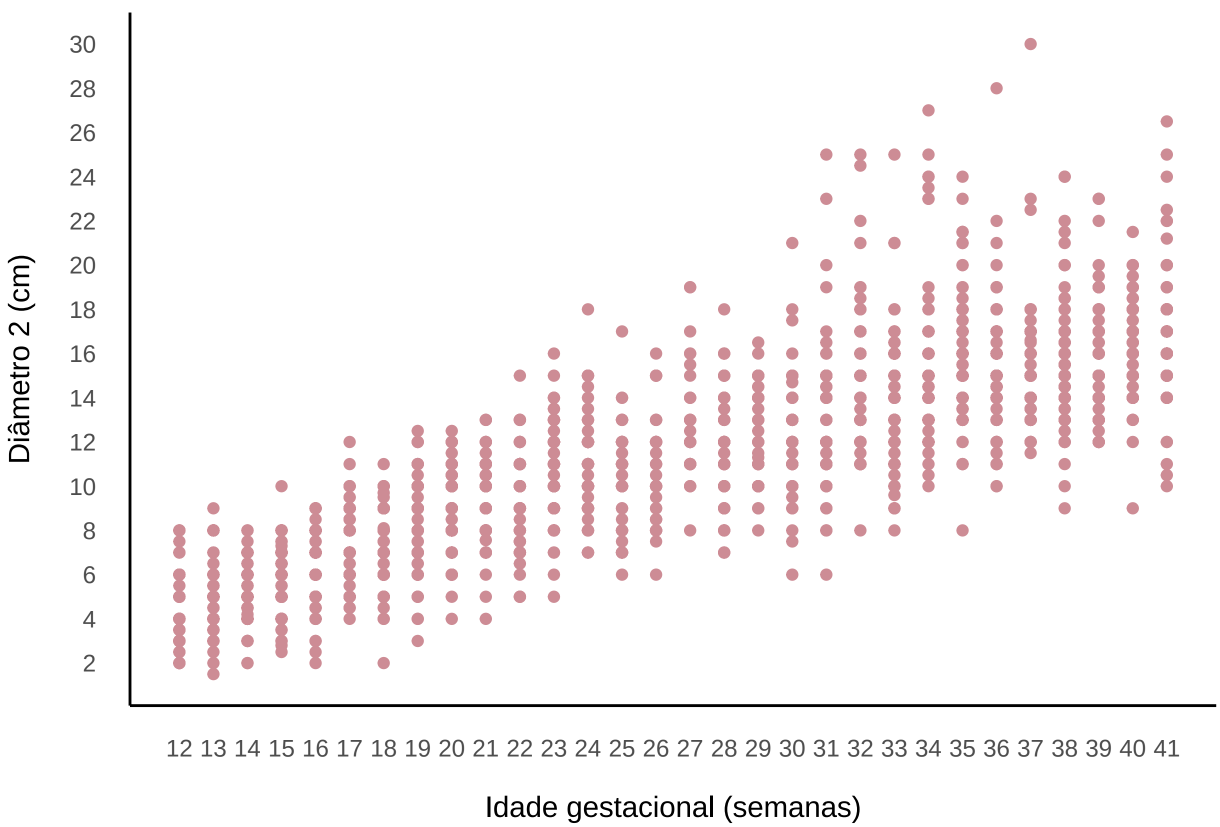
```r
# Gerar uma sequência de valores de 12 a 41 com incremento de 1
x_values <- seq(12, 41, by = 1)

p1 <- ggplot(data, aes(GA, Diameter1)) +
  geom_point(color = "lightpink") +
  labs(x = "Idade gestacional (semanas)", y = "Diâmetro 1 (cm)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Diameter1), 2)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p1
```




```r
ggsave("D1.pdf", p1, dpi = 1200)
```

Diâmetro 2

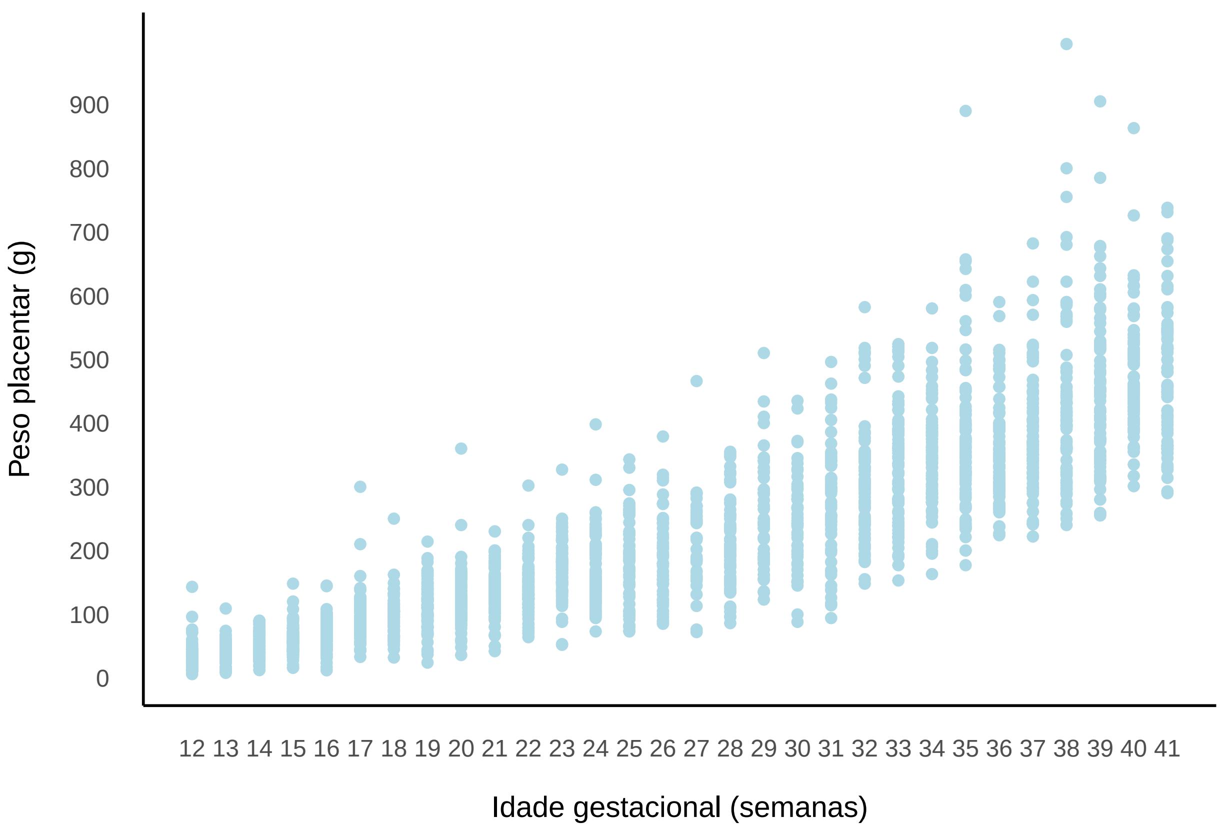
```
p2 <- ggplot(data, aes(GA, Diameter2)) +
  geom_point(color = "lightpink3") +
  labs(x = "Idade gestacional (semanas)", y = "Diâmetro 2 (cm)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Diameter2), 2)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p2
```




```
ggsave("D2.pdf", p2, dpi = 1200)
```

Peso placentar

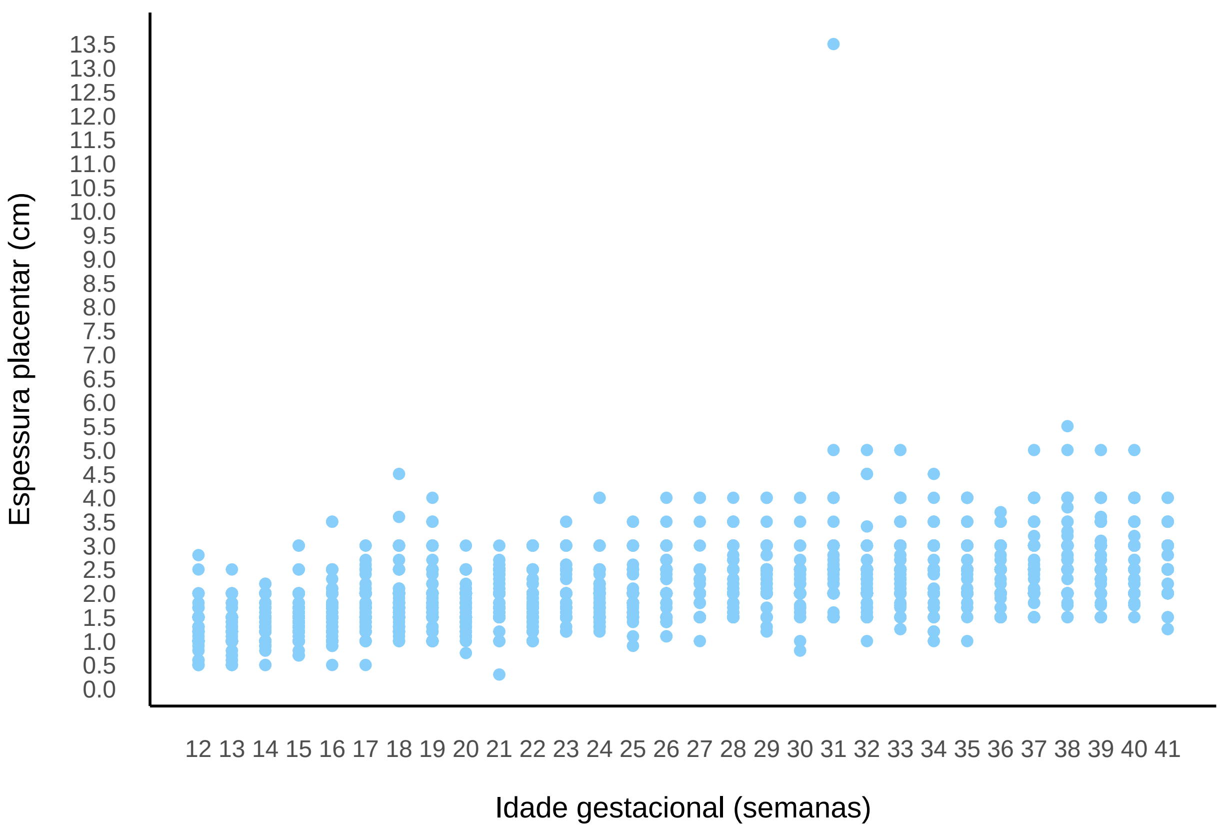
```r
p3 <- ggplot(data, aes(GA, Placentalweight)) +
  geom_point(color = "lightblue") +
  labs(x = "Idade gestacional (semanas)", y = "Peso placentar (g)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Placentalweight), 100)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p3
```




```r
ggsave("peso.pdf", p3, dpi = 1200)
```

Espessura placentar

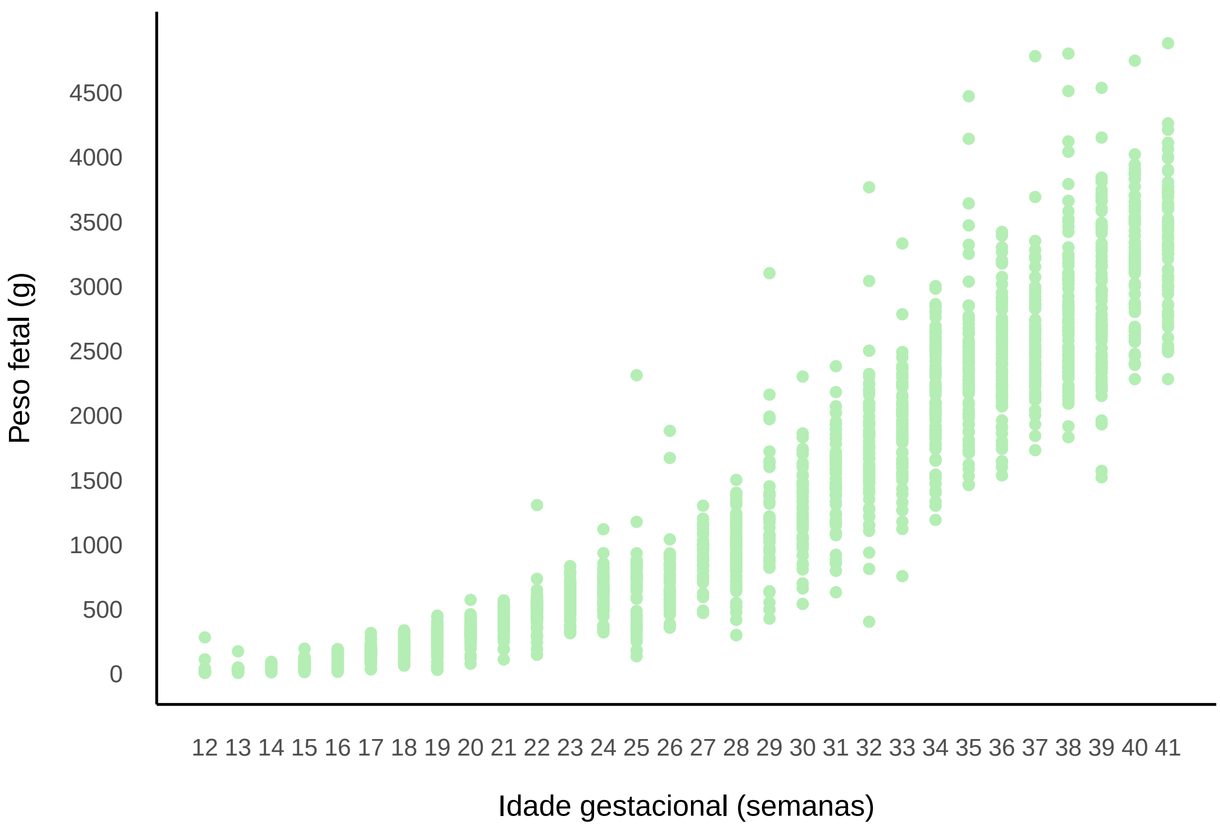
```
p4 <- ggplot(data, aes(GA, Placentalthickness)) +
  geom_point(color = "lightskyblue") +
  labs(x = "Idade gestacional (semanas)", y = "Espessura placentar (cm)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Placentalthickness), 0.5)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p4
```




```
ggsave("espessura.pdf", p4, dpi = 1200)
```

Peso fetal

```
p5 <- ggplot(data, aes(GA, Fetalweight)) +
  geom_point(color = "darkseagreen2") +
  labs(x = "Idade gestacional (semanas)", y = "Peso fetal (g)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Fetalweight), 500)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p5
```




```
ggsave("peso_fetal.pdf", p5, dpi = 1200)
```

Análise geral dos gráficos de dispersão de todas as variáveis

Variáveis contínuas. Os gráficos sugerem uma relação positiva, com maior variação para idades gestacionais maiores. Sugerem também que a variável resposta (Diameter1, Diameter2, Placentalweight, Placentalthickness e Fetalweight) média é aproximadamente constante.

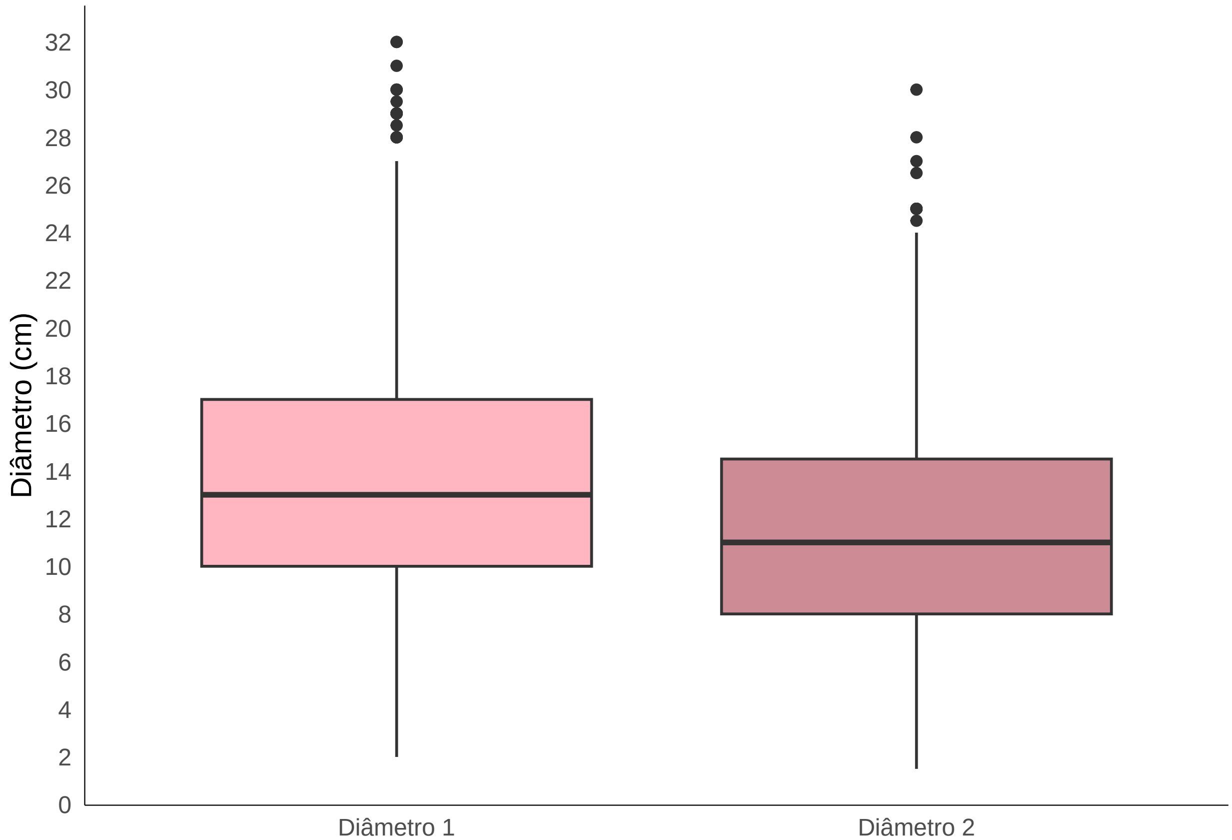
Problemas:

- Complexidade da relação entre Diameter1/Diameter2/Placentalweight/Placentalthickness e a idade gestacional: A dependência da mediana da variável de resposta na idade gestacinal é não linear, e funções de suavização não paramétricas podem ser necessárias.
- Não homogeneidade da variação da variável de resposta: Há uma indicação de não homogeneidade da variância da variável de resposta.
- Assimetria: Há uma indicação de assimetria positiva na distribuição da variável resposta que poderá depender da GA e isso poderá ser tido em conta no modelo estatístico.

Boxplots

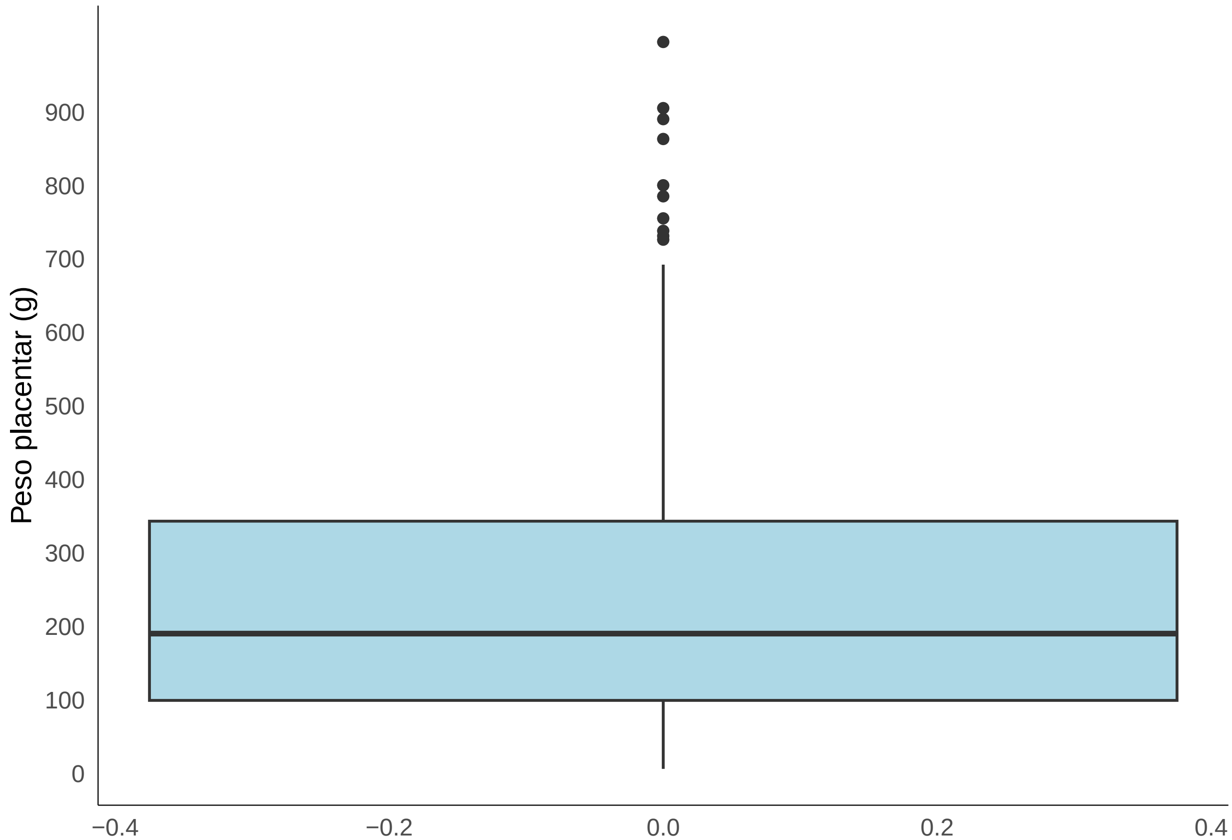
Variáveis Diâmetro 1 e Diâmetro 2

```r
data_list <- list(data$Diameter1, data$Diameter2)

data_df <- data.frame(Diameter = unlist(data_list),
                      Group = rep(c("Diâmetro 1", "Diâmetro 2"), each = length(data$Diameter1)))
d1_d2 <- ggplot(data_df, aes(x = Group, y = Diameter, fill = Group)) +
  geom_boxplot() +
  scale_y_continuous(breaks = seq(0, max(data$Diameter1), 2)) +
  labs(y = "Diâmetro (cm)", x = NULL) +
  scale_fill_manual(values = c('lightpink', 'lightpink3')) +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2)) +
  theme(legend.position = "none")

ggsave("boxplot_d1_d2.pdf",d1_d2, dpi = 1200)

d1_d2
```



Variável Placentalweight

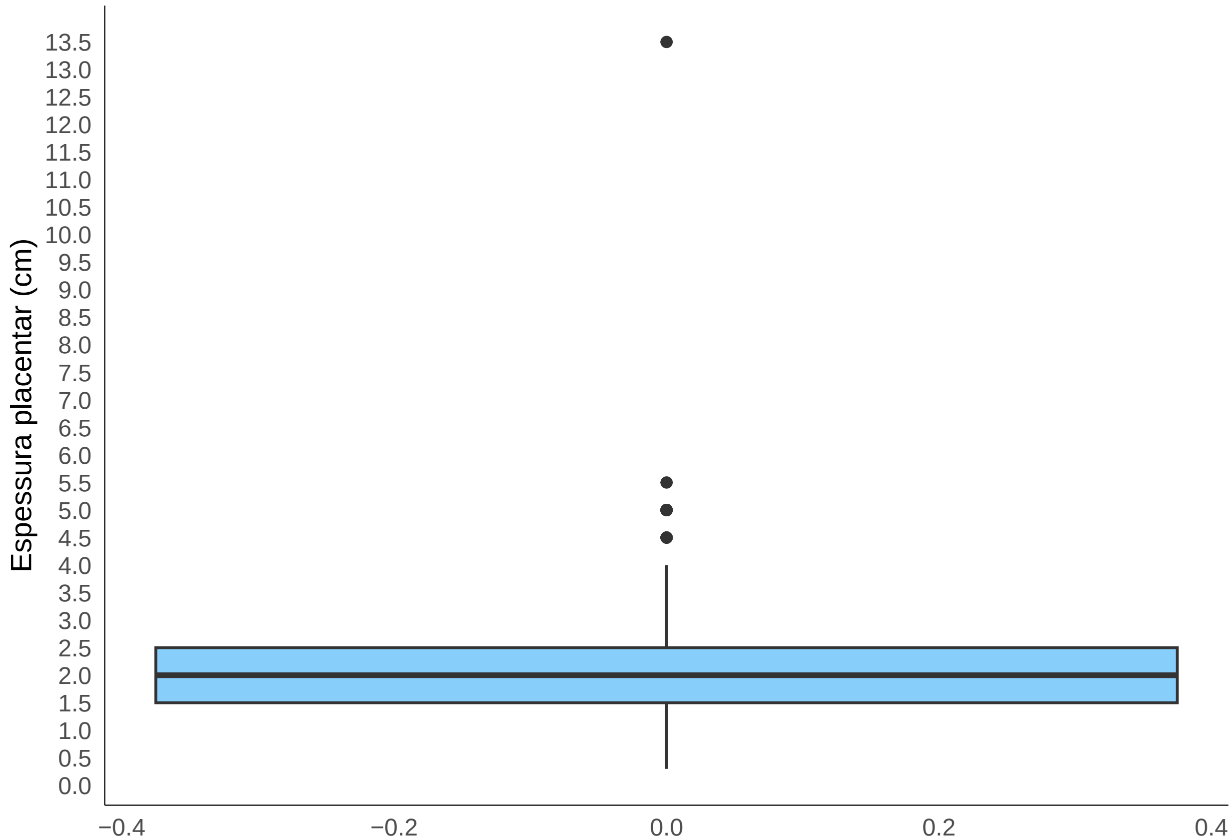
```
pw <- ggplot(data, aes(y = Placentalweight)) +
  geom_boxplot(fill = "lightblue") +
  scale_y_continuous(breaks = seq(0, max(data$Placentalweight), 100)) +
  labs(y = "Peso placentar (g)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

pw
```




```
ggsave("boxplot_pw.pdf",pw, dpi = 1200)
```

Variável Placentalthickness

```
pt <- ggplot(data, aes(y = Placentalthickness)) +
  geom_boxplot(fill = "lightskyblue") +
  scale_y_continuous(breaks = seq(0, max(data$Placentalthickness), 0.5)) +
  labs(y = "Espessura placentar (cm)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

pt
```




```r
ggsave("boxplot_pt.pdf",pt, dpi = 1200)
```

Variável Fetalweight

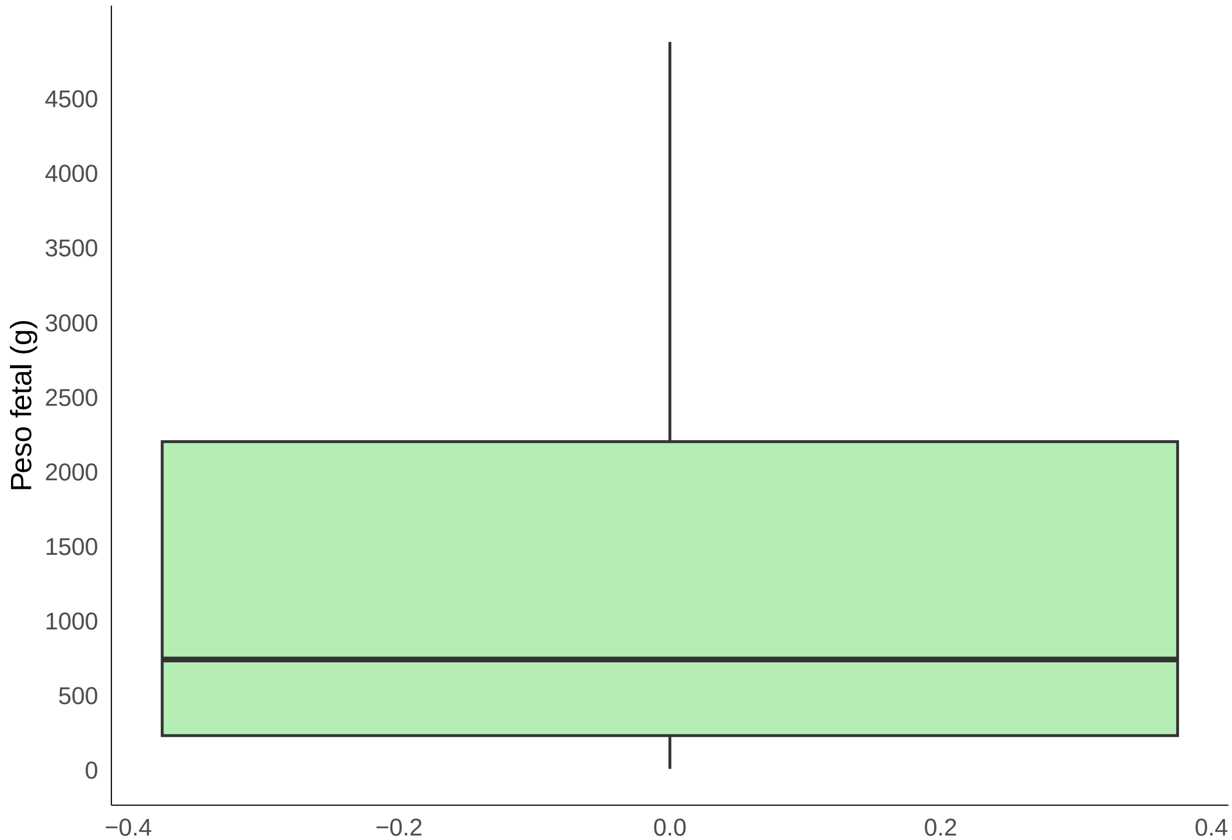
```r
var(data$Fetalweight)
```

```
## [1] 1326605
```

```r
sd(data$Fetalweight)
```

```
## [1] 1151.783
```

```r
fw <- ggplot(data, aes(y = Fetalweight)) +
  geom_boxplot(fill = "darkseagreen2") +
  scale_y_continuous(breaks = seq(0, max(data$Fetalweight), 500)) +
  labs(y = "Peso fetal (g)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

fw
```




```
ggsave("boxplot_fw.pdf",fw, dpi = 1200)
```

Análise geral de todas as variáveis

A análise dos boxplot permitiu uma avaliação clara da distribuição dos dados e destacou a presença de outliers em quatro variáveis cruciais para a nossa investigação: D1, D2, PP e EP. Uma consideração importante neste estudo é o facto de estarmos a lidar com dados biológicos, mais precisamente, dados relacionados à placenta. Em estudos biológicos, é possível que os outliers possam não ser simples erros de medição, mas sim reflexões de variações naturais ou eventos biológicos excecionais. Portanto, foi optado por uma abordagem conservadora, removendo apenas os outliers mais severos.

Remoção de Outliers

Os outliers foram removidos a partir do cálculo dos quartis e apenas removendo os severos.

```
#função que remove outliers de acordo com os quartis
outliers_removal <- function(datast, variable) {
  quartiles <- quantile(datast[[variable]], probs = c(0.25, 0.75))
  IQR <- IQR(datast[[variable]])

  #só retirar os severos -> 3
  lower <- quartiles[1] - 3 * IQR
  upper <- quartiles[2] + 3 * IQR
```

```r
  subset_data <- subset(datast, datast[[variable]] > lower & datast[[variable]] < upper)
  return(subset_data)
}

#variáveis para remover outliers
variables <- c("Diameter1", "Diameter2", "Placentalweight", "Placentalthickness", "Fetalweight")


for (variable in variables) {
  data <- outliers_removal(data, variable)
}

#verificar dimensão
dim(data)
```

```
## [1] 2064   11
```

Com esta técnica, foram removidos apenas 2 valores discrepantes severos dos dados.

Fim pré-processamento

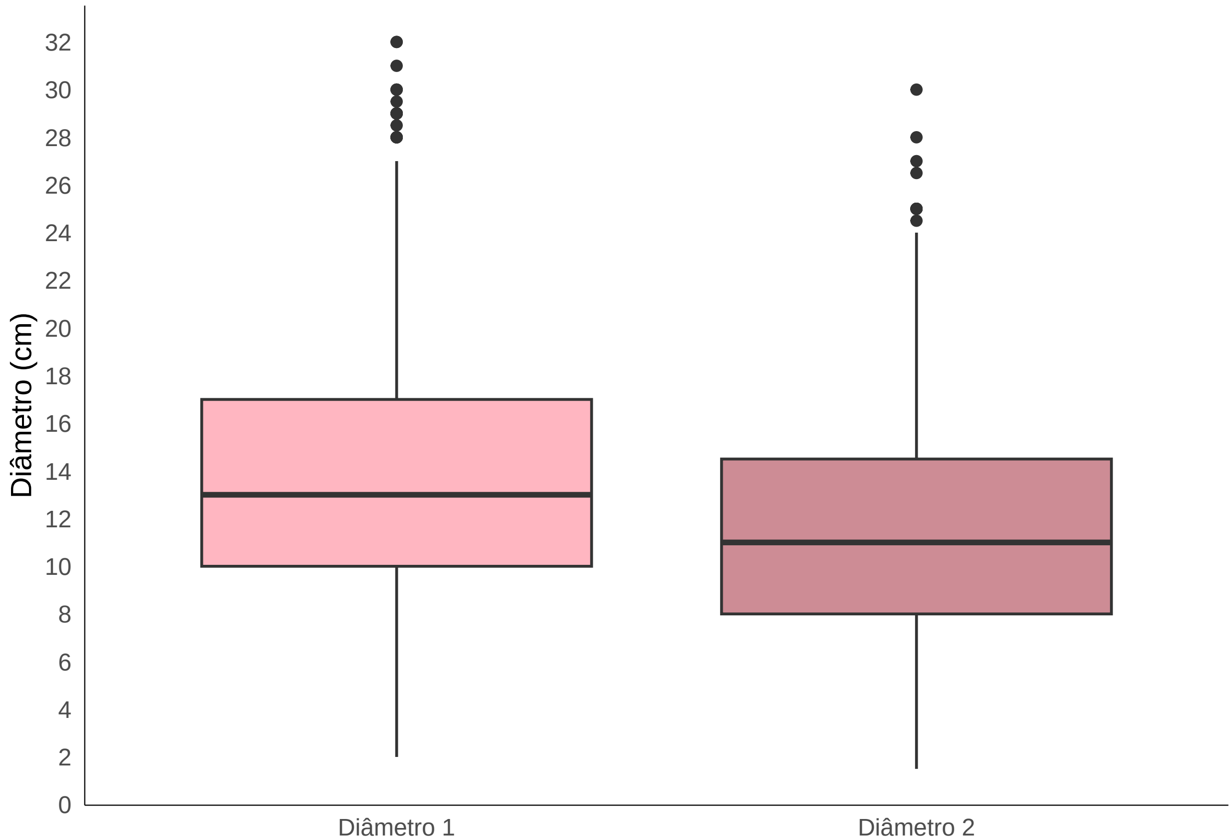
No final deste processo de pré-processamento, obtivemos um conjunto de dados limpo, consistente e dimensionado para análises subsequentes, contendo 2064 observações e 11 variáveis de interesse.

Análise pós pré-processamento

Boxplots para verificação de remoção de outliers

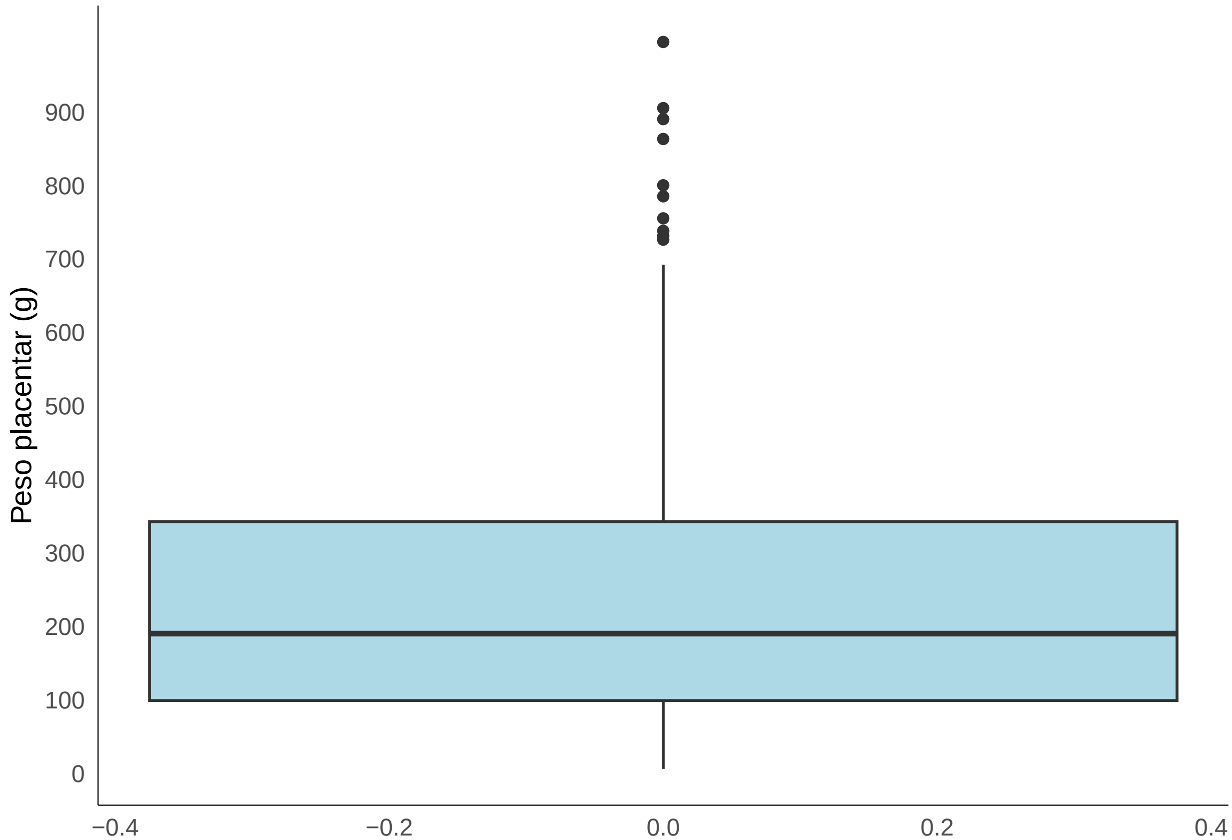
Variáveis Diameter1 e Diameter2

```r
data_list2 <- list(data$Diameter1, data$Diameter2)

data_df2 <- data.frame(Diameter = unlist(data_list2),
                      Group = rep(c("Diâmetro 1", "Diâmetro 2"), each = length(data$Diameter1)))


d1_d2_2 <- ggplot(data_df2, aes(x = Group, y = Diameter, fill = Group)) +
  geom_boxplot() +
  scale_y_continuous(breaks = seq(0, max(data$Diameter1), 2)) +
  labs(y = "Diâmetro (cm)", x = NULL) +
  scale_fill_manual(values = c('lightpink', 'lightpink3')) +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2)) +
  theme(legend.position = "none")

ggsave("boxplot_d1_d2_out.pdf",d1_d2_2, dpi = 1200)

d1_d2_2
```



Variável Placentalweight

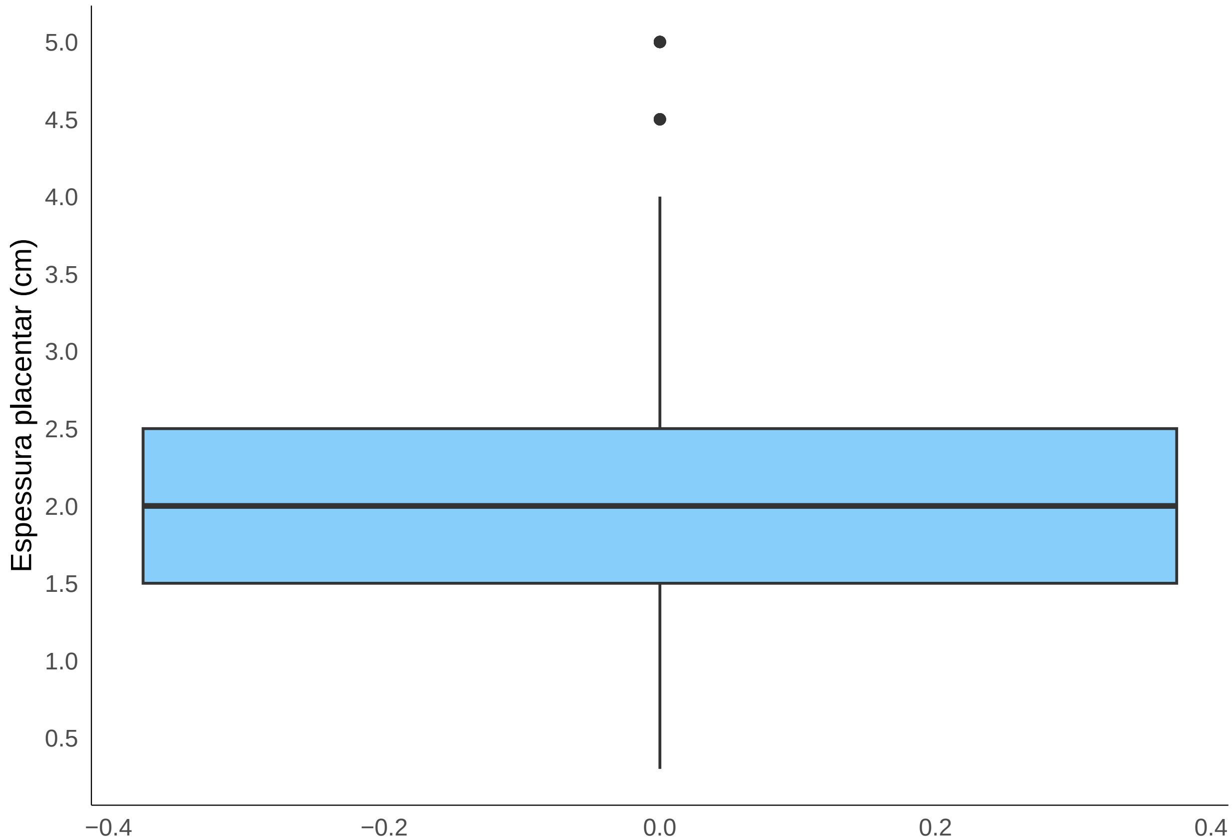
```r
pw2 <- ggplot(data, aes(y = Placentalweight)) +
  geom_boxplot(fill = "lightblue") +
  scale_y_continuous(breaks = seq(0, max(data$Placentalweight), 100)) +
  labs(y = "Peso placentar (g)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

pw2
```




```r
ggsave("boxplot_pw_out.pdf",pw2, dpi = 1200)
```

Variável Placentalthickness

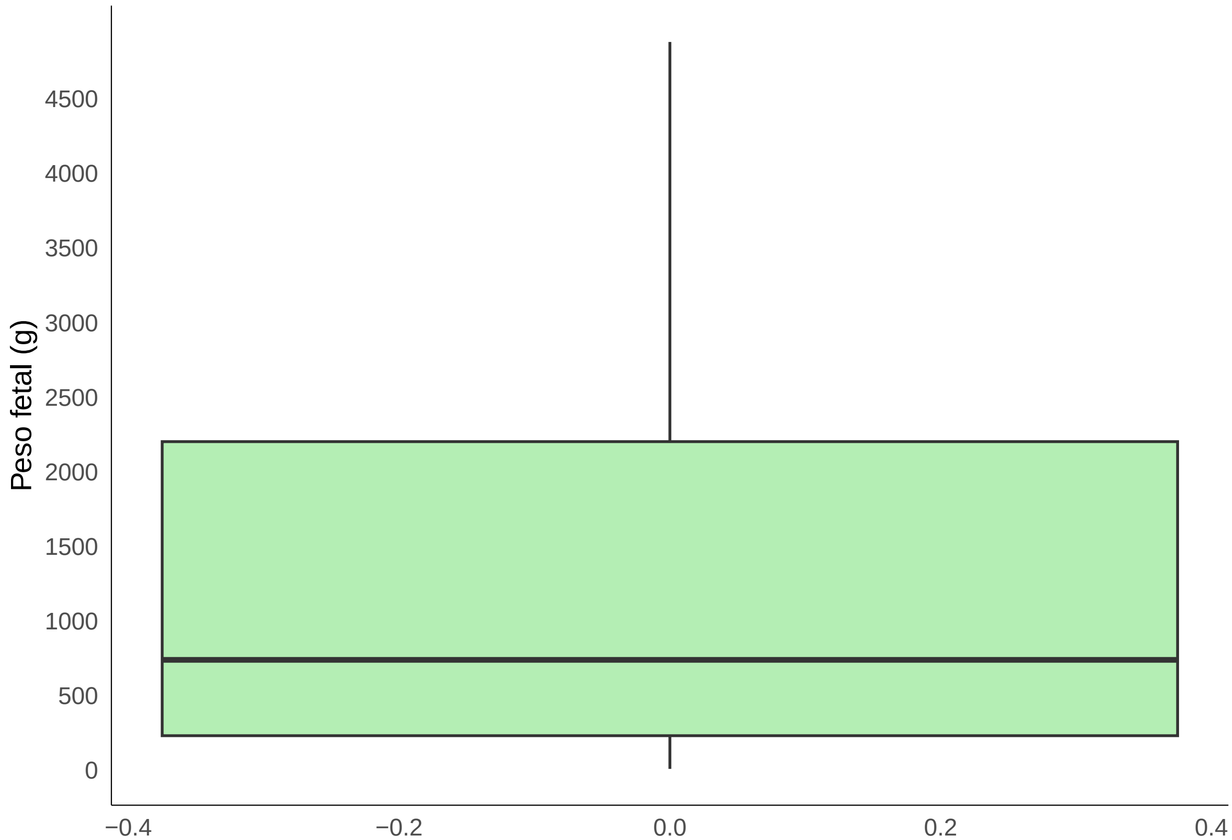
```r
pt2 <- ggplot(data, aes(y = Placentalthickness)) +
  geom_boxplot(fill = "lightskyblue") +
  scale_y_continuous(breaks = seq(0, max(data$Placentalthickness), 0.5)) +
  labs(y = "Espessura placentar (cm)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

pt2
```




```r
ggsave("boxplot_pt_out.pdf",pt2, dpi = 1200)
```

Variável Fetalweight

```r
fw2 <- ggplot(data, aes(y = Fetalweight)) +
  geom_boxplot(fill = "darkseagreen2") +
  scale_y_continuous(breaks = seq(0, max(data$Fetalweight), 500)) +
  labs(y = "Peso fetal (g)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

fw2
```




```r
ggsave("boxplot_fw_out.pdf",fw2, dpi = 1200)
```

Variável GA

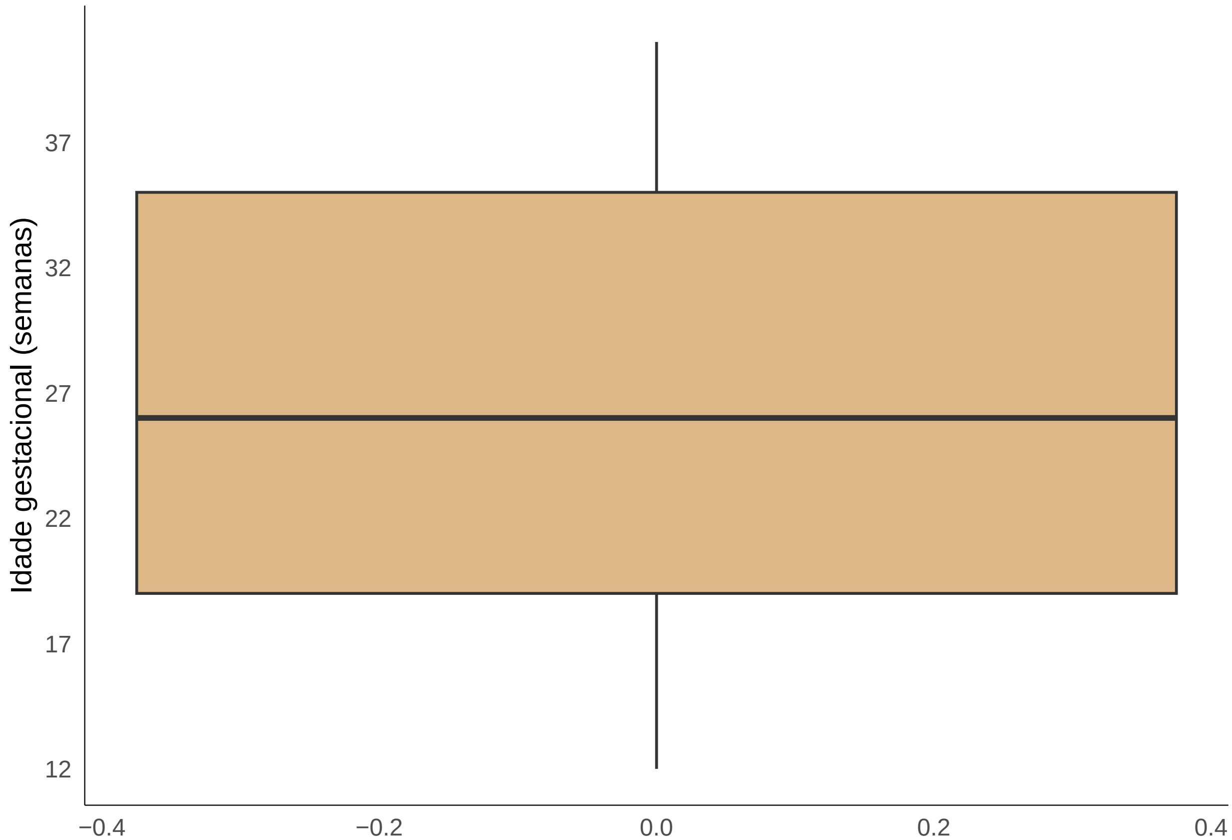
```r
var(data$GA)
```

```
## [1] 79.90503
```

```r
sd(data$GA)
```

```
## [1] 8.938961
```

```r
y_values <- seq(12, 41, by = 5)


ga <- ggplot(data, aes(y = GA)) +
  geom_boxplot(fill = "burlywood") +
  scale_y_continuous(breaks = y_values) +
  labs(y = "Idade gestacional (semanas)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

ga
```




```r
ggsave("boxplot_ga.pdf",ga, dpi = 1200)
```

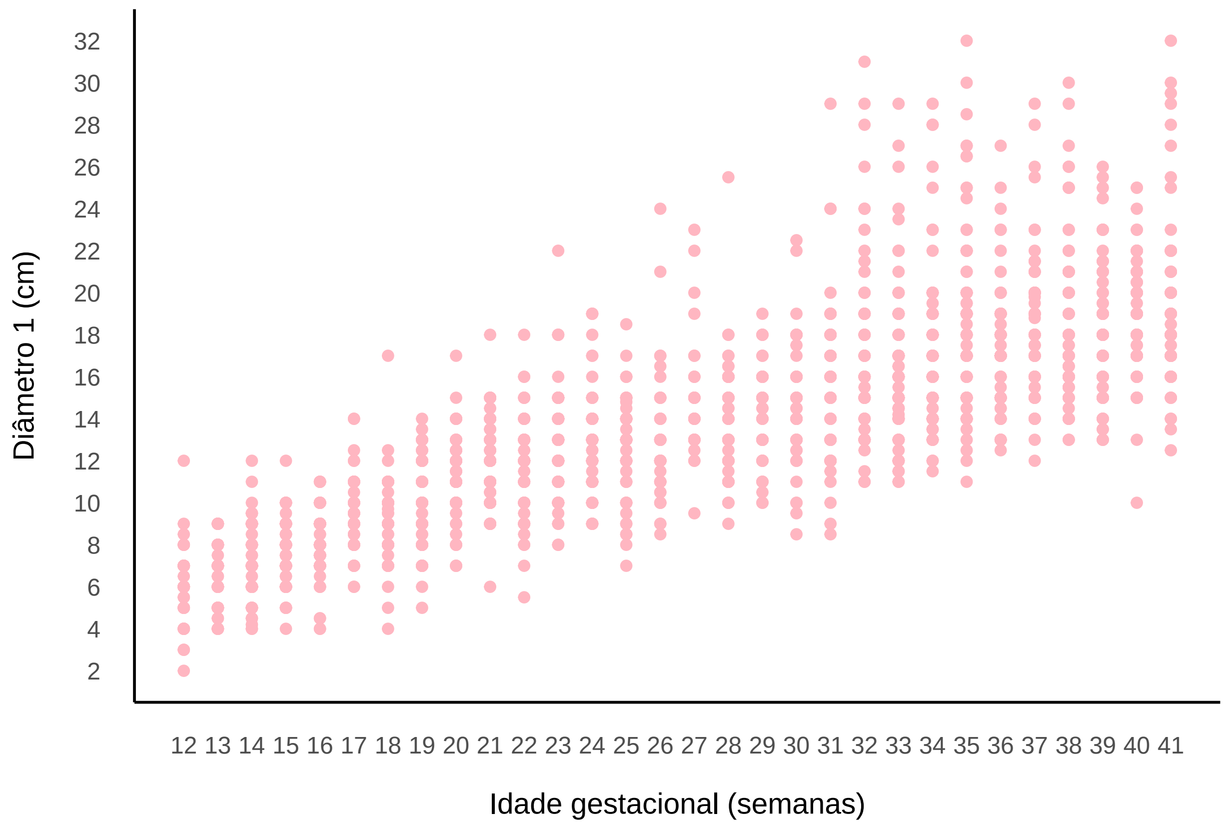
É possível verificar que já não existem outliers severos nas variáveis.

Gráficos de dispersão

Diameter 1

```r
# Gerar uma sequência de valores de 12 a 41 com incremento de 1
x_values <- seq(12, 41, by = 1)

# Criar os gráficos sem a cor de fundo, mas com eixos e legendas
p1 <- ggplot(data, aes(GA, Diameter1)) +
  geom_point(color = "lightpink") +
  labs(x = "Idade gestacional (semanas)", y = "Diâmetro 1 (cm)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Diameter1), 2)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
```

```
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p1
```



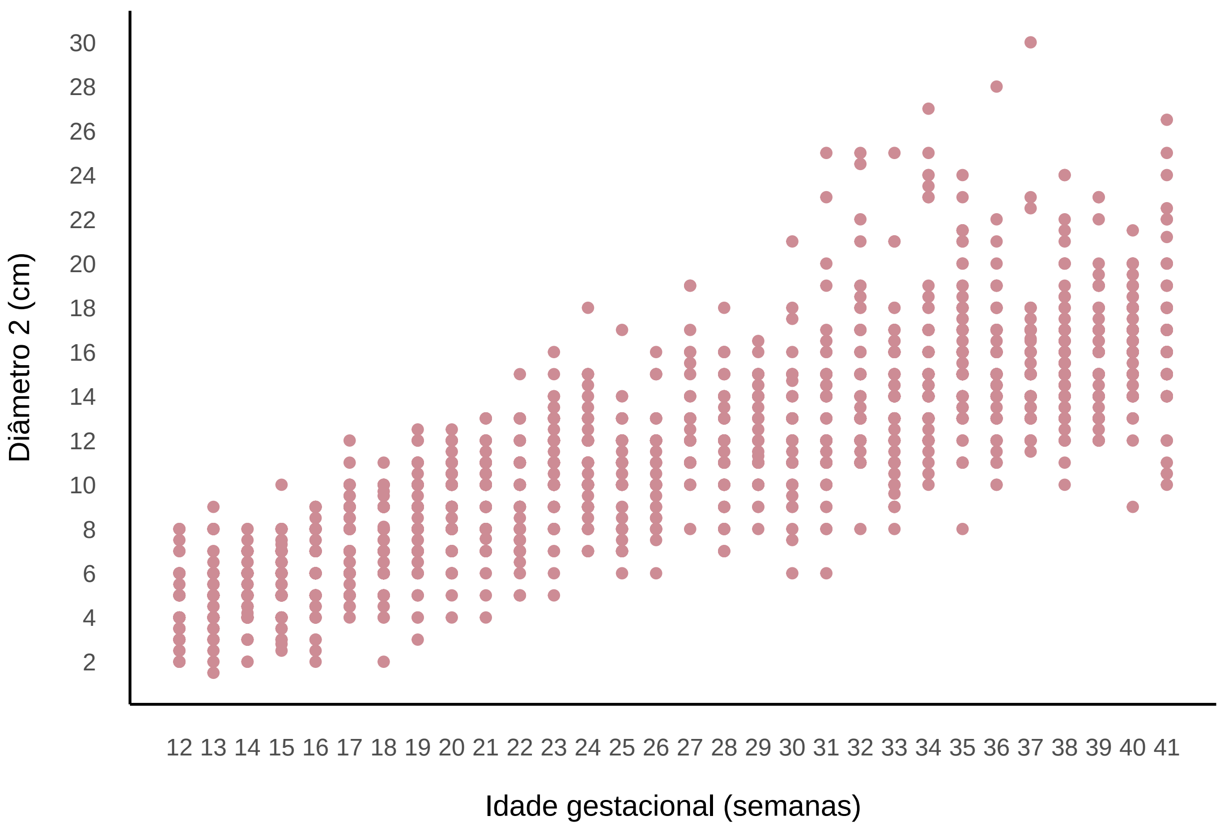

```
ggsave("D1.pdf", p1, dpi = 1200)
```

O gráfico de dispersão revela uma tendência positiva. À medida que a IG aumenta, há uma tendência geral de aumento no valor do D1. Isso sugere uma possível relação positiva entre estas duas variáveis, indicando que, em média, o D1 tende a aumentar à medida que a gestação avança.

Diameter 2

```
p2 <- ggplot(data, aes(GA, Diameter2)) +
  geom_point(color = "lightpink3") +
  labs(x = "Idade gestacional (semanas)", y = "Diâmetro 2 (cm)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Diameter2), 2)) +
  theme_minimal() +
   theme(
```

```
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p2
```



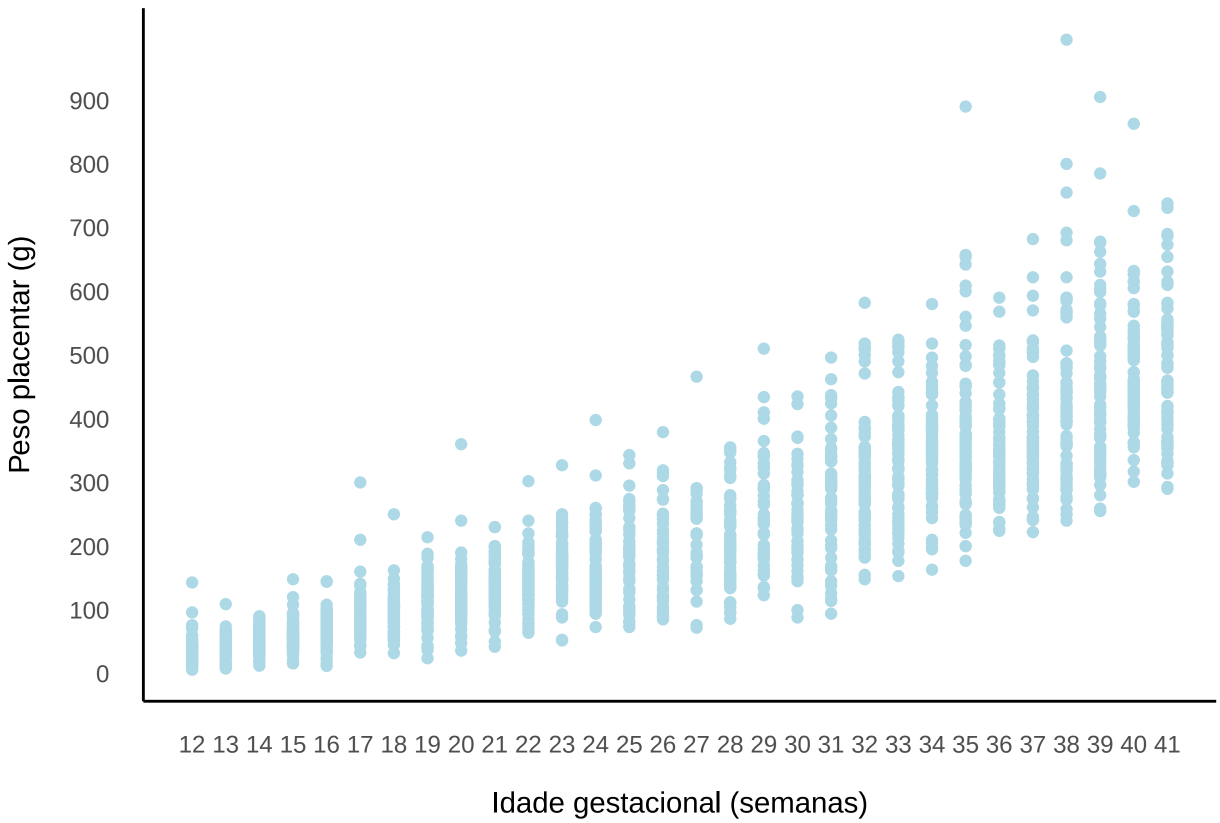

```
ggsave("D2.pdf", p2, dpi = 1200)
```

No gráfico de dispersão observa-se uma tendência semelhante ao D1. À medida que a IG aumenta, há uma tendência geral de aumento no valor de D2. Isso sugere uma relação positiva entre as variáveis, indicando que o D2 tende a aumentar à medida que a gestação progride.

Placentalweight

```
p3 <- ggplot(data, aes(GA, Placentalweight)) +
  geom_point(color = "lightblue") +
  labs(x = "Idade gestacional (semanas)", y = "Peso placentar (g)") +
```

```r
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Placentalweight), 100)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p3
```

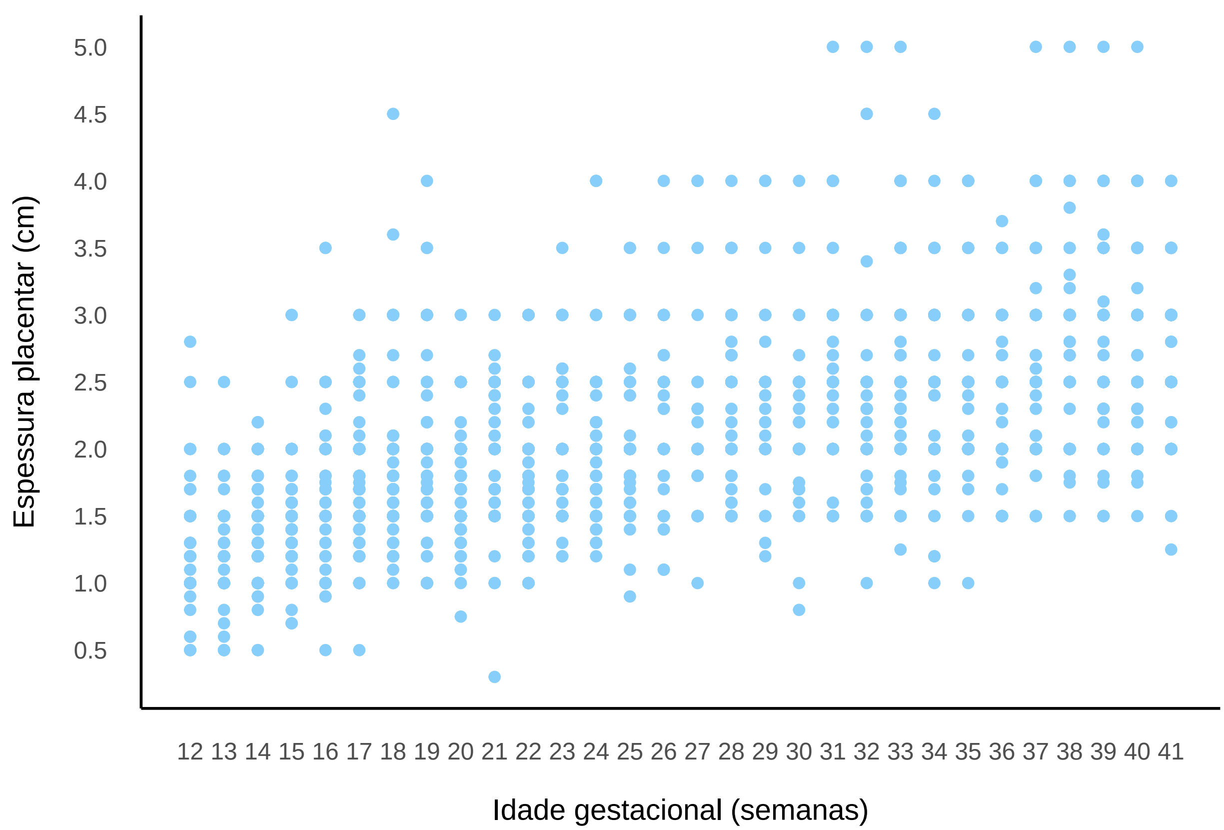



```r
ggsave("peso.pdf", p3, dpi = 1200)
```

No gráfico de dispersão há uma tendência de aumento no PP à medida que aIG avança, sugerindo uma relação positiva.

Placentalthickness

```r
p4 <- ggplot(data, aes(GA, Placentalthickness)) +
  geom_point(color = "lightskyblue") +
  labs(x = "Idade gestacional (semanas)", y = "Espessura placentar (cm)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Placentalthickness), 0.5)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p4
```

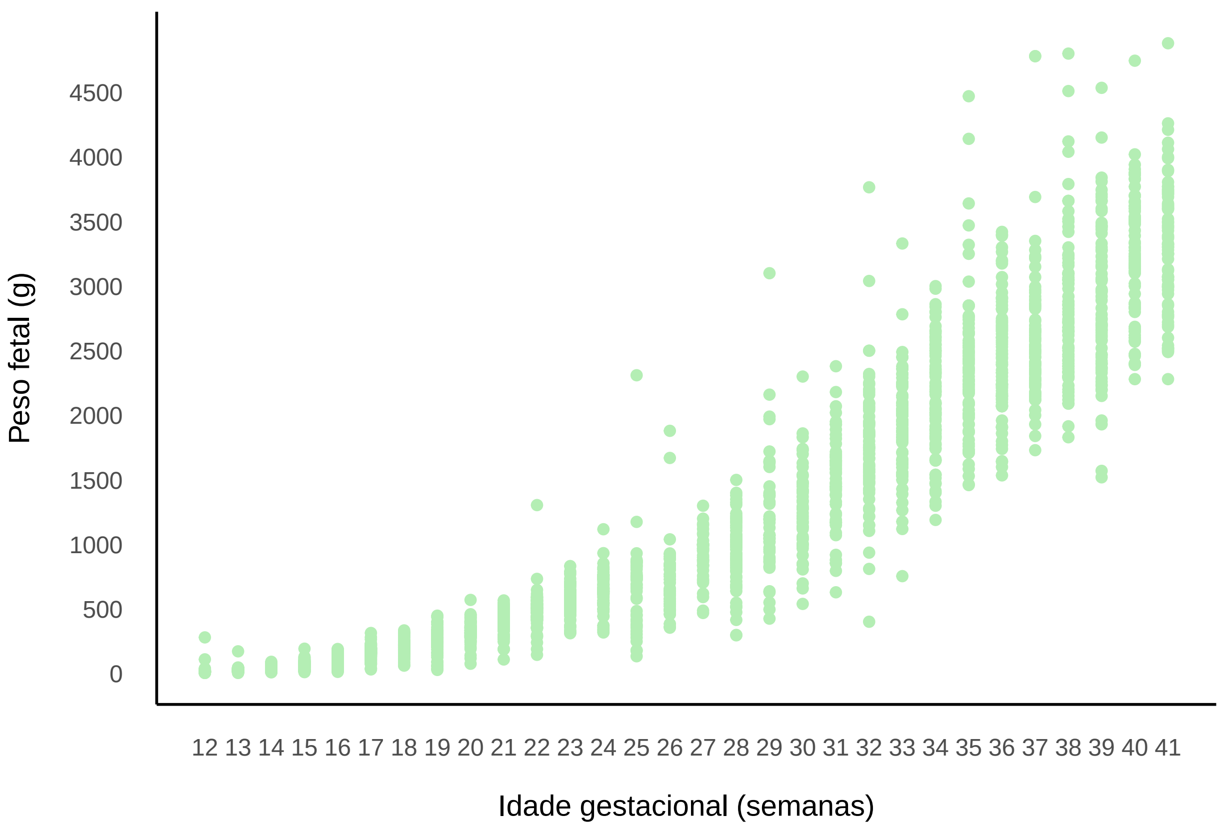



```r
ggsave("espessura.pdf", p4, dpi = 1200)
```

o gráfico de dispersão mostra uma relação menos clara com a IG. Embora haja alguma variação, não é evidente uma tendência de aumento ou diminuição da EP.

Fetalweight

```
p5 <- ggplot(data, aes(GA, Fetalweight)) +
  geom_point(color = "darkseagreen2") +
  labs(x = "Idade gestacional (semanas)", y = "Peso fetal (g)") +
  scale_x_continuous(breaks = x_values) +
  scale_y_continuous(breaks = seq(0, max(data$Fetalweight), 500)) +
  theme_minimal() +
   theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left")

p5
```




```
ggsave("peso_fetal.pdf", p5, dpi = 1200)
```

O gráfico de dispersão mostra uma tendência clara de aumento do PF à medida que a IG avança.

Contagem de ocorrências em variáveis

```r
#obstetriccontext
outcome_counts <- table(data$Obstetriccontext)
print(outcome_counts)
```

```
##
##   1   2   3   4   5   9
## 875 629 415   6   6 133
```

```r
#fetalgender
outcome_counts2 <- table(data$Fetalgender)
print(outcome_counts2)
```

```
##
##   0   1   2   9
## 862 947  14 241
```

```r
#placentalshape
outcome_counts3 <- table(data$Placentalshape)
print(outcome_counts3)
```

```
##
##    0    1    2    3
## 1839  116  106    3
```

```r
#local
outcome_counts4 <- table(data$local)
print(outcome_counts4)
```

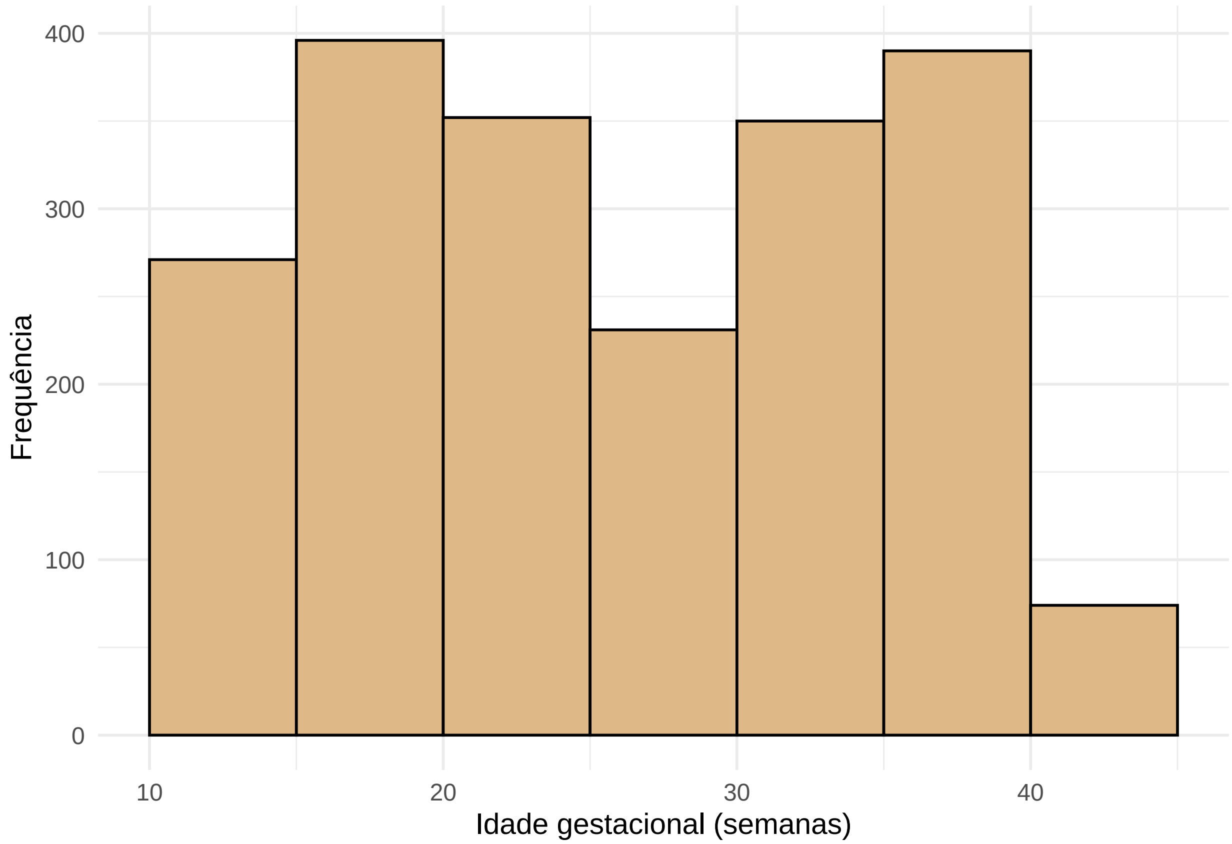
```
##
##                      Acores                    Alto Ave
##                           1                          15
##                 Alto Douro                 Alto Minho
##                          38                          86
##                Baixo Vouga           Barreiro/Montijo
##                          69                          95
##                   Boa Nova             Castelo Branco
##                           1                          11
##                 CH Algarve                CH Nordeste
##                           9                           1
##                      CHULC                    Cligest
##                          12                           1
##                 Cova Beira                CS Boavista
##                          33                           2
##                  CUF Porto             Douro e Vouga
##                           3                         307
##                       Faro                       Gaia
##                          62                         198
##                     Guarda         HAL Castelo Branco
```

```
##                        11                          1
##                       HBA                        HGO
##                        36                         74
##                      Hluz                HNS Rosário
##                        10                          1
##         Hosp. Arrábida  Gaia      Hosp. Infante D. Pedro
##                         1                          3
##                    Hospor                 HP Algarve
##                         5                          8
##                       MAC                    Madeira
##                        35                         48
##                Matosinhos                  Médio Ave
##                       108                         37
##                  Nordeste          Ordem da Trindade
##                        18                          1
## Padre Américo  Vale do Sousa                  PV/VC
##                         1                         63
##                      SAMS                   Santarém
##                         2                          7
##            SB Sul e Ilhas               SCM Espinho
##                        48                          1
##                    Tâmega               Tâmega Sousa
##                       447                          1
##         V. I. N. Sra da Lapa                Vila Real
##                         1                         20
##                     Viseu
##                       132
```

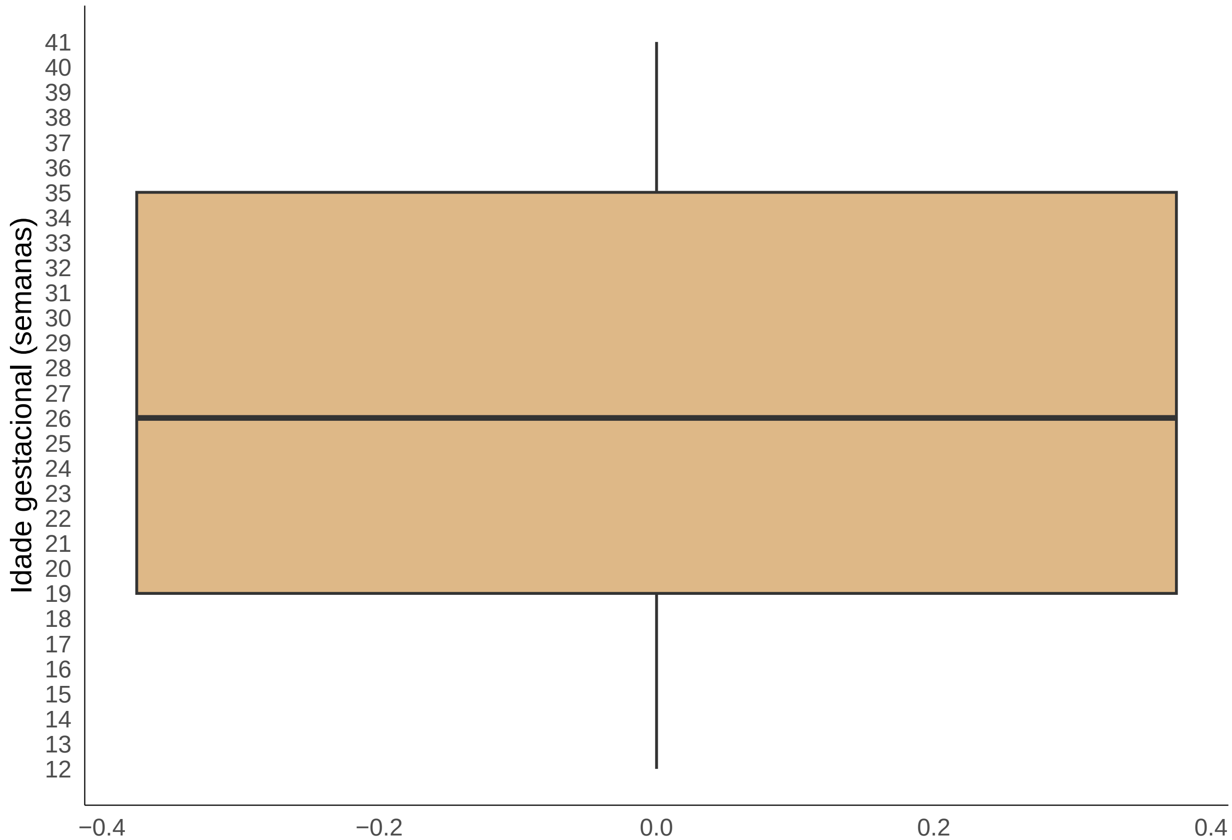
Histogramas e boxplots

Idade gestacional

```
hist_ga <- ggplot(data, aes(x = GA)) +
  geom_histogram(binwidth = 5, fill = "burlywood", color = "black", boundary=0) +
  labs(
    x = "Idade gestacional (semanas)",
    y = "Frequência"
  ) +
   theme_minimal()

hist_ga
```




```
ggsave("hist_ga.pdf",hist_ga, dpi = 1200)


bp_ga <- ggplot(data, aes(y = GA)) +
  geom_boxplot(fill = "burlywood") +
  scale_y_continuous(breaks = seq(12, max(data$GA), 1)) +
  labs(y = "Idade gestacional (semanas)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

bp_ga
```




```r
ggsave("boxplot_ga.pdf",bp_ga, dpi = 1200)
```

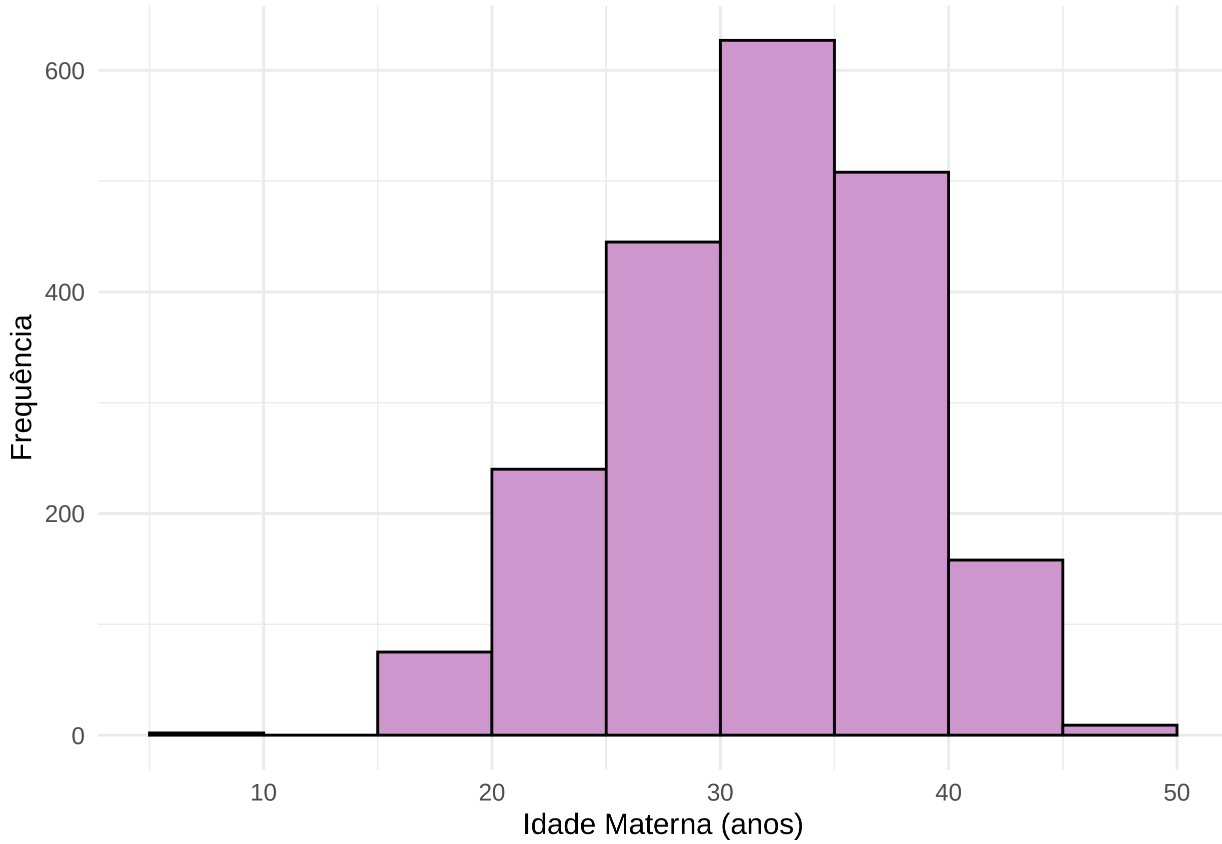
O histograma da IG demonstra uma distribuição do número de amostras por intervalo de IG assimétrica, tendo alguns intervalos com um número de amostras mais baixo.

MaternalAge

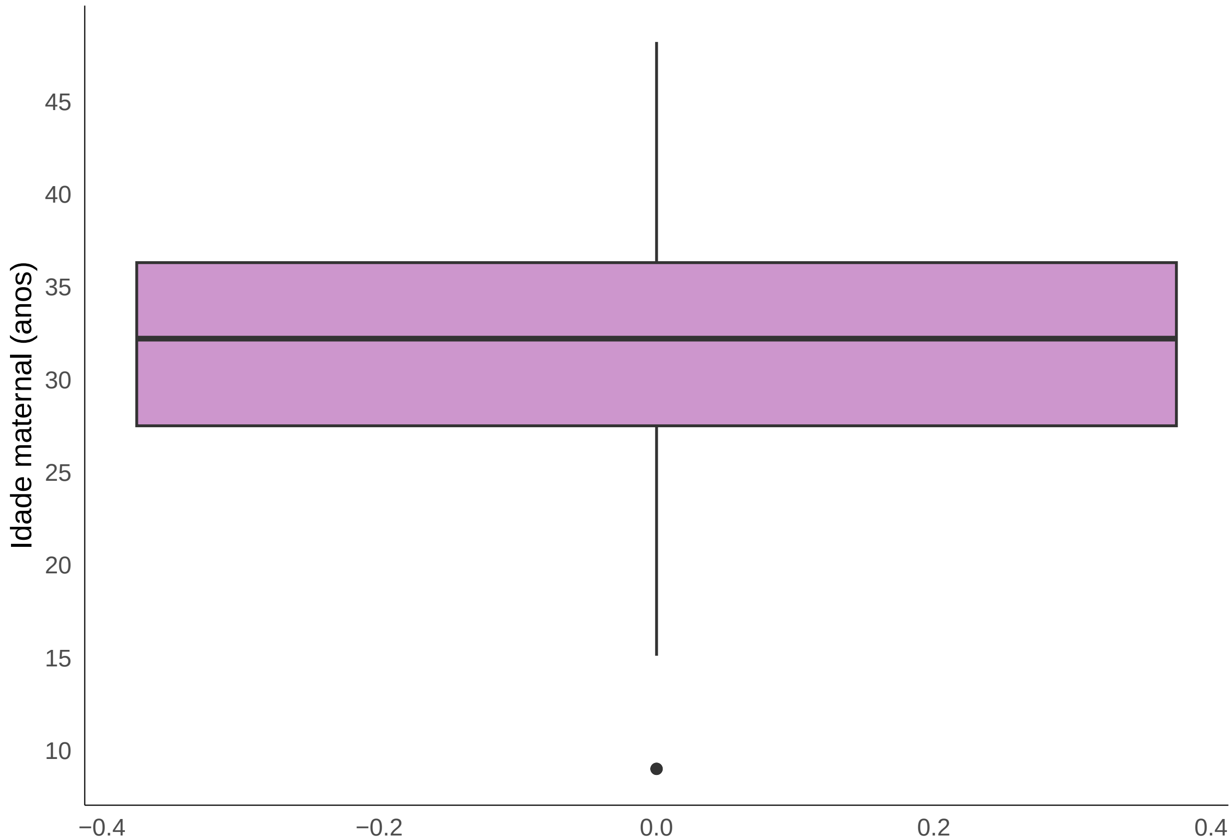
```r
typeof(data$MaternalAge)
```

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

```r
hist_ma <- ggplot(data, aes(x = MaternalAge)) +
  geom_histogram(binwidth = 5, fill = "plum3", color = "black", boundary=0) +
  labs(
    x = "Idade Materna (anos)",
    y = "Frequência"
  ) +
   theme_minimal()

hist_ma
```




```
ma <- ggplot(data, aes(y = MaternalAge)) +
  geom_boxplot(fill = "plum3") +
  scale_y_continuous(breaks = seq(0, max(data$MaternalAge), 5)) +
  labs(y = "Idade maternal (anos)") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

ma
```



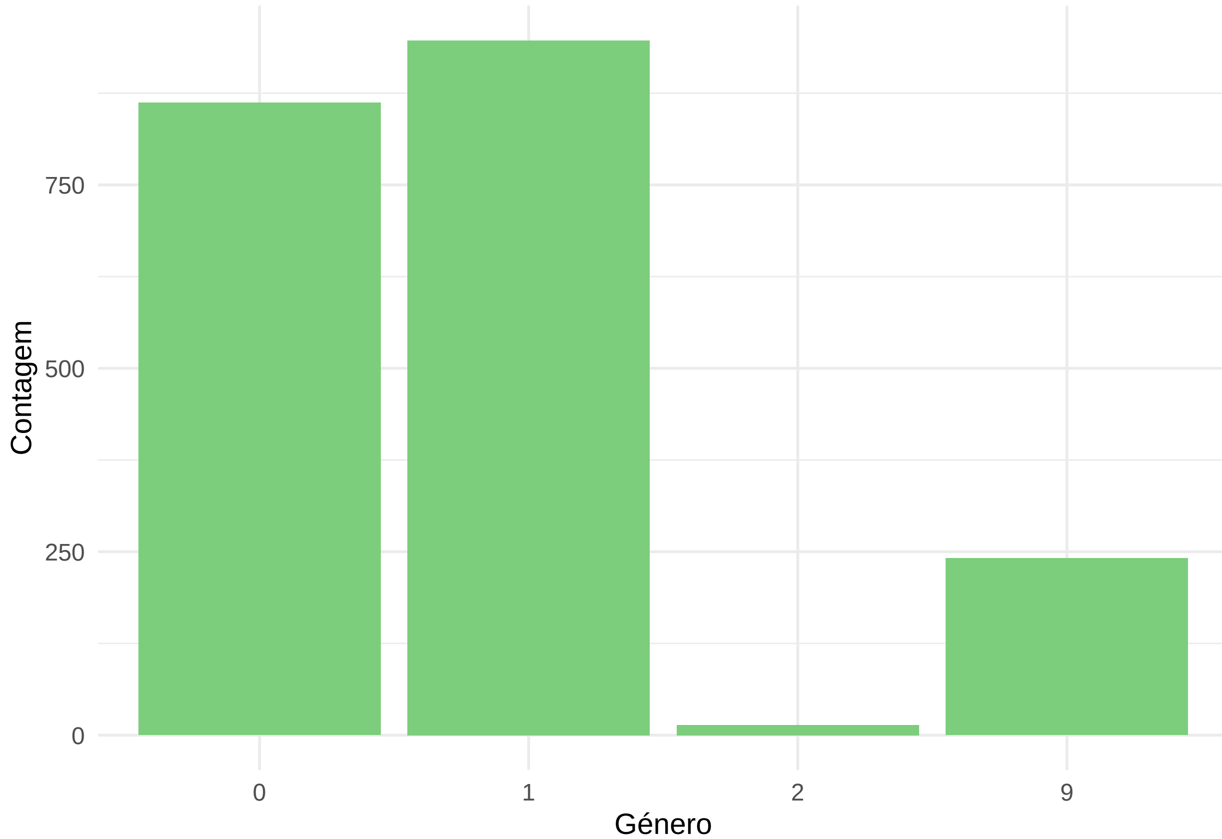

```
ggsave("boxplot_ma.pdf",ma, dpi = 1200)
```

O histograma da idade materna, demonstra a distribuição das idades das mães nas observações do estudo. Este revela que a maioria das mães tem idades compreendidas entre 25 e 40 anos, com o intervalo de 30 a 35 anos sendo o mais frequente, com aproximadamente 630 observações. Nota-se também que a distribuição é assimétrica, com um pico significativo na faixa etária de 30 a 35 anos.

Gráficos de barras

Fetal gender

```
#Contar a frequência de cada género
gender_counts <- table(data$Fetalgender)

# Converter a uma dataframe
gender_counts_df <- data.frame(gender = names(gender_counts), Count = as.numeric(gender_counts))


bar_plot_gender <- ggplot(data = gender_counts_df, aes(x = gender, y = Count)) +
  geom_bar(stat = "identity", fill = "palegreen3") +
  labs( x = "Género", y = "Contagem") +
  theme_minimal()

print(bar_plot_gender)
```

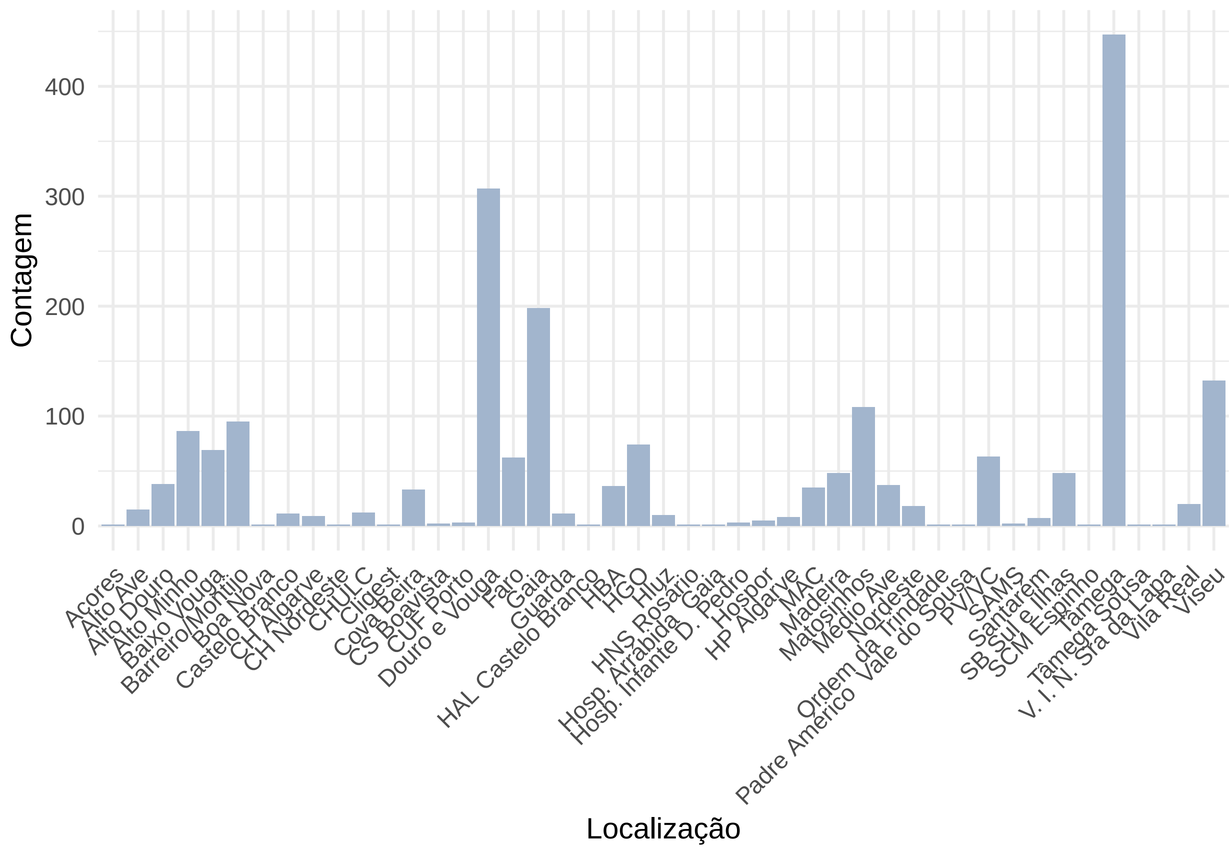



```
ggsave("barplot_gender.pdf",bar_plot_gender, dpi = 1200)
```

No género do feto, os dados mostram que a maioria das amostras (947) corresponde a fetos do sexo masculino, enquanto 862 amostras são de fetos do sexo feminino. Além disso, 14 amostras apresentam ambiguidade no género fetal, e 241 amostras têm o género do feto classificado como desconhecido.

Local

```
# Contar a frequência de cada local
location_counts <- table(data$local)

# Converter a data frame
location_counts_df <- data.frame(Location = names(location_counts), Count = as.numeric(location_counts))


bar_plot <- ggplot(data = location_counts_df, aes(x = Location, y = Count)) +
  geom_bar(stat = "identity", fill = "lightsteelblue3") +
  labs( x = "Localização", y = "Contagem") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))

print(bar_plot)
```

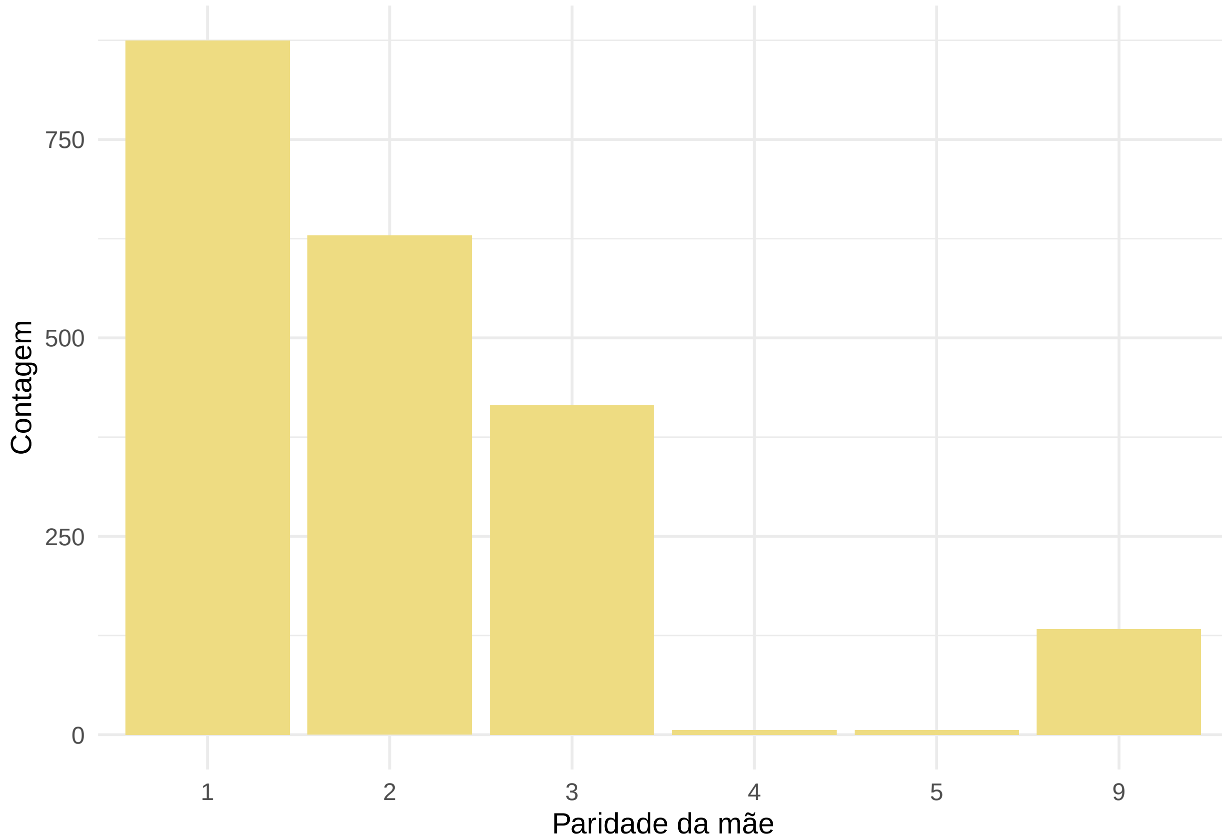



```r
ggsave("barplot_local.pdf",bar_plot, dpi = 1200)
```

A variável local, apresenta uma ampla gama de regiões e hospitais de Portugal onde as amostras foram recolhidas, demonstrando uma diversidade geográfica. Os números variam substancialmente entre os diferentes locais. Por exemplo, o local com o maior número de amostras é no Tâmega com 447 amostras, enquanto dos Açores existe apenas uma amostra.

Obstetric context

```r
# Contar as frequencias de cada contexto
context_counts <- table(data$Obstetriccontext)

# Converter a data frame
context_counts_df <- data.frame(context = names(context_counts), Count = as.numeric(context_counts))

bar_plot_context <- ggplot(data = context_counts_df, aes(x = context, y = Count)) +
  geom_bar(stat = "identity", fill = "lightgoldenrod2") +
  labs( x = "Paridade da mãe", y = "Contagem") +
  theme_minimal()

print(bar_plot_context)
```

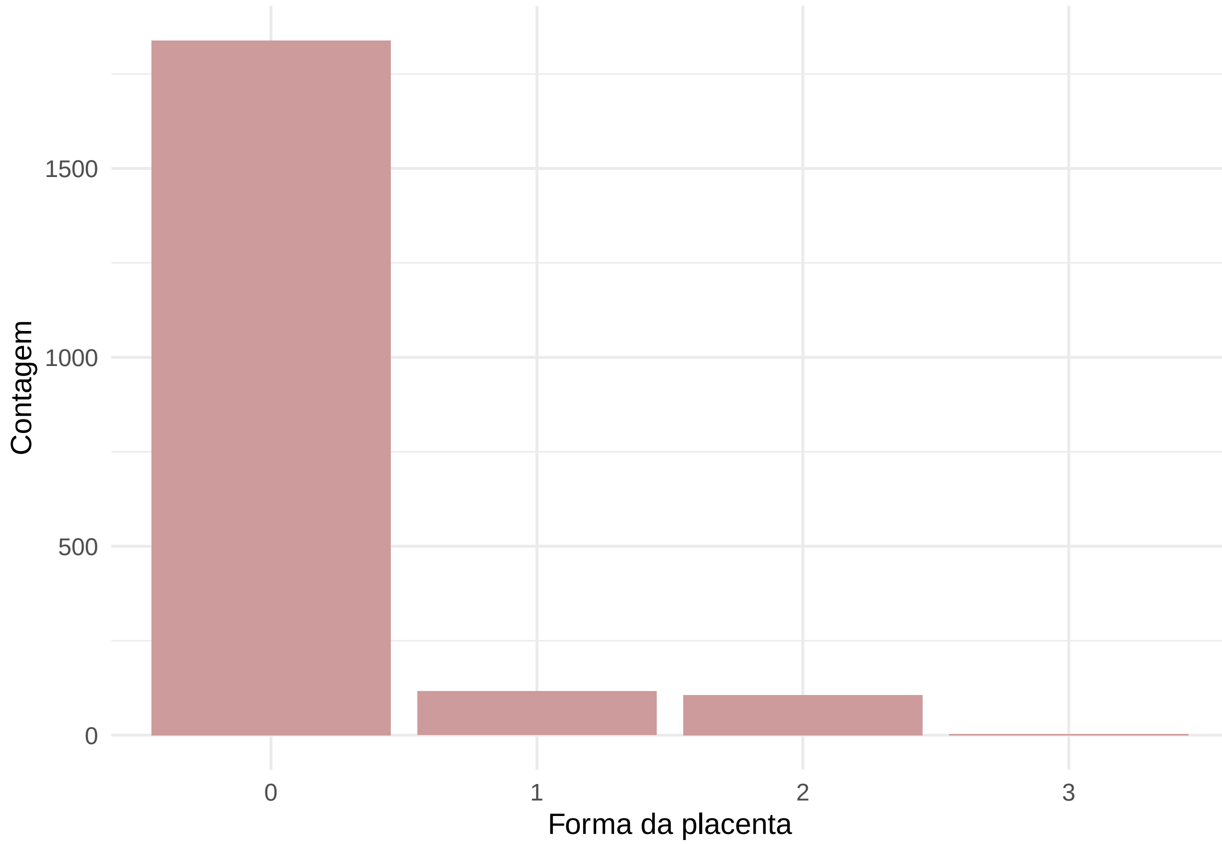



```
ggsave("barplot_context.pdf",bar_plot_context, dpi = 1200)
```

Quanto à paridade da mãe, esta variável foi analisada quanto à sua distribuição nos dados amostrais. Os resultados revelaram uma variação no número de filhos das mães representadas neste estudo. A maioria das mães (875) tem um filho, seguidas por 629 mães com dois filhos e 415 com três filhos. Um número significativo de casos (133) possui valores desconhecidos para esta variável.

Placentalshape

```
# Count the frequency of each shape
shape_counts <- table(data$Placentalshape)

# Convert context_counts to a data frame
shape_counts_df <- data.frame(shape = names(shape_counts), Count = as.numeric(shape_counts))

# Plot the bar plot
bar_plot_shape <- ggplot(data = shape_counts_df, aes(x = shape, y = Count)) +
  geom_bar(stat = "identity", fill = "rosybrown3") +
  labs( x = "Forma da placenta", y = "Contagem") +
  theme_minimal()

print(bar_plot_shape)
```



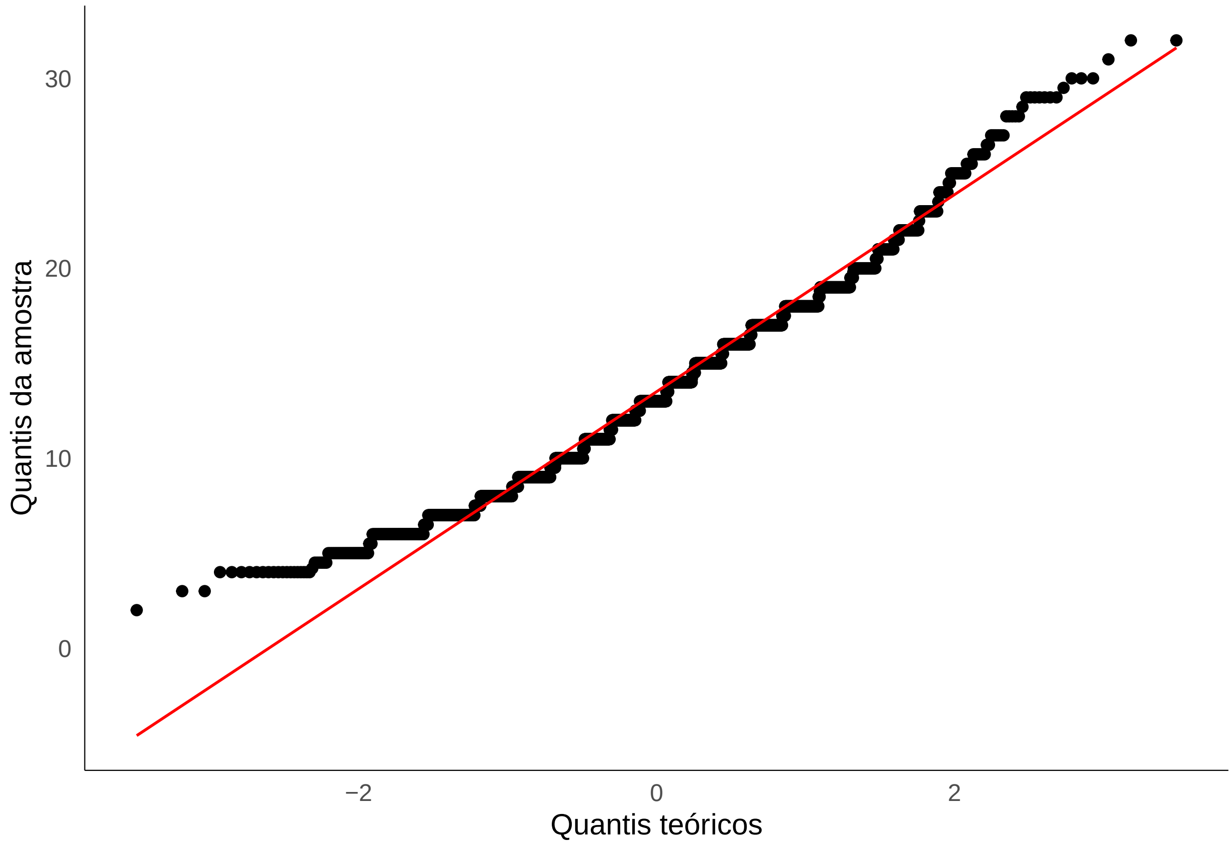

```
ggsave("barplot_shape.pdf",bar_plot_shape, dpi = 1200)
```

A análise da forma da placenta, revela que a maioria (1839) das placentas apresenta uma forma normal (simples). Existem também casos menos comuns de placenta bilobada/polilobada (116) e placenta circunmarginada/circunvalada (106). A categoria "Membranácea" é a menos frequente (3).

Normalidade

Diameter 1

```
#Gráficos para vizualizar a possibiidade de os dados seguirem uma distribuição normal
qq_d1 <- ggplot(data, aes(sample = Diameter1)) +
  geom_qq() +
  geom_qq_line(color = "red") +
  labs(x = "Quantis teóricos", y = "Quantis da amostra") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

qq_d1
```




```
ggsave("Q-Q_d1.pdf", qq_d1, dpi = 1200)

#Shapiro test para a normalidade
shapiro.test(data$Diameter1)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  data$Diameter1
## W = 0.97864, p-value < 2.2e-16
```

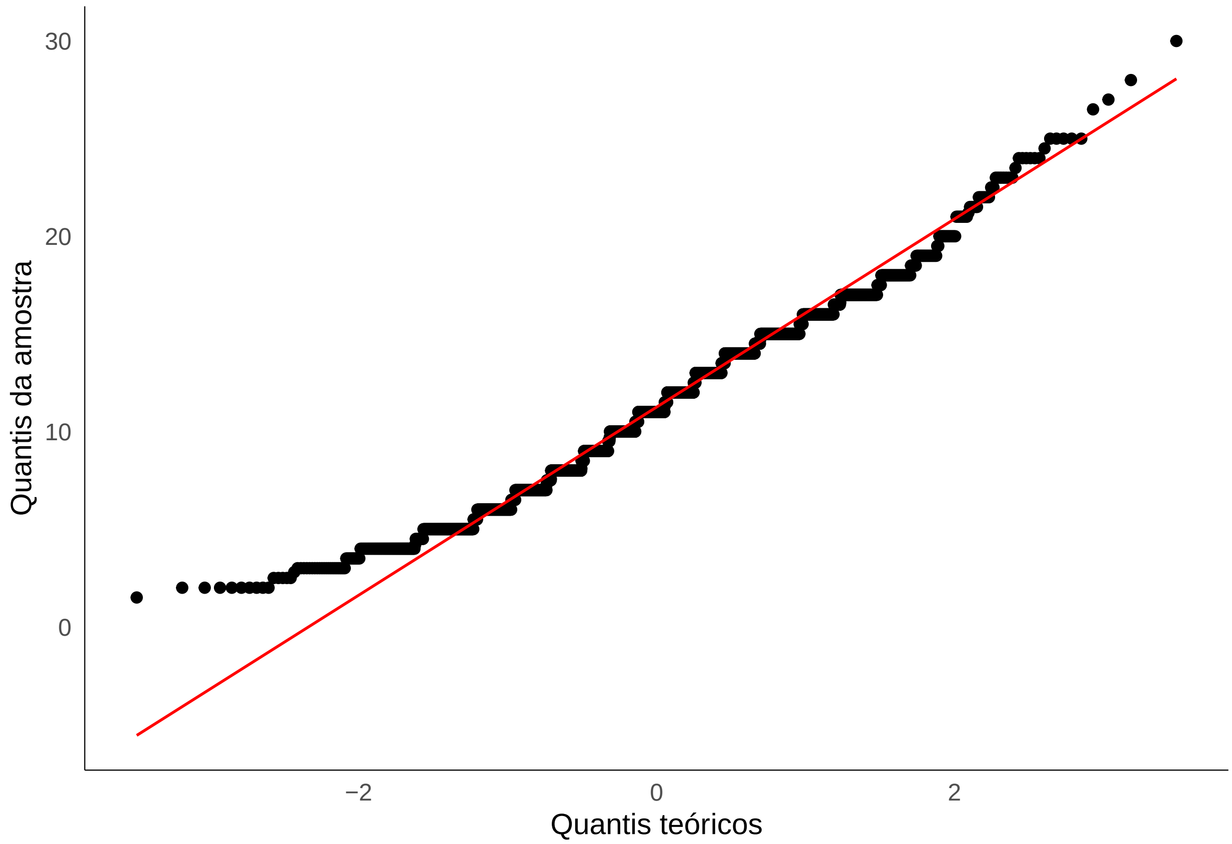
```
#variância
var(data$Diameter1)
```

```
## [1] 24.00598
```

Diameter 2

```
#Gráficos para vizualizar a possibiidade de os dados seguirem uma distribuição normal

qq_d2 <- ggplot(data, aes(sample = Diameter2)) +
  geom_qq() +
  geom_qq_line(color = "red") +
```

```r
  labs(x = "Quantis teóricos", y = "Quantis da amostra") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

qq_d2
```




```r
ggsave("Q-Q_d2.pdf", qq_d2, dpi = 1200)

#Shapiro test para a normalidade
shapiro.test(data$Diameter2)
```

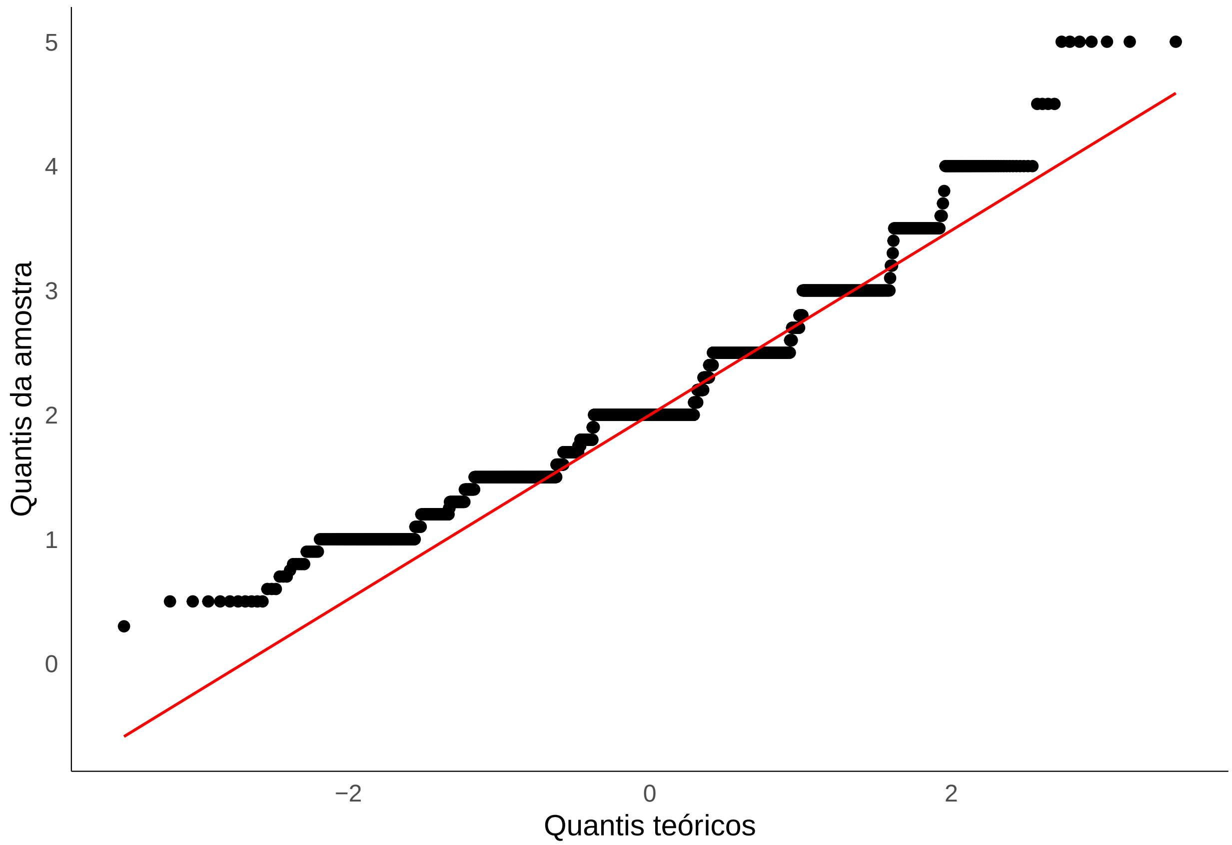
```
##
##  Shapiro-Wilk normality test
##
## data:  data$Diameter2
## W = 0.98303, p-value = 5.932e-15
```

```r
#variância
var(data$Diameter2)
```

```
## [1] 19.95359
```

Placenta thickness

```
#Gráficos para vizualizar a possibiidade de os dados seguirem uma distribuição normal
qq_ep <- ggplot(data, aes(sample = Placentalthickness)) +
  geom_qq() +
  geom_qq_line(color = "red") +
  labs(x = "Quantis teóricos", y = "Quantis da amostra") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

qq_ep
```




```
ggsave("Q-Q_ep.pdf", qq_ep, dpi = 1200)

#Shapiro test para a normalidade
shapiro.test(data$Placentalthickness)
```

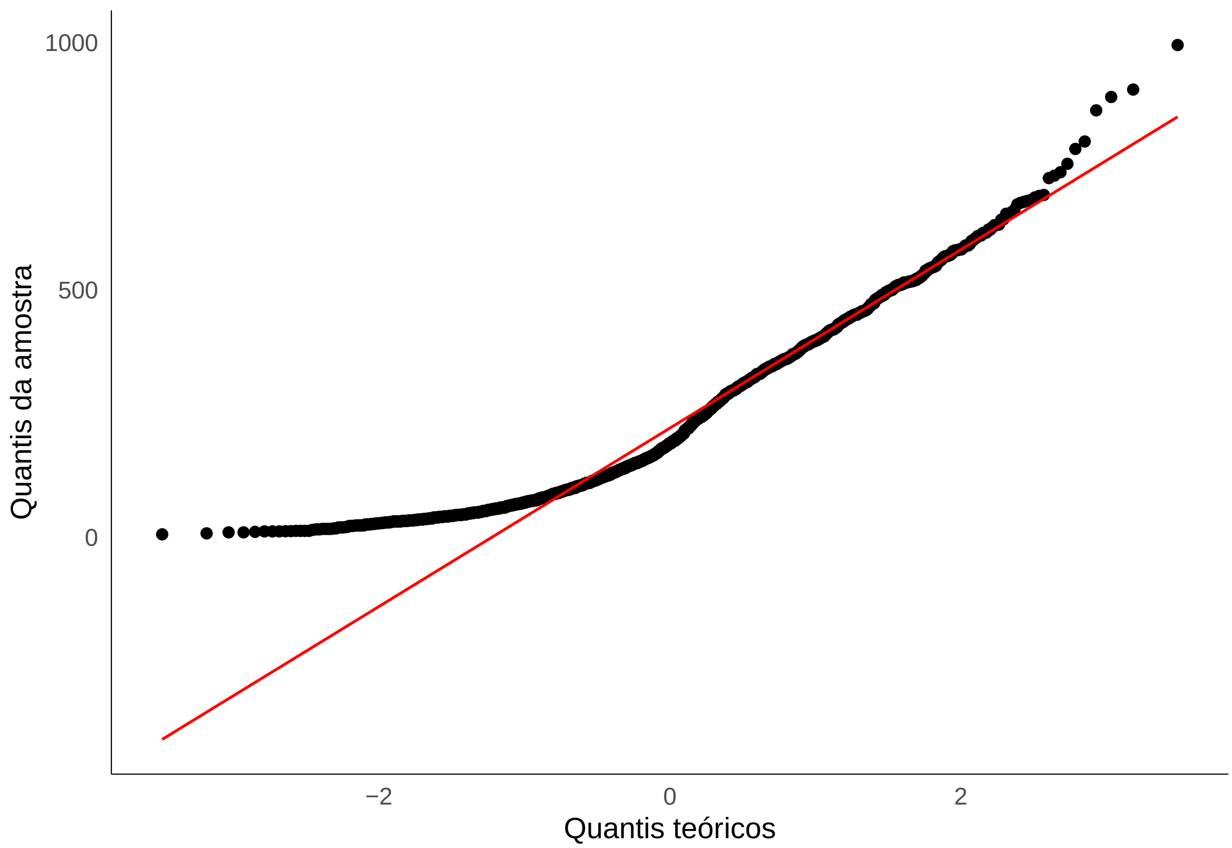
```
##
##  Shapiro-Wilk normality test
##
## data:  data$Placentalthickness
## W = 0.95163, p-value < 2.2e-16
```

```r
#variância
var(data$Placentalthickness)
```

```
## [1] 0.4831519
```

Placenta weight

```r
#Gráficos para vizualizar a possibiidade de os dados seguirem uma distribuição normal
qq_pp <- ggplot(data, aes(sample = Placentalweight)) +
  geom_qq() +
  geom_qq_line(color = "red") +
  labs(x = "Quantis teóricos", y = "Quantis da amostra") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

qq_pp
```




```r
ggsave("Q-Q_pp.pdf", qq_pp, dpi = 1200)
#Shapiro test para a normalidade
shapiro.test(data$Placentalweight)
```

```
##
```

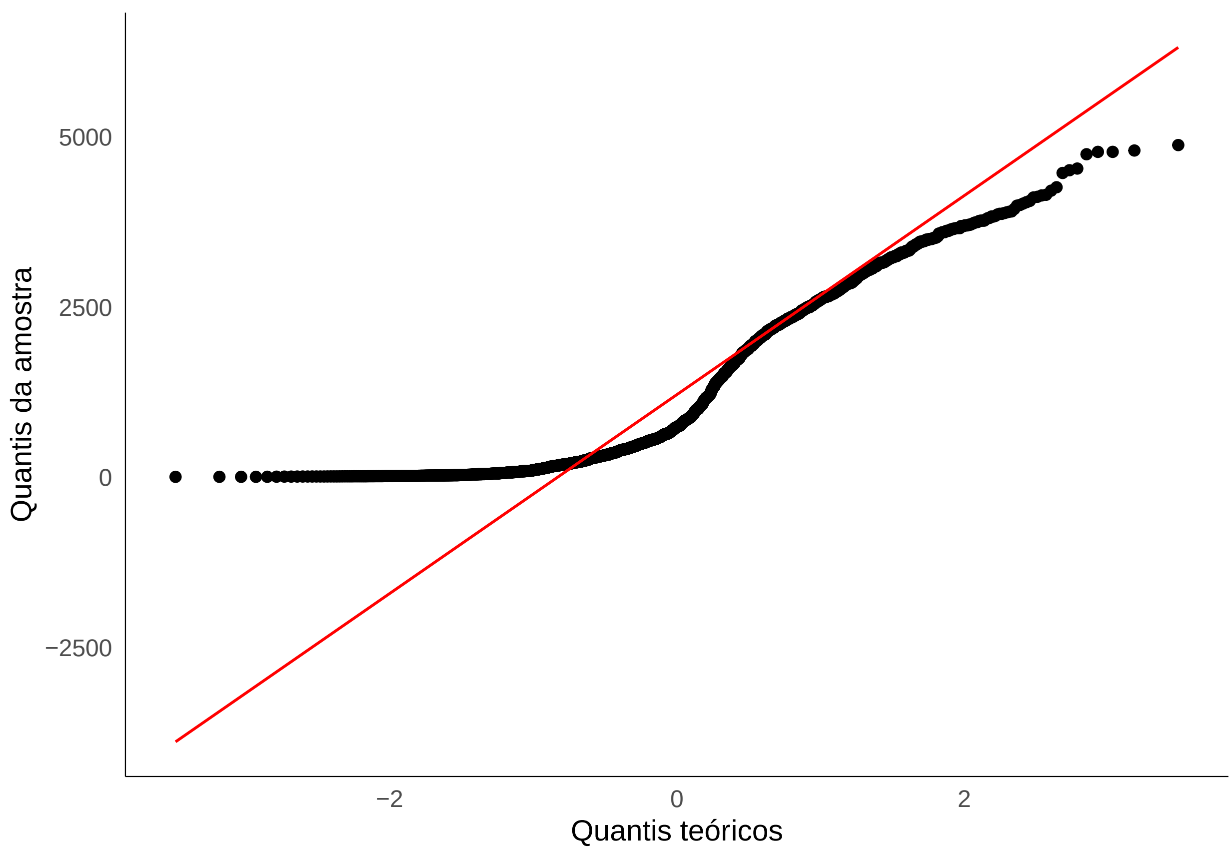
```
##  Shapiro-Wilk normality test
##
## data:  data$Placentalweight
## W = 0.93261, p-value < 2.2e-16
```

```r
#variância
var(data$Placentalweight)
```

```
## [1] 24988.93
```

Fetalweight

```r
#Gráficos para vizualizar a possibiidade de os dados seguirem uma distribuição normal
qq_pf <- ggplot(data, aes(sample = Fetalweight)) +
  geom_qq() +
  geom_qq_line(color = "red") +
  labs(x = "Quantis teóricos", y = "Quantis da amostra") +
  theme_minimal() +
  theme(panel.grid = element_blank(),
        axis.line = element_line(size = 0.2))

qq_pf
```



```r
ggsave("Q-Q_pf.pdf", qq_pf, dpi = 1200)

#Shapiro test para a normalidade
shapiro.test(data$Fetalweight)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  data$Fetalweight
## W = 0.87883, p-value < 2.2e-16
```

```r
#variância
var(data$Fetalweight)
```

```
## [1] 1327260
```

Análise geral das variáveis

Os resultados sugerem que as distribuições de todas as variáveis não seguem estritamente uma distribuição normal, como indicado por desvios visuais nos gráficos Q-Q e valores-p significativamente baixos no teste de Shapiro-Wilk, <2x10^-16 para todas as variáveis, exceto o D2 que teve um valor-p ligeiramente mais alto de 6x10^-15. Logo, há uma rejeição clara da normalidade.

Estatísticas descritivas das variáveis em geral

```r
dfSummary(data,na.col=F,valid.col=F)
```

```
## Data Frame Summary
## data
## Dimensions: 2064 x 11
## Duplicates: 0
##
## -----------------------------------------------------------------------------------------------------------
## No   Variable             Stats / Values                Freqs (% of Valid)     Graph
## ---- -------------------- ----------------------------- ---------------------- ---------------------
## 1    local                1. Tâmega                     447 (21.7%)            IIII
##      [character]          2. Douro e Vouga              307 (14.9%)            II
##                           3. Gaia                       198 ( 9.6%)            I
##                           4. Viseu                      132 ( 6.4%)            I
##                           5. Matosinhos                 108 ( 5.2%)            I
##                           6. Barreiro/Montijo            95 ( 4.6%)
##                           7. Alto Minho                  86 ( 4.2%)
##                           8. HGO                         74 ( 3.6%)
##                           9. Baixo Vouga                 69 ( 3.3%)
##                           10. PV/VC                      63 ( 3.1%)
##                           [ 35 others ]                 485 (23.5%)            IIII
##
## 2    GA                   Mean (sd) : 26.5 (8.9)        30 distinct values       : : :       . : :
##      [integer]            min < med < max:                                     : : : : .   . : : :
##                           12 < 26 < 41                                         : : : : : : : : : :
```

```
##                         IQR (CV) : 16 (0.3)                                : : : : : : : : : :
##                                                                            : : : : : : : : : :
##
## 3    MaternalAge        Mean (sd) : 31.8 (6.2)       284 distinct values             :
##      [numeric]          min < med < max:                                           . : :
##                         9 < 32.2 < 48.2                                            : : :
##                         IQR (CV) : 8.8 (0.2)                                     : : : : .
##                                                                                . : : : : :
##
## 4    Fetalweight        Mean (sd) : 1229.6 (1152.1)  1062 distinct values    :
##      [numeric]          min < med < max:                                     :
##                         5.7 < 736.5 < 4880                                   :
##                         IQR (CV) : 1972 (0.9)                                : :     .
##                                                                              : : : : : : : . .
##
## 5    Fetalgender        Mean (sd) : 1.5 (2.8)        0 : 862 (41.8%)         IIIIIIII
##      [integer]          min < med < max:             1 : 947 (45.9%)         IIIIIIIII
##                         0 < 1 < 9                    2 :  14 ( 0.7%)
##                         IQR (CV) : 1 (1.8)           9 : 241 (11.7%)         II
##
## 6    Placentalweight    Mean (sd) : 229.8 (158.1)    581 distinct values     : :
##      [numeric]          min < med < max:                                     : :
##                         6 < 190 < 995                                        : : : :
##                         IQR (CV) : 243.2 (0.7)                               : : : : .
##                                                                              : : : : : : .
##
## 7    Diameter1          Mean (sd) : 13.4 (4.9)       62 distinct values          : : :
##      [numeric]          min < med < max:                                         : : :
##                         2 < 13 < 32                                            : : : : :
##                         IQR (CV) : 7 (0.4)                                     : : : : :
##                                                                              . : : : : : : .
##
## 8    Diameter2          Mean (sd) : 11.2 (4.5)       62 distinct values          .   :
##      [numeric]          min < med < max:                                       : : . :
##                         1.5 < 11 < 30                                          : : : : .
##                         IQR (CV) : 6.5 (0.4)                                   : : : : :
##                                                                              : : : : : : . .
##
## 9    Placentalthickness Mean (sd) : 2.1 (0.7)        40 distinct values            :
##      [numeric]          min < med < max:                                         . : .
##                         0.3 < 2 < 5                                              : : :
##                         IQR (CV) : 1 (0.3)                                     . : : : :
##                                                                                : : : : : . .
##
## 10   Obstetriccontext   Mean (sd) : 2.2 (1.9)        1 : 875 (42.4%)         IIIIIIII
##      [integer]          min < med < max:             2 : 629 (30.5%)         IIIIII
##                         1 < 2 < 9                    3 : 415 (20.1%)         IIII
##                         IQR (CV) : 2 (0.9)           4 :   6 ( 0.3%)
##                                                      5 :   6 ( 0.3%)
##                                                      9 : 133 ( 6.4%)         I
##
## 11   Placentalshape     Mean (sd) : 0.2 (0.5)        0 : 1839 (89.1%)        IIIIIIIIIIIIIIII
##      [integer]          min < med < max:             1 :  116 ( 5.6%)        I
##                         0 < 0 < 3                    2 :  106 ( 5.1%)        I
```

```
##                          IQR (CV) : 0 (3.1)           3 :    3 ( 0.1%)
## ------------------------------------------------------------------------------------------------------------
```

Análise estatísca pela IG

O comportamento das amostras devem ser analisados para todas as variáveis em cada idade gestacional. Será analisada a média, desvio padrão, assimetria e curtose.

A assimetria é uma medida da assimetria de uma distribuição. Este valor pode ser positivo ou negativo.

- Uma assimetria negativa indica que a cauda está no lado esquerdo da distribuição, que se estende para valores mais negativos.
- Uma assimetria positiva indica que a cauda está no lado direito da distribuição, que se estende para valores mais positivos.
- Um valor de zero indica que não há assimetria na distribuição, o que significa que a distribuição é perfeitamente simétrica.

A Curtose é uma medida que vê se uma distribuição tem ou não cauda pesada ou cauda leve em relação a uma distribuição normal.

- A curtose de uma distribuição normal é 3.
- Se uma dada distribuição tem uma curtose menor que 3, ela é chamada de playkurtic, o que significa que ela tende a produzir menos outliers e menos extremos do que a distribuição normal.
- Se uma determinada distribuição tem uma curtose maior que 3, ela é chamada de leptokurtic, o que significa que tende a produzir mais outliers do que a distribuição normal.

Diameter1

```r
# Estatísticas para avaliar variável
metrics_df <- data %>%
  group_by(GA) %>%
  summarise(
    N = n(),
    Média = round(mean(Diameter1),3),
    DP = round(sd(Diameter1),3),
    Min = round(min(Diameter1),3),
    Max = round(max(Diameter1),3),
    Mediana = round(median(Diameter1),3),
    Assimetria = round(skewness(Diameter1),3),
    Curtose = round(kurtosis(Diameter1),3)
  )

#Tabela com as estatísticas
kable(metrics_df, format = "markdown", align = c("l", "r", "r", "r", "r", "r", "r", "r", "r"))
```

GA	N	Média	DP	Min	Max	Mediana	Assimetria	Curtose
12	54	6.074	1.652	2.0	12.0	6.00	0.419	5.104
13	64	6.570	1.519	4.0	9.0	7.00	-0.104	1.984
14	73	7.105	1.630	4.0	12.0	7.00	0.415	3.154

GA	N	Média	DP	Min	Max	Mediana	Assimetria	Curtose
15	80	7.569	1.442	4.0	12.0	8.00	0.139	3.117
16	82	8.122	1.484	4.0	11.0	8.00	-0.462	3.641
17	76	9.414	1.550	6.0	14.0	9.00	0.445	3.818
18	80	9.203	1.732	4.0	17.0	9.00	0.649	7.594
19	82	10.055	1.952	5.0	14.0	10.00	-0.162	2.421
20	76	11.099	1.809	7.0	17.0	11.00	0.186	3.941
21	78	11.763	1.910	6.0	18.0	12.00	0.249	3.847
22	75	11.713	2.236	5.5	18.0	12.00	-0.034	3.258
23	80	12.656	2.383	8.0	22.0	13.00	0.844	4.971
24	70	12.836	2.321	9.0	19.0	13.00	0.746	3.665
25	49	12.608	2.482	7.0	18.5	13.00	-0.171	2.699
26	43	13.012	2.997	8.5	24.0	12.00	1.511	6.282
27	36	14.750	2.732	9.5	23.0	14.00	1.341	5.025
28	61	13.877	2.677	9.0	25.5	14.00	1.217	7.003
29	44	14.170	2.280	10.0	19.0	14.00	0.065	2.295
30	47	14.681	2.890	8.5	22.5	14.50	0.407	3.578
31	57	15.632	3.625	8.5	29.0	16.00	0.942	5.318
32	70	16.821	4.151	11.0	31.0	16.00	1.387	4.956
33	74	16.462	3.628	11.0	29.0	16.00	1.196	4.788
34	73	17.199	3.665	11.5	29.0	17.00	1.355	5.030
35	76	18.599	4.314	11.0	32.0	17.75	0.968	3.706
36	80	17.275	2.743	12.5	27.0	17.00	0.940	4.687
37	77	18.235	3.170	12.0	29.0	18.00	1.009	4.706
38	77	18.234	3.709	13.0	30.0	17.00	1.232	4.103
39	75	18.033	3.138	13.0	26.0	18.00	0.524	2.756
40	81	18.525	2.599	10.0	25.0	18.00	0.021	3.823
41	74	19.068	3.915	12.5	32.0	18.00	1.420	4.949

Observamos uma relação positiva entre a Idade Gestacional e o Diâmetro 1, indicando um desenvolvimento progressivo da placenta ao longo da gestação. Por exemplo, o D1 médio aumentou de 6,07 +/- 1,65 cm na semana 12 para 19,07 +/- 3,92 cm na semana 41, com ligeira variação. Os dados são aproximadamente simétricos, refletindo crescimento equilibrado, com caudas mais pesadas que a distribuição normal.

Diameter2

```
metrics_df2 <- data %>%
  group_by(GA) %>%
  summarise(
    N = n(),
    Média = round(mean(Diameter2),3),
    DP = round(sd(Diameter2),3),
    Min = round(min(Diameter2),3),
    Max = round(max(Diameter2),3),
    Mediana = round(median(Diameter2),3),
    Assimetria = round(skewness(Diameter2),3),
    Curtose = round(kurtosis(Diameter2),3),
  )


library(knitr)
```

```r
kable(metrics_df2, format = "markdown", align = c("l", "r", "r", "r", "r", "r", "r", "r", "r"))
```

GA	N	Média	DP	Min	Max	Mediana	Assimetria	Curtose
12	54	4.370	1.594	2.0	8.0	4.00	0.690	2.809
13	64	5.016	1.553	1.5	9.0	5.00	0.441	3.173
14	73	5.181	1.290	2.0	8.0	5.00	-0.069	2.928
15	80	5.739	1.478	2.5	10.0	6.00	0.024	2.702
16	82	6.262	1.580	2.0	9.0	6.00	-0.319	2.735
17	76	7.408	1.700	4.0	12.0	7.00	0.128	2.470
18	80	7.266	1.718	2.0	11.0	7.00	-0.255	2.825
19	82	8.244	1.906	3.0	12.5	8.00	-0.144	3.089
20	76	8.796	1.765	4.0	12.5	9.00	-0.097	2.763
21	78	9.526	1.801	4.0	13.0	10.00	-0.465	3.164
22	75	9.573	2.089	5.0	15.0	10.00	-0.091	2.724
23	80	10.781	2.048	5.0	16.0	11.00	-0.194	3.095
24	70	10.843	2.153	7.0	18.0	10.75	0.614	3.764
25	49	10.551	2.278	6.0	17.0	11.00	0.045	2.959
26	43	10.872	2.351	6.0	16.0	11.00	0.250	2.483
27	36	12.694	2.474	8.0	19.0	12.00	0.923	3.588
28	61	11.623	2.456	7.0	18.0	12.00	0.165	2.709
29	44	12.302	2.183	8.0	16.5	12.00	0.044	1.850
30	47	12.419	2.731	6.0	21.0	12.00	0.465	4.244
31	57	13.193	3.351	6.0	25.0	13.00	1.080	5.462
32	70	14.286	3.156	8.0	25.0	13.25	1.294	5.134
33	74	13.812	2.934	8.0	25.0	14.00	0.834	4.988
34	73	15.233	3.490	10.0	27.0	14.00	1.575	5.259
35	76	15.724	2.917	8.0	24.0	15.00	0.557	3.634
36	80	15.144	2.753	10.0	28.0	15.00	1.406	7.905
37	77	15.203	2.669	11.5	30.0	15.00	2.729	14.637
38	77	15.688	2.707	10.0	24.0	15.00	0.958	4.251
39	75	15.540	2.479	12.0	23.0	15.00	0.941	3.874
40	81	16.253	2.039	9.0	21.5	16.50	-0.341	4.051
41	74	16.591	3.027	10.0	26.5	16.00	0.832	4.505

Os dados mostram que à medida que a Idade Gestacional avança, o D2 cresce progressivamente. Por exemplo, na semana 12, o D2 tinha uma média de 4,37 +/- 1,59 cm, aumentando para 16,59 +/- 3,03 cm na semana 41, com uma ligeira variação. A assimetria dos dados é próxima de zero na maioria das IG, indicando distribuições aproximadamente simétricas. A maioria dos valores de curtose se situa entre 2 e 5, sugerindo distribuições mais concentradas no centro do que a distribuição normal.

Placentalthickness

```r
metrics_df3 <- data %>%
  group_by(GA) %>%
  summarise(
    N = n(),
    Média = round(mean(Placentalthickness), 3),
    DP = round(sd(Placentalthickness), 3),
    Min = round(min(Placentalthickness),3),
```

```r
    Max = round(max(Placentalthickness),3),
    Mediana = round(median(Placentalthickness),3),
    Assimetria = round(skewness(Placentalthickness), 3) ,
    Curtose = round(kurtosis(Placentalthickness),3)
  )


library(knitr)

kable(metrics_df3, format = "markdown", align = c("l", "r", "r", "r", "r", "r", "r", "r", "r"))
```

GA	N	Média	DP	Min	Max	Mediana	Assimetria	Curtose
12	54	1.257	0.458	0.50	2.8	1.200	0.989	4.647
13	64	1.284	0.396	0.50	2.5	1.200	0.426	3.498
14	73	1.412	0.388	0.50	2.2	1.500	0.043	2.566
15	80	1.555	0.435	0.70	3.0	1.500	0.880	4.701
16	82	1.664	0.517	0.50	3.5	1.500	0.955	5.300
17	76	1.762	0.467	0.50	3.0	1.725	0.277	3.430
18	80	1.865	0.596	1.00	4.5	1.700	1.753	7.230
19	82	1.871	0.633	1.00	4.0	1.800	0.990	4.059
20	76	1.778	0.400	0.75	3.0	1.800	0.211	3.389
21	78	1.949	0.459	0.30	3.0	2.000	-0.486	3.915
22	75	1.879	0.516	1.00	3.0	1.900	0.483	2.880
23	80	1.975	0.477	1.20	3.5	2.000	0.853	3.459
24	70	1.939	0.547	1.20	4.0	2.000	1.714	6.938
25	49	2.044	0.546	0.90	3.5	2.000	0.829	3.797
26	43	2.167	0.615	1.10	4.0	2.000	0.655	3.580
27	36	2.108	0.646	1.00	4.0	2.000	1.515	5.477
28	61	2.230	0.578	1.50	4.0	2.000	0.883	3.465
29	44	2.309	0.613	1.20	4.0	2.250	0.794	4.022
30	47	2.167	0.544	0.80	4.0	2.000	0.674	5.488
31	57	2.426	0.693	1.50	5.0	2.300	1.380	5.472
32	70	2.301	0.674	1.00	5.0	2.250	1.754	7.775
33	74	2.541	0.673	1.25	5.0	2.500	0.976	4.646
34	73	2.479	0.603	1.00	4.5	2.500	0.338	4.242
35	76	2.441	0.593	1.00	4.0	2.500	0.879	3.846
36	80	2.441	0.518	1.50	3.7	2.500	0.057	2.592
37	77	2.503	0.699	1.50	5.0	2.500	1.118	4.236
38	77	2.628	0.636	1.50	5.0	2.500	0.840	4.383
39	75	2.655	0.680	1.50	5.0	2.500	0.727	3.769
40	81	2.656	0.641	1.50	5.0	2.500	1.004	4.212
41	74	2.639	0.558	1.25	4.0	2.500	0.021	2.893

A Espessura Placentar aumenta à medida que a Idade Gestacional avança, embora o aumento seja menos significativo em comparação com outras medidas. Além disso, a EP exibe uma variabilidade menor, conforme indicado pelo Desvio Padrão. Os dados da EP mostram distribuições aproximadamente simétricas, com caudas pesadas.

Placentalweight

```r
metrics_df4 <- data %>%
  group_by(GA) %>%
  summarise(
    N = n(),
    Média = round(mean(Placentalweight),3),
    DP = round(sd(Placentalweight),3),
    Min = round(min(Placentalweight), 3),
    Max = round(max(Placentalweight),3),
    Mediana = round(median(Placentalweight), 3),
    Assimetria = round(skewness(Placentalweight),3),
    Curtose = round(kurtosis(Placentalweight),3)
  )


library(knitr)

kable(metrics_df4, format = "markdown", align = c("l", "r", "r", "r", "r", "r", "r", "r", "r"))
```

GA	N	Média	DP	Min	Max	Mediana	Assimetria	Curtose
12	54	35.789	23.385	6.0	143	33.0	2.194	9.997
13	64	41.642	16.919	8.0	109	42.0	0.771	5.547
14	73	51.123	17.839	12.3	90	49.0	0.277	2.477
15	80	59.799	22.318	16.0	148	57.0	0.978	5.254
16	82	71.220	24.138	12.0	145	70.0	0.256	3.856
17	76	94.134	37.661	33.0	300	88.5	2.467	13.883
18	80	95.463	31.435	32.0	250	95.5	1.463	8.765
19	82	113.243	35.988	24.0	214	113.0	0.057	3.061
20	76	126.979	44.187	36.0	360	120.5	1.929	11.883
21	78	140.671	37.138	42.0	230	143.0	-0.119	3.268
22	75	143.856	39.009	64.0	302	140.0	0.935	5.641
23	80	171.162	43.220	52.0	327	172.5	0.135	4.761
24	70	169.293	55.575	73.0	398	153.0	1.278	5.804
25	49	180.567	70.160	73.0	343	185.0	0.246	2.328
26	43	190.674	71.346	85.0	379	190.0	0.508	2.702
27	36	216.250	73.589	72.0	466	220.0	0.647	5.129
28	61	206.803	68.806	86.0	355	203.0	0.367	2.445
29	44	254.614	88.796	123.0	510	241.5	0.700	3.118
30	47	249.098	77.004	88.0	435	247.0	0.223	2.891
31	57	280.807	90.189	94.0	496	294.0	-0.001	2.780
32	70	310.729	89.198	148.0	582	305.5	0.826	3.840
33	74	334.622	88.021	153.0	524	328.0	0.251	2.550
34	73	344.959	79.024	163.0	580	345.0	0.291	3.294
35	76	373.376	123.470	177.0	890	355.0	1.417	6.118
36	80	360.075	79.816	224.0	590	349.5	0.707	3.113
37	77	378.030	89.348	222.0	682	360.0	1.000	4.268
38	77	428.034	135.385	240.0	995	404.0	1.517	6.219
39	75	445.960	126.361	255.0	905	435.0	0.999	4.308
40	81	473.920	89.092	301.0	863	458.0	1.277	6.597
41	74	474.419	107.053	290.0	738	459.5	0.418	2.619

O Peso Placentárioaumenta significativamente com a Idade Gestacional, variando de 35,79 +/- 23,39g a 474,42 +/- 107,05 g. A variabilidade, medida pelo Desvio Padrão, é notável, especialmente nas fases finais da gestação. Os valores mínimos e máximos do PP também variam substancialmente, por exemplo, nas 38 semanas, variam entre 240g e 995g. As distribuições de dados são diversas em assimetria e forma, com algumas apresentando alta assimetria e leptocurtose, como as observadas nas 17 semanas.

Peso fetal

```
metrics_df7 <- data %>%
  group_by(GA) %>%
  summarise(
    N = n(),
    Média = round(mean(Fetalweight), 3),
    DP = round(sd(Fetalweight), 3),
    Min = round(min(Fetalweight), 3),
    Max = round(max(Fetalweight), 3),
    Mediana = round(median(Fetalweight), 3),
    Assimetria = round(skewness(Fetalweight), 3),
    Curtose = round(kurtosis(Fetalweight),3)
  )


library(knitr)

kable(metrics_df7, format = "markdown", align = c("l", "r", "r", "r", "r", "r", "r", "r", "r"))
```

GA	N	Média	DP	Min	Max	Mediana	Assimetria	Curtose
12	54	23.775	38.600	5.7	281.0	16.25	5.839	38.418
13	64	28.716	20.613	6.0	173.0	27.00	5.439	38.835
14	73	45.149	16.868	10.5	92.0	46.00	0.126	2.807
15	80	68.091	32.090	12.0	193.4	70.50	0.571	4.529
16	82	100.713	43.873	14.0	191.0	98.35	0.110	2.391
17	76	164.233	52.081	33.0	315.0	168.00	-0.202	3.764
18	80	204.878	57.367	63.0	335.0	209.50	-0.318	3.534
19	82	259.973	84.896	29.0	449.0	269.00	-0.747	3.877
20	76	329.461	78.183	77.0	571.0	328.00	-0.341	4.767
21	78	401.821	83.962	110.0	567.0	409.50	-0.975	4.655
22	75	484.573	139.033	146.0	1305.0	489.00	2.381	17.926
23	80	558.339	104.503	313.0	833.0	562.50	-0.162	3.492
24	70	637.014	143.012	319.0	1118.0	642.50	0.047	4.108
25	49	673.886	334.221	135.0	2310.0	732.00	2.152	12.920
26	43	710.837	293.231	356.0	1880.0	640.00	2.229	9.236
27	36	910.900	189.815	470.0	1300.0	954.50	-0.457	3.022
28	61	934.852	267.503	297.0	1500.0	980.00	-0.319	2.850
29	44	1213.386	486.862	426.0	3100.0	1102.50	1.434	6.581
30	47	1267.340	349.700	540.0	2300.0	1275.00	0.342	3.334
31	57	1483.281	356.880	630.0	2380.0	1470.00	-0.087	3.022
32	70	1749.086	482.689	402.0	3765.0	1740.00	0.896	6.964
33	74	1928.486	388.521	755.0	3330.0	1960.00	0.138	4.989
34	73	2133.397	443.349	1190.0	3000.0	2100.00	-0.077	2.212

GA	N	Média	DP	Min	Max	Mediana	Assimetria	Curtose
35	76	2334.566	558.020	1460.0	4470.0	2270.00	1.330	5.807
36	80	2456.012	453.459	1535.0	3420.0	2445.00	0.163	2.493
37	77	2574.390	515.947	1730.0	4780.0	2450.00	2.137	9.733
38	77	2826.896	576.361	1830.0	4800.0	2720.00	1.017	4.259
39	75	2890.000	584.177	1520.0	4535.0	2830.00	0.190	2.937
40	81	3245.642	468.568	2280.0	4745.0	3230.00	0.086	3.057
41	74	3301.554	503.917	2280.0	4880.0	3312.50	0.280	3.042

Há um aumento notável no Peso Fetal. Na semana 12, o PF tinha uma média de 23,77 +/- 38,60 g, que aumentou consideravelmente para 3301,55 +/- 503,92 g na semana 41. A mediana segue a mesma tendência de crescimento, reforçando a consistência dos resultados. A análise da assimetria revela que as distribuições dos dados são geralmente assimétricas, com valores maiores que zero, indicando uma maior concentração de valores menores em relação à média. A curtose também apoia essa observação, mostrando valores positivos.

Análise das variáveis com géneros separados

```
#separar por géneros
grouped_data <- split(data, data$Fetalgender)
gender_0 <- grouped_data[[1]] #feminino
gender_1 <- grouped_data[[2]] #masculino
gender_2 <- grouped_data[[3]] #ambíguo
gender_9 <- grouped_data[[4]] #desconhecido
```

Variável GA

```
var(gender_0$GA)
```

```
## [1] 75.74295
```

```
sd(gender_0$GA)
```

```
## [1] 8.703042
```

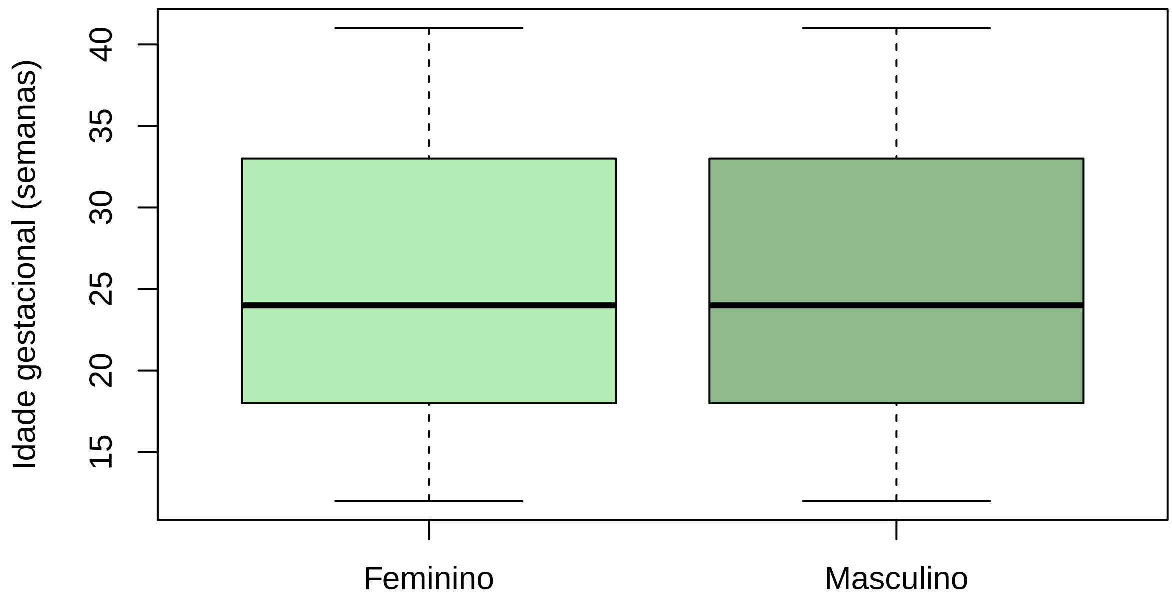
```
var(gender_1$GA)
```

```
## [1] 72.70126
```

```
sd(gender_1$GA)
```

```
## [1] 8.526503
```

```
gender_list <- list(gender_0$GA, gender_1$GA)
boxplot(gender_list,names = c("Feminino", "Masculino"), ylab = "Idade gestacional (semanas)", col = c("
```



Variáveis Diameter1 e Diameter 2

```r
var(gender_0$Diameter1)
```

```
## [1] 21.97654
```

```r
sd(gender_0$Diameter1)
```

```
## [1] 4.687914
```

```r
var(gender_1$Diameter1)
```

```
## [1] 22.42812
```

```r
sd(gender_1$Diameter1)
```

```
## [1] 4.735833
```

```r
var(gender_0$Diameter2)
```

```
## [1] 18.46965
```

```r
sd(gender_0$Diameter2)
```

```
## [1] 4.297634
```

```r
var(gender_1$Diameter2)
```

```
## [1] 19.07274
```

```r
sd(gender_1$Diameter2)
```

```
## [1] 4.367235
```

```r
summary(gender_0$Diameter1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.00    9.00   12.50   12.77   16.00   29.00
```

```r
summary(gender_0$Diameter2)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.00    7.00   10.50   10.62   14.00   27.00
```

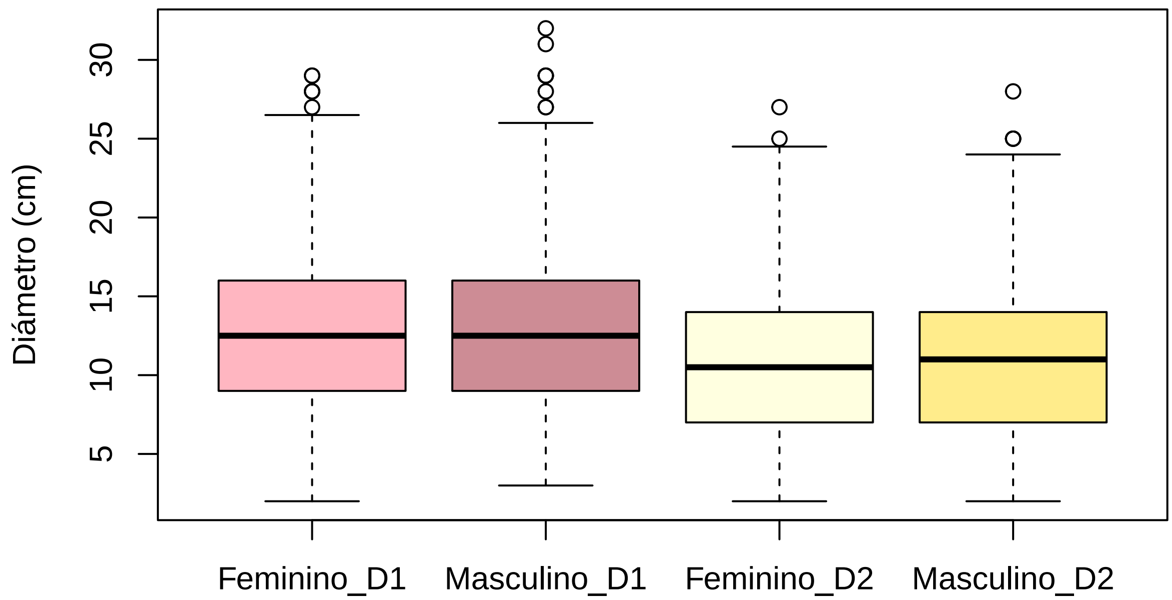
```r
summary(gender_1$Diameter1)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    3.00    9.00   12.50   12.96   16.00   32.00
```

```r
summary(gender_1$Diameter2)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.00    7.00   11.00   10.83   14.00   28.00
```

```r
gender_list1 <- list(gender_0$Diameter1, gender_1$Diameter1, gender_0$Diameter2, gender_1$Diameter2)
boxplot(gender_list1,names = c("Feminino_D1", "Masculino_D1", "Feminino_D2", "Masculino_D2"), ylab = "D
```



Variável Placentalweight

```
var(gender_0$Placentalweight)
```

```
## [1] 23315.15
```

```
sd(gender_0$Placentalweight)
```

```
## [1] 152.693
```

```
var(gender_1$Placentalweight)
```

```
## [1] 21715.84
```

```
sd(gender_1$Placentalweight)
```

```
## [1] 147.363
```

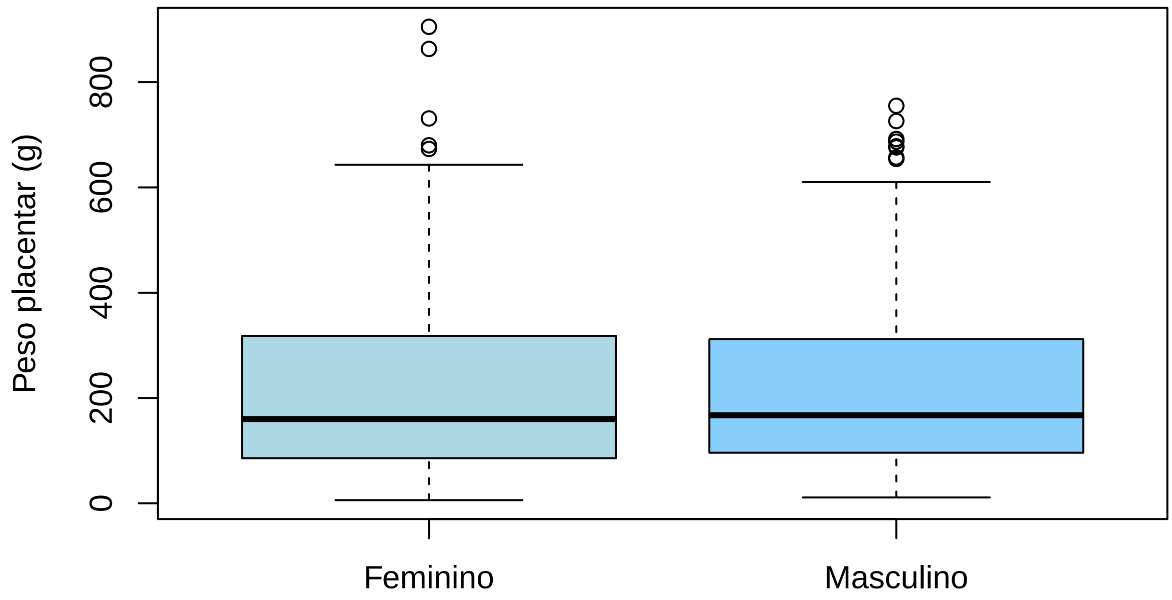
```
summary(gender_0$Placentalweight)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     6.0    85.7   160.0   208.5   318.0   905.0
```

```
summary(gender_1$Placentalweight)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    11.0    96.0   167.0   211.9   311.5   755.0
```

```
gender_list2 <- list(gender_0$Placentalweight, gender_1$Placentalweight)
boxplot(gender_list2,names = c("Feminino", "Masculino"), ylab = "Peso placentar (g)", col = c("lightblu
```



Variável Placentalthickness

```
var(gender_0$Placentalthickness)
```

```
## [1] 0.4666614
```

```
sd(gender_0$Placentalthickness)
```

```
## [1] 0.6831262
```

```r
var(gender_1$Placentalthickness)
```

```
## [1] 0.461098
```

```r
sd(gender_1$Placentalthickness)
```

```
## [1] 0.679042
```

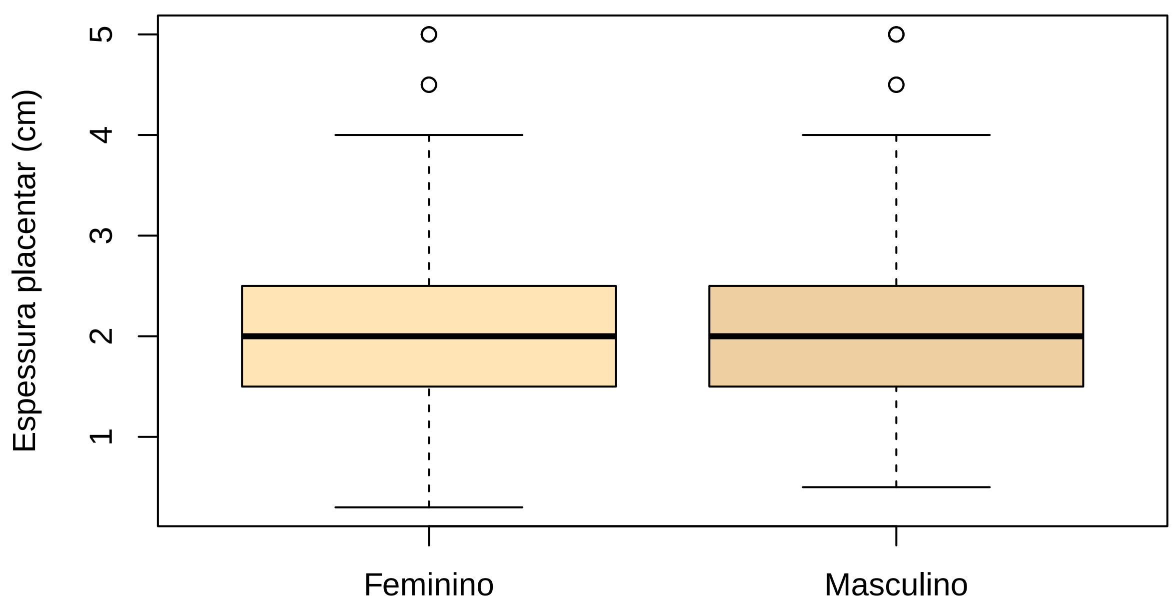
```r
summary(gender_0$Placentalthickness)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.300   1.500   2.000   2.016   2.500   5.000
```

```r
summary(gender_1$Placentalthickness)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.500   1.500   2.000   2.071   2.500   5.000
```

```r
gender_list3 <- list(gender_0$Placentalthickness, gender_1$Placentalthickness)
boxplot(gender_list3,names = c("Feminino", "Masculino"), ylab = "Espessura placentar (cm)", col = c("mo
```



Análise geral das variáveis pelos géneros

Os boxplots são muito semelhantes para ambos os géneros em cada variável, não parece existir diferenças significativas.

Testes de significância para cada IG com sexos separados

```
#semanas existentes
unique(data$GA)
```

```
##  [1] 12 15 13 14 16 19 17 18 20 22 32 21 23 25 26 27 24 33 28 29 39 31 30 38 35
## [26] 37 40 41 34 36
```

```
#dividir os dados por semanas e género
split_data <- split(data, list(data$GA, data$Fetalgender))
```

12 semanas

```
t.test(split_data[["12.0"]]$Diameter1, split_data[["12.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["12.0"]]$Diameter1 and split_data[["12.1"]]$Diameter1
## t = -1.2784, df = 49.861, p-value = 0.207
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.5179719  0.3372312
## sample estimates:
## mean of x mean of y
##   5.78000   6.37037
```

```
t.test(split_data[["12.0"]]$Diameter2, split_data[["12.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["12.0"]]$Diameter2 and split_data[["12.1"]]$Diameter2
## t = -2.7414, df = 48.287, p-value = 0.008552
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.9888106 -0.3060043
## sample estimates:
## mean of x mean of y
##  3.760000  4.907407
```

```
t.test(split_data[["12.0"]]$Placentalweight, split_data[["12.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["12.0"]]$Placentalweight and split_data[["12.1"]]$Placentalweight
## t = -0.6542, df = 46.412, p-value = 0.5162
```

```
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -17.716359   9.023618
## sample estimates:
## mean of x mean of y
##  34.02400  38.37037
```

```r
t.test(split_data[["12.0"]]$Placentalthickness, split_data[["12.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["12.0"]]$Placentalthickness and split_data[["12.1"]]$Placentalthickness
## t = 0.33717, df = 41.286, p-value = 0.7377
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.214315  0.300241
## sample estimates:
## mean of x mean of y
##  1.280000  1.237037
```

```r
t.test(split_data[["12.0"]]$Fetalweight, split_data[["12.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["12.0"]]$Fetalweight and split_data[["12.1"]]$Fetalweight
## t = 0.66847, df = 30.021, p-value = 0.5089
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -15.50078  30.58626
## sample estimates:
## mean of x mean of y
##  28.20200  20.65926
```

13 semanas

```r
t.test(split_data[["13.0"]]$Diameter1, split_data[["13.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["13.0"]]$Diameter1 and split_data[["13.1"]]$Diameter1
## t = 0.75425, df = 49.135, p-value = 0.4543
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.5053018  1.1125745
## sample estimates:
## mean of x mean of y
##  6.863636  6.560000
```

```r
t.test(split_data[["13.0"]]$Diameter2, split_data[["13.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["13.0"]]$Diameter2 and split_data[["13.1"]]$Diameter2
## t = 0.23869, df = 51.458, p-value = 0.8123
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.7184547  0.9123941
## sample estimates:
## mean of x mean of y
##   5.19697   5.10000
```

```r
t.test(split_data[["13.0"]]$Placentalweight, split_data[["13.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["13.0"]]$Placentalweight and split_data[["13.1"]]$Placentalweight
## t = -0.87488, df = 46.886, p-value = 0.3861
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -13.148431   5.178734
## sample estimates:
## mean of x mean of y
##  41.21515  45.20000
```

```r
t.test(split_data[["13.0"]]$Placentalthickness, split_data[["13.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["13.0"]]$Placentalthickness and split_data[["13.1"]]$Placentalthickness
## t = -1.5828, df = 54.895, p-value = 0.1192
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.36918777  0.04336959
## sample estimates:
## mean of x mean of y
##  1.209091  1.372000
```

```r
t.test(split_data[["13.0"]]$Fetalweight, split_data[["13.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["13.0"]]$Fetalweight and split_data[["13.1"]]$Fetalweight
## t = -1.3339, df = 28.35, p-value = 0.1928
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
```

```
##  -21.13029   4.45781
## sample estimates:
## mean of x mean of y
##  25.07576  33.41200
```

14 semanas

```r
t.test(split_data[["14.0"]]$Diameter1, split_data[["14.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["14.0"]]$Diameter1 and split_data[["14.1"]]$Diameter1
## t = -0.43411, df = 59.19, p-value = 0.6658
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9635586  0.6199927
## sample estimates:
## mean of x mean of y
##  7.034884  7.206667
```

```r
t.test(split_data[["14.0"]]$Diameter2, split_data[["14.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["14.0"]]$Diameter2 and split_data[["14.1"]]$Diameter2
## t = -2.2984, df = 59.144, p-value = 0.02509
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.29937515 -0.08992717
## sample estimates:
## mean of x mean of y
##  4.895349  5.590000
```

```r
t.test(split_data[["14.0"]]$Placentalweight, split_data[["14.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["14.0"]]$Placentalweight and split_data[["14.1"]]$Placentalweight
## t = -1.8265, df = 59.028, p-value = 0.07283
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -16.2223602   0.7394145
## sample estimates:
## mean of x mean of y
##  47.94186  55.68333
```

```r
t.test(split_data[["14.0"]]$Placentalthickness, split_data[["14.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["14.0"]]$Placentalthickness and split_data[["14.1"]]$Placentalthickness
## t = -2.3686, df = 63.499, p-value = 0.02091
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3891495 -0.0330210
## sample estimates:
## mean of x mean of y
##  1.325581  1.536667
```

```r
t.test(split_data[["14.0"]]$Fetalweight, split_data[["14.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["14.0"]]$Fetalweight and split_data[["14.1"]]$Fetalweight
## t = -1.5409, df = 48.48, p-value = 0.1299
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -14.973926   1.978732
## sample estimates:
## mean of x mean of y
##  42.47907  48.97667
```

15 semanas

```r
t.test(split_data[["15.0"]]$Diameter1, split_data[["15.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["15.0"]]$Diameter1 and split_data[["15.1"]]$Diameter1
## t = 0.3535, df = 75.145, p-value = 0.7247
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.5420619  0.7759489
## sample estimates:
## mean of x mean of y
##  7.628571  7.511628
```

```r
t.test(split_data[["15.0"]]$Diameter2, split_data[["15.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["15.0"]]$Diameter2 and split_data[["15.1"]]$Diameter2
## t = 1.0378, df = 75.316, p-value = 0.3027
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3145883  0.9989737
## sample estimates:
## mean of x mean of y
##  5.914286  5.572093
```

```r
t.test(split_data[["15.0"]]$Placentalweight, split_data[["15.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["15.0"]]$Placentalweight and split_data[["15.1"]]$Placentalweight
## t = -0.44181, df = 75.997, p-value = 0.6599
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -12.261464   7.809238
## sample estimates:
## mean of x mean of y
##  58.29714  60.52326
```

```r
t.test(split_data[["15.0"]]$Placentalthickness, split_data[["15.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["15.0"]]$Placentalthickness and split_data[["15.1"]]$Placentalthickness
## t = -0.19548, df = 72.8, p-value = 0.8456
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.2172270  0.1784231
## sample estimates:
## mean of x mean of y
##  1.545714  1.565116
```

```r
t.test(split_data[["15.0"]]$Fetalweight, split_data[["15.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["15.0"]]$Fetalweight and split_data[["15.1"]]$Fetalweight
## t = 0.89126, df = 75.969, p-value = 0.3756
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -7.896046 20.686345
## sample estimates:
## mean of x mean of y
##  70.81143  64.41628
```

16 semanas

```r
t.test(split_data[["16.0"]]$Diameter1, split_data[["16.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["16.0"]]$Diameter1 and split_data[["16.1"]]$Diameter1
## t = -0.83924, df = 79.999, p-value = 0.4038
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9152026  0.3722596
## sample estimates:
## mean of x mean of y
##  7.972973  8.244444
```

```r
t.test(split_data[["16.0"]]$Diameter2, split_data[["16.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["16.0"]]$Diameter2 and split_data[["16.1"]]$Diameter2
## t = -0.52881, df = 79.963, p-value = 0.5984
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.8682653  0.5037008
## sample estimates:
## mean of x mean of y
##  6.162162  6.344444
```

```r
t.test(split_data[["16.0"]]$Placentalweight, split_data[["16.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["16.0"]]$Placentalweight and split_data[["16.1"]]$Placentalweight
## t = -0.69555, df = 79.914, p-value = 0.4887
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -14.114023   6.803272
## sample estimates:
## mean of x mean of y
##  69.21351  72.86889
```

```r
t.test(split_data[["16.0"]]$Placentalthickness, split_data[["16.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["16.0"]]$Placentalthickness and split_data[["16.1"]]$Placentalthickness
```

```
## t = -0.36992, df = 75.799, p-value = 0.7125
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.2732041  0.1876185
## sample estimates:
## mean of x mean of y
##  1.640541  1.683333
```

```
t.test(split_data[["16.0"]]$Fetalweight, split_data[["16.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["16.0"]]$Fetalweight and split_data[["16.1"]]$Fetalweight
## t = -2.6683, df = 78.343, p-value = 0.009261
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -42.430289  -6.171213
## sample estimates:
## mean of x mean of y
##  87.37703 111.67778
```

17 semanas

```
t.test(split_data[["17.0"]]$Diameter1, split_data[["17.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["17.0"]]$Diameter1 and split_data[["17.1"]]$Diameter1
## t = -0.28204, df = 55.527, p-value = 0.779
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.8632411  0.6501976
## sample estimates:
## mean of x mean of y
##  9.350000  9.456522
```

```
t.test(split_data[["17.0"]]$Diameter2, split_data[["17.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["17.0"]]$Diameter2 and split_data[["17.1"]]$Diameter2
## t = 0.30614, df = 59.18, p-value = 0.7606
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.6899767  0.9392520
## sample estimates:
## mean of x mean of y
##  7.483333  7.358696
```

```r
t.test(split_data[["17.0"]]$Placentalweight, split_data[["17.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["17.0"]]$Placentalweight and split_data[["17.1"]]$Placentalweight
## t = -0.29182, df = 46.917, p-value = 0.7717
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -22.09627  16.49801
## sample estimates:
## mean of x mean of y
##  92.44000  95.23913
```

```r
t.test(split_data[["17.0"]]$Placentalthickness, split_data[["17.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["17.0"]]$Placentalthickness and split_data[["17.1"]]$Placentalthickness
## t = -1.5769, df = 67.646, p-value = 0.1195
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.37743314  0.04424474
## sample estimates:
## mean of x mean of y
##  1.661667  1.828261
```

```r
t.test(split_data[["17.0"]]$Fetalweight, split_data[["17.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["17.0"]]$Fetalweight and split_data[["17.1"]]$Fetalweight
## t = -1.0407, df = 69.567, p-value = 0.3016
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -35.68928  11.21653
## sample estimates:
## mean of x mean of y
##  156.8267  169.0630
```

18 semanas

```r
t.test(split_data[["18.0"]]$Diameter1, split_data[["18.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["18.0"]]$Diameter1 and split_data[["18.1"]]$Diameter1
## t = 1.5873, df = 65.317, p-value = 0.1173
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1617556  1.4152909
## sample estimates:
## mean of x mean of y
##  9.547222  8.920455
```

```r
t.test(split_data[["18.0"]]$Diameter2, split_data[["18.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["18.0"]]$Diameter2 and split_data[["18.1"]]$Diameter2
## t = 1.6731, df = 75.552, p-value = 0.09845
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1214031  1.3956455
## sample estimates:
## mean of x mean of y
##  7.616667  6.979545
```

```r
t.test(split_data[["18.0"]]$Placentalweight, split_data[["18.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["18.0"]]$Placentalweight and split_data[["18.1"]]$Placentalweight
## t = -1.442, df = 77.999, p-value = 0.1533
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -23.607936   3.774603
## sample estimates:
## mean of x mean of y
##  90.00833  99.92500
```

```r
t.test(split_data[["18.0"]]$Placentalthickness, split_data[["18.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["18.0"]]$Placentalthickness and split_data[["18.1"]]$Placentalthickness
## t = -0.64293, df = 68.854, p-value = 0.5224
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3605674  0.1848098
## sample estimates:
## mean of x mean of y
##  1.816667  1.904545
```

```
t.test(split_data[["18.0"]]$Fetalweight, split_data[["18.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["18.0"]]$Fetalweight and split_data[["18.1"]]$Fetalweight
## t = -1.8067, df = 77.907, p-value = 0.07467
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -47.494635   2.303726
## sample estimates:
## mean of x mean of y
##  192.4500  215.0455
```

19 semanas

```
t.test(split_data[["19.0"]]$Diameter1, split_data[["19.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["19.0"]]$Diameter1 and split_data[["19.1"]]$Diameter1
## t = 1.0477, df = 78.263, p-value = 0.298
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.4065014  1.3098062
## sample estimates:
## mean of x mean of y
## 10.267442  9.815789
```

```
t.test(split_data[["19.0"]]$Diameter2, split_data[["19.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["19.0"]]$Diameter2 and split_data[["19.1"]]$Diameter2
## t = 0.98572, df = 78.205, p-value = 0.3273
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.4221313  1.2501607
## sample estimates:
## mean of x mean of y
##  8.453488  8.039474
```

```
t.test(split_data[["19.0"]]$Placentalweight, split_data[["19.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["19.0"]]$Placentalweight and split_data[["19.1"]]$Placentalweight
## t = 0.69318, df = 76.7, p-value = 0.4903
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -10.48724  21.68662
## sample estimates:
## mean of x mean of y
##  115.5023  109.9026
```

```r
t.test(split_data[["19.0"]]$Placentalthickness, split_data[["19.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["19.0"]]$Placentalthickness and split_data[["19.1"]]$Placentalthickness
## t = -1.5852, df = 61.537, p-value = 0.118
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.50648121  0.05850079
## sample estimates:
## mean of x mean of y
##  1.752326  1.976316
```

```r
t.test(split_data[["19.0"]]$Fetalweight, split_data[["19.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["19.0"]]$Fetalweight and split_data[["19.1"]]$Fetalweight
## t = -0.21345, df = 69.692, p-value = 0.8316
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -42.80546  34.52945
## sample estimates:
## mean of x mean of y
##  258.6488  262.7868
```

20 semanas

```r
t.test(split_data[["20.0"]]$Diameter1, split_data[["20.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["20.0"]]$Diameter1 and split_data[["20.1"]]$Diameter1
## t = -1.9281, df = 72.436, p-value = 0.05776
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.60444176  0.02666398
## sample estimates:
## mean of x mean of y
##  10.72500  11.51389
```

```r
t.test(split_data[["20.0"]]$Diameter2, split_data[["20.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["20.0"]]$Diameter2 and split_data[["20.1"]]$Diameter2
## t = -0.23688, df = 70.666, p-value = 0.8134
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9156738  0.7212293
## sample estimates:
## mean of x mean of y
##  8.750000  8.847222
```

```r
t.test(split_data[["20.0"]]$Placentalweight, split_data[["20.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["20.0"]]$Placentalweight and split_data[["20.1"]]$Placentalweight
## t = -0.76061, df = 67.433, p-value = 0.4495
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -27.45705  12.30372
## sample estimates:
## mean of x mean of y
##  123.3900  130.9667
```

```r
t.test(split_data[["20.0"]]$Placentalthickness, split_data[["20.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["20.0"]]$Placentalthickness and split_data[["20.1"]]$Placentalthickness
## t = -2.0859, df = 69.412, p-value = 0.04066
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.369793720 -0.008261836
## sample estimates:
## mean of x mean of y
##  1.688750  1.877778
```

```r
t.test(split_data[["20.0"]]$Fetalweight, split_data[["20.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["20.0"]]$Fetalweight and split_data[["20.1"]]$Fetalweight
## t = -0.96088, df = 72.929, p-value = 0.3398
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
```

```
##  -53.12342  18.56231
## sample estimates:
## mean of x mean of y
##  321.2750  338.5556
```

21 semanas

```r
t.test(split_data[["21.0"]]$Diameter1, split_data[["21.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["21.0"]]$Diameter1 and split_data[["21.1"]]$Diameter1
## t = 0.0625, df = 66.424, p-value = 0.9504
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.8594749  0.9150305
## sample estimates:
## mean of x mean of y
##  11.77778  11.75000
```

```r
t.test(split_data[["21.0"]]$Diameter2, split_data[["21.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["21.0"]]$Diameter2 and split_data[["21.1"]]$Diameter2
## t = -0.30838, df = 75.084, p-value = 0.7586
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9431282  0.6902711
## sample estimates:
## mean of x mean of y
##  9.458333  9.584762
```

```r
t.test(split_data[["21.0"]]$Placentalweight, split_data[["21.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["21.0"]]$Placentalweight and split_data[["21.1"]]$Placentalweight
## t = 0.8018, df = 73.589, p-value = 0.4253
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -10.08838  23.67250
## sample estimates:
## mean of x mean of y
##  144.3278  137.5357
```

```r
t.test(split_data[["21.0"]]$Placentalthickness, split_data[["21.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["21.0"]]$Placentalthickness and split_data[["21.1"]]$Placentalthickness
## t = -0.31429, df = 63.608, p-value = 0.7543
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.2481567  0.1806964
## sample estimates:
## mean of x mean of y
##  1.930556  1.964286
```

```r
t.test(split_data[["21.0"]]$Fetalweight, split_data[["21.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["21.0"]]$Fetalweight and split_data[["21.1"]]$Fetalweight
## t = -1.7721, df = 74.473, p-value = 0.08047
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -70.741553   4.138378
## sample estimates:
## mean of x mean of y
##  383.8889  417.1905
```

22 semanas

```r
t.test(split_data[["22.0"]]$Diameter1, split_data[["22.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["22.0"]]$Diameter1 and split_data[["22.1"]]$Diameter1
## t = 1.9871, df = 66.886, p-value = 0.05101
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.004593315  2.043879030
## sample estimates:
## mean of x mean of y
##  12.25714  11.23750
```

```r
t.test(split_data[["22.0"]]$Diameter2, split_data[["22.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["22.0"]]$Diameter2 and split_data[["22.1"]]$Diameter2
## t = 0.71912, df = 72.853, p-value = 0.4744
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.6105432  1.2998290
## sample estimates:
## mean of x mean of y 
##  9.757143  9.412500
```

```
t.test(split_data[["22.0"]]$Placentalweight, split_data[["22.1"]]$Placentalweight)
```

```
## 
##  Welch Two Sample t-test
## 
## data:  split_data[["22.0"]]$Placentalweight and split_data[["22.1"]]$Placentalweight
## t = 1.0222, df = 72.878, p-value = 0.31
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -8.661154 26.901154
## sample estimates:
## mean of x mean of y 
##    148.72    139.60
```

```
t.test(split_data[["22.0"]]$Placentalthickness, split_data[["22.1"]]$Placentalthickness)
```

```
## 
##  Welch Two Sample t-test
## 
## data:  split_data[["22.0"]]$Placentalthickness and split_data[["22.1"]]$Placentalthickness
## t = -0.83184, df = 71.819, p-value = 0.4083
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3323778  0.1366635
## sample estimates:
## mean of x mean of y 
##  1.827143  1.925000
```

```
t.test(split_data[["22.0"]]$Fetalweight, split_data[["22.1"]]$Fetalweight)
```

```
## 
##  Welch Two Sample t-test
## 
## data:  split_data[["22.0"]]$Fetalweight and split_data[["22.1"]]$Fetalweight
## t = -0.87803, df = 60.426, p-value = 0.3834
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -89.28593  34.80736
## sample estimates:
## mean of x mean of y 
##  470.0457  497.2850
```

23 semanas

```r
t.test(split_data[["23.0"]]$Diameter1, split_data[["23.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["23.0"]]$Diameter1 and split_data[["23.1"]]$Diameter1
## t = 0.53132, df = 48.574, p-value = 0.5976
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.8958028  1.5395616
## sample estimates:
## mean of x mean of y
##  12.88710  12.56522
```

```r
t.test(split_data[["23.0"]]$Diameter2, split_data[["23.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["23.0"]]$Diameter2 and split_data[["23.1"]]$Diameter2
## t = 0.56078, df = 55.501, p-value = 0.5772
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.7280393  1.2939579
## sample estimates:
## mean of x mean of y
##  10.96774  10.68478
```

```r
t.test(split_data[["23.0"]]$Placentalweight, split_data[["23.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["23.0"]]$Placentalweight and split_data[["23.1"]]$Placentalweight
## t = 0.84984, df = 59.777, p-value = 0.3988
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.98108  29.67954
## sample estimates:
## mean of x mean of y
##  176.8710  168.0217
```

```r
t.test(split_data[["23.0"]]$Placentalthickness, split_data[["23.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["23.0"]]$Placentalthickness and split_data[["23.1"]]$Placentalthickness
```

```
## t = 0.77434, df = 72.055, p-value = 0.4413
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1280701  0.2907630
## sample estimates:
## mean of x mean of y
##  2.016129  1.934783
```

```r
t.test(split_data[["23.0"]]$Fetalweight, split_data[["23.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["23.0"]]$Fetalweight and split_data[["23.1"]]$Fetalweight
## t = -1.2012, df = 67.159, p-value = 0.2339
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -76.75543  19.07913
## sample estimates:
## mean of x mean of y
##  538.4097  567.2478
```

24 semanas

```r
t.test(split_data[["24.0"]]$Diameter1, split_data[["24.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["24.0"]]$Diameter1 and split_data[["24.1"]]$Diameter1
## t = 0.49225, df = 64.938, p-value = 0.6242
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.8546921  1.4138137
## sample estimates:
## mean of x mean of y
##  12.96875  12.68919
```

```r
t.test(split_data[["24.0"]]$Diameter2, split_data[["24.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["24.0"]]$Diameter2 and split_data[["24.1"]]$Diameter2
## t = 0.41952, df = 63.73, p-value = 0.6762
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.8325493  1.2751169
## sample estimates:
## mean of x mean of y
##  10.93750  10.71622
```

```r
t.test(split_data[["24.0"]]$Placentalweight, split_data[["24.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["24.0"]]$Placentalweight and split_data[["24.1"]]$Placentalweight
## t = 0.28171, df = 60.575, p-value = 0.7791
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -23.65510  31.41186
## sample estimates:
## mean of x mean of y
##  171.0000  167.1216
```

```r
t.test(split_data[["24.0"]]$Placentalthickness, split_data[["24.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["24.0"]]$Placentalthickness and split_data[["24.1"]]$Placentalthickness
## t = 0.21292, df = 66.324, p-value = 0.832
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.2376996  0.2944564
## sample estimates:
## mean of x mean of y
##  1.950000  1.921622
```

```r
t.test(split_data[["24.0"]]$Fetalweight, split_data[["24.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["24.0"]]$Fetalweight and split_data[["24.1"]]$Fetalweight
## t = -1.2688, df = 54.1, p-value = 0.21
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -115.88671   26.05563
## sample estimates:
## mean of x mean of y
##  611.6250  656.5405
```

25 semanas

```r
t.test(split_data[["25.0"]]$Diameter1, split_data[["25.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["25.0"]]$Diameter1 and split_data[["25.1"]]$Diameter1
## t = -2.0598, df = 33.111, p-value = 0.04735
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.99952942 -0.01871619
## sample estimates:
## mean of x mean of y
##  11.68421  13.19333
```

```r
t.test(split_data[["25.0"]]$Diameter2, split_data[["25.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["25.0"]]$Diameter2 and split_data[["25.1"]]$Diameter2
## t = -1.3193, df = 29.198, p-value = 0.1973
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.404417  0.518452
## sample estimates:
## mean of x mean of y
##  9.973684 10.916667
```

```r
t.test(split_data[["25.0"]]$Placentalweight, split_data[["25.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["25.0"]]$Placentalweight and split_data[["25.1"]]$Placentalweight
## t = -0.82315, df = 25.863, p-value = 0.418
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -66.44609  28.45310
## sample estimates:
## mean of x mean of y
##  168.9368  187.9333
```

```r
t.test(split_data[["25.0"]]$Placentalthickness, split_data[["25.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["25.0"]]$Placentalthickness and split_data[["25.1"]]$Placentalthickness
## t = -0.12213, df = 36.33, p-value = 0.9035
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3535682  0.3133927
## sample estimates:
## mean of x mean of y
##  2.031579  2.051667
```

```r
t.test(split_data[["25.0"]]$Fetalweight, split_data[["25.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["25.0"]]$Fetalweight and split_data[["25.1"]]$Fetalweight
## t = -0.69105, df = 22.65, p-value = 0.4966
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -316.8726  158.2796
## sample estimates:
## mean of x mean of y
##  625.3368  704.6333
```

26 semanas

```r
t.test(split_data[["26.0"]]$Diameter1, split_data[["26.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["26.0"]]$Diameter1 and split_data[["26.1"]]$Diameter1
## t = -0.96344, df = 21.338, p-value = 0.3461
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.291834  1.206050
## sample estimates:
## mean of x mean of y
##  12.60417  13.64706
```

```r
t.test(split_data[["26.0"]]$Diameter2, split_data[["26.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["26.0"]]$Diameter2 and split_data[["26.1"]]$Diameter2
## t = -0.82392, df = 32.733, p-value = 0.4159
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.2198289  0.9404171
## sample estimates:
## mean of x mean of y
##  10.62500  11.26471
```

```r
t.test(split_data[["26.0"]]$Placentalweight, split_data[["26.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["26.0"]]$Placentalweight and split_data[["26.1"]]$Placentalweight
## t = -1.3477, df = 29.704, p-value = 0.1879
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -80.29670  16.46827
## sample estimates:
## mean of x mean of y
##  177.7917  209.7059
```

```
t.test(split_data[["26.0"]]$Placentalthickness, split_data[["26.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["26.0"]]$Placentalthickness and split_data[["26.1"]]$Placentalthickness
## t = -0.78543, df = 29.255, p-value = 0.4385
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.5819505  0.2589112
## sample estimates:
## mean of x mean of y
##  2.120833  2.282353
```

```
t.test(split_data[["26.0"]]$Fetalweight, split_data[["26.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["26.0"]]$Fetalweight and split_data[["26.1"]]$Fetalweight
## t = -0.34781, df = 29.348, p-value = 0.7305
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -238.1748  168.9101
## sample estimates:
## mean of x mean of y
##  697.2500  731.8824
```

27 semanas

```
t.test(split_data[["27.0"]]$Diameter1, split_data[["27.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["27.0"]]$Diameter1 and split_data[["27.1"]]$Diameter1
## t = 0.28651, df = 32.843, p-value = 0.7763
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.655232  2.197715
## sample estimates:
## mean of x mean of y
##  14.88235  14.61111
```

```r
t.test(split_data[["27.0"]]$Diameter2, split_data[["27.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["27.0"]]$Diameter2 and split_data[["27.1"]]$Diameter2
## t = -0.15423, df = 32.906, p-value = 0.8784
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.878522  1.613816
## sample estimates:
## mean of x mean of y
##  12.61765  12.75000
```

```r
t.test(split_data[["27.0"]]$Placentalweight, split_data[["27.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["27.0"]]$Placentalweight and split_data[["27.1"]]$Placentalweight
## t = 1.7591, df = 28.144, p-value = 0.08943
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -7.043526 92.847448
## sample estimates:
## mean of x mean of y
##  236.2353  193.3333
```

```r
t.test(split_data[["27.0"]]$Placentalthickness, split_data[["27.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["27.0"]]$Placentalthickness and split_data[["27.1"]]$Placentalthickness
## t = 2.0223, df = 25.42, p-value = 0.05379
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.007647049  0.877581689
## sample estimates:
## mean of x mean of y
##  2.329412  1.894444
```

```r
t.test(split_data[["27.0"]]$Fetalweight, split_data[["27.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["27.0"]]$Fetalweight and split_data[["27.1"]]$Fetalweight
## t = -0.2223, df = 31.764, p-value = 0.8255
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
```

```
##  -138.7274  111.4346
## sample estimates:
## mean of x mean of y
##  892.7647  906.4111
```

28 semanas

```r
t.test(split_data[["28.0"]]$Diameter1, split_data[["28.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["28.0"]]$Diameter1 and split_data[["28.1"]]$Diameter1
## t = -0.24175, df = 38.6, p-value = 0.8103
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.805634  1.420217
## sample estimates:
## mean of x mean of y
##  13.76562  13.95833
```

```r
t.test(split_data[["28.0"]]$Diameter2, split_data[["28.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["28.0"]]$Diameter2 and split_data[["28.1"]]$Diameter2
## t = 0.64492, df = 50.786, p-value = 0.5219
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9135409  1.7781242
## sample estimates:
## mean of x mean of y
##  11.70312  11.27083
```

```r
t.test(split_data[["28.0"]]$Placentalweight, split_data[["28.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["28.0"]]$Placentalweight and split_data[["28.1"]]$Placentalweight
## t = -0.45088, df = 49.971, p-value = 0.654
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -47.04764  29.79764
## sample estimates:
## mean of x mean of y
##   201.125   209.750
```

```r
t.test(split_data[["28.0"]]$Placentalthickness, split_data[["28.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["28.0"]]$Placentalthickness and split_data[["28.1"]]$Placentalthickness
## t = -0.36083, df = 51.937, p-value = 0.7197
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3759075  0.2613241
## sample estimates:
## mean of x mean of y
##  2.234375  2.291667
```

```r
t.test(split_data[["28.0"]]$Fetalweight, split_data[["28.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["28.0"]]$Fetalweight and split_data[["28.1"]]$Fetalweight
## t = -0.53532, df = 38.955, p-value = 0.5955
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -200.0037  116.2954
## sample estimates:
## mean of x mean of y
##  906.8125  948.6667
```

29 semanas

```r
t.test(split_data[["29.0"]]$Diameter1, split_data[["29.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["29.0"]]$Diameter1 and split_data[["29.1"]]$Diameter1
## t = -0.21508, df = 35.488, p-value = 0.8309
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.623957  1.312683
## sample estimates:
## mean of x mean of y
##  14.02083  14.17647
```

```r
t.test(split_data[["29.0"]]$Diameter2, split_data[["29.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["29.0"]]$Diameter2 and split_data[["29.1"]]$Diameter2
## t = 0.45671, df = 32.444, p-value = 0.6509
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.136431  1.793784
## sample estimates:
## mean of x mean of y
##  12.38750  12.05882
```

```r
t.test(split_data[["29.0"]]$Placentalweight, split_data[["29.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["29.0"]]$Placentalweight and split_data[["29.1"]]$Placentalweight
## t = -0.62325, df = 38.864, p-value = 0.5368
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -69.33682  36.67505
## sample estimates:
## mean of x mean of y
##  243.3750  259.7059
```

```r
t.test(split_data[["29.0"]]$Placentalthickness, split_data[["29.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["29.0"]]$Placentalthickness and split_data[["29.1"]]$Placentalthickness
## t = 0.096657, df = 35.55, p-value = 0.9235
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3870923  0.4258178
## sample estimates:
## mean of x mean of y
##  2.295833  2.276471
```

```r
t.test(split_data[["29.0"]]$Fetalweight, split_data[["29.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["29.0"]]$Fetalweight and split_data[["29.1"]]$Fetalweight
## t = -1.0503, df = 32.319, p-value = 0.3014
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -399.2886  127.5435
## sample estimates:
## mean of x mean of y
##  1115.833  1251.706
```

30 semanas

```
t.test(split_data[["30.0"]]$Diameter1, split_data[["30.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["30.0"]]$Diameter1 and split_data[["30.1"]]$Diameter1
## t = -0.91351, df = 32.048, p-value = 0.3678
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.4654960  0.9387103
## sample estimates:
## mean of x mean of y
##  14.09375  14.85714
```

```
t.test(split_data[["30.0"]]$Diameter2, split_data[["30.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["30.0"]]$Diameter2 and split_data[["30.1"]]$Diameter2
## t = -1.4061, df = 30.817, p-value = 0.1697
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.8294314  0.5205029
## sample estimates:
## mean of x mean of y
##  11.78125  12.93571
```

```
t.test(split_data[["30.0"]]$Placentalweight, split_data[["30.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["30.0"]]$Placentalweight and split_data[["30.1"]]$Placentalweight
## t = -0.51884, df = 31.774, p-value = 0.6075
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -63.49677  37.72177
## sample estimates:
## mean of x mean of y
##  240.8125  253.7000
```

```
t.test(split_data[["30.0"]]$Placentalthickness, split_data[["30.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["30.0"]]$Placentalthickness and split_data[["30.1"]]$Placentalthickness
```

```
## t = 1.0353, df = 37.319, p-value = 0.3072
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1323779  0.4091636
## sample estimates:
## mean of x mean of y
##  2.243750  2.105357
```

```r
t.test(split_data[["30.0"]]$Fetalweight, split_data[["30.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["30.0"]]$Fetalweight and split_data[["30.1"]]$Fetalweight
## t = -0.9583, df = 31.723, p-value = 0.3452
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -331.8611  119.5575
## sample estimates:
## mean of x mean of y
##  1185.062  1291.214
```

31 semanas

```r
t.test(split_data[["31.0"]]$Diameter1, split_data[["31.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["31.0"]]$Diameter1 and split_data[["31.1"]]$Diameter1
## t = -1.3467, df = 41.231, p-value = 0.1854
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.5622647  0.7117384
## sample estimates:
## mean of x mean of y
##  14.89474  16.32000
```

```r
t.test(split_data[["31.0"]]$Diameter2, split_data[["31.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["31.0"]]$Diameter2 and split_data[["31.1"]]$Diameter2
## t = 0.19351, df = 41.802, p-value = 0.8475
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.776875  2.153717
## sample estimates:
## mean of x mean of y
##  13.36842  13.18000
```

```r
t.test(split_data[["31.0"]]$Placentalweight, split_data[["31.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["31.0"]]$Placentalweight and split_data[["31.1"]]$Placentalweight
## t = 0.31675, df = 33.961, p-value = 0.7534
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -52.53171  71.92961
## sample estimates:
## mean of x mean of y
##  285.5789  275.8800
```

```r
t.test(split_data[["31.0"]]$Placentalthickness, split_data[["31.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["31.0"]]$Placentalthickness and split_data[["31.1"]]$Placentalthickness
## t = -0.69904, df = 36.407, p-value = 0.489
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.5484810  0.2672178
## sample estimates:
## mean of x mean of y
##  2.347368  2.488000
```

```r
t.test(split_data[["31.0"]]$Fetalweight, split_data[["31.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["31.0"]]$Fetalweight and split_data[["31.1"]]$Fetalweight
## t = -0.14909, df = 30.916, p-value = 0.8825
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -247.4168  213.7115
## sample estimates:
## mean of x mean of y
##  1463.947  1480.800
```

32 semanas

```r
t.test(split_data[["32.0"]]$Diameter1, split_data[["32.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["32.0"]]$Diameter1 and split_data[["32.1"]]$Diameter1
## t = -0.2902, df = 60.45, p-value = 0.7727
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.375818  1.773713
## sample estimates:
## mean of x mean of y
##  16.62000  16.92105
```

```
t.test(split_data[["32.0"]]$Diameter2, split_data[["32.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["32.0"]]$Diameter2 and split_data[["32.1"]]$Diameter2
## t = -0.47258, df = 52.435, p-value = 0.6385
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.100887  1.299835
## sample estimates:
## mean of x mean of y
##  14.06000  14.46053
```

```
t.test(split_data[["32.0"]]$Placentalweight, split_data[["32.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["32.0"]]$Placentalweight and split_data[["32.1"]]$Placentalweight
## t = 0.26727, df = 40.746, p-value = 0.7906
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -41.04461  53.56250
## sample estimates:
## mean of x mean of y
##  312.6800  306.4211
```

```
t.test(split_data[["32.0"]]$Placentalthickness, split_data[["32.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["32.0"]]$Placentalthickness and split_data[["32.1"]]$Placentalthickness
## t = -0.58722, df = 47.803, p-value = 0.5598
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.4680510  0.2564721
## sample estimates:
## mean of x mean of y
##  2.260000  2.365789
```

```r
t.test(split_data[["32.0"]]$Fetalweight, split_data[["32.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["32.0"]]$Fetalweight and split_data[["32.1"]]$Fetalweight
## t = 0.62015, df = 42.042, p-value = 0.5385
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -162.9703  307.5703
## sample estimates:
## mean of x mean of y
##    1771.8    1699.5
```

33 semanas

```r
t.test(split_data[["33.0"]]$Diameter1, split_data[["33.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["33.0"]]$Diameter1 and split_data[["33.1"]]$Diameter1
## t = 0.44409, df = 52.991, p-value = 0.6588
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.423932  2.233780
## sample estimates:
## mean of x mean of y
##  16.39583  15.99091
```

```r
t.test(split_data[["33.0"]]$Diameter2, split_data[["33.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["33.0"]]$Diameter2 and split_data[["33.1"]]$Diameter2
## t = -0.67728, df = 50.917, p-value = 0.5013
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.9265841  0.9546144
## sample estimates:
## mean of x mean of y
##  13.56250  14.04848
```

```r
t.test(split_data[["33.0"]]$Placentalweight, split_data[["33.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["33.0"]]$Placentalweight and split_data[["33.1"]]$Placentalweight
## t = 0.016308, df = 47.955, p-value = 0.9871
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -46.32272  47.08030
## sample estimates:
## mean of x mean of y
##  329.1667  328.7879
```

```
t.test(split_data[["33.0"]]$Placentalthickness, split_data[["33.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["33.0"]]$Placentalthickness and split_data[["33.1"]]$Placentalthickness
## t = -0.069836, df = 54.97, p-value = 0.9446
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3487107  0.3252258
## sample estimates:
## mean of x mean of y
##  2.512500  2.524242
```

```
t.test(split_data[["33.0"]]$Fetalweight, split_data[["33.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["33.0"]]$Fetalweight and split_data[["33.1"]]$Fetalweight
## t = 0.96069, df = 47.76, p-value = 0.3415
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -118.1259  334.2395
## sample estimates:
## mean of x mean of y
##  1973.875  1865.818
```

34 semanas

```
t.test(split_data[["34.0"]]$Diameter1, split_data[["34.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["34.0"]]$Diameter1 and split_data[["34.1"]]$Diameter1
## t = -0.92558, df = 42.62, p-value = 0.3599
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.911176  1.079910
## sample estimates:
## mean of x mean of y
##  16.66129  17.57692
```

```r
t.test(split_data[["34.0"]]$Diameter2, split_data[["34.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["34.0"]]$Diameter2 and split_data[["34.1"]]$Diameter2
## t = -0.050975, df = 52.853, p-value = 0.9595
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.902364  1.808071
## sample estimates:
## mean of x mean of y
##  15.14516  15.19231
```

```r
t.test(split_data[["34.0"]]$Placentalweight, split_data[["34.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["34.0"]]$Placentalweight and split_data[["34.1"]]$Placentalweight
## t = 0.69908, df = 43.906, p-value = 0.4882
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -29.15937  60.12959
## sample estimates:
## mean of x mean of y
##  352.6774  337.1923
```

```r
t.test(split_data[["34.0"]]$Placentalthickness, split_data[["34.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["34.0"]]$Placentalthickness and split_data[["34.1"]]$Placentalthickness
## t = 1.2472, df = 51.568, p-value = 0.218
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1224507  0.5244358
## sample estimates:
## mean of x mean of y
##  2.554839  2.353846
```

```r
t.test(split_data[["34.0"]]$Fetalweight, split_data[["34.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["34.0"]]$Fetalweight and split_data[["34.1"]]$Fetalweight
## t = -0.97972, df = 50.679, p-value = 0.3319
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
```

```
##  -362.5857  124.7817
## sample estimates:
## mean of x mean of y
##  2092.290  2211.192
```

35 semanas

```r
t.test(split_data[["35.0"]]$Diameter1, split_data[["35.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["35.0"]]$Diameter1 and split_data[["35.1"]]$Diameter1
## t = 0.077725, df = 54.641, p-value = 0.9383
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.136866  2.309280
## sample estimates:
## mean of x mean of y
##  18.39655  18.31034
```

```r
t.test(split_data[["35.0"]]$Diameter2, split_data[["35.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["35.0"]]$Diameter2 and split_data[["35.1"]]$Diameter2
## t = 1.0098, df = 55.824, p-value = 0.3169
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.7294423  2.2122009
## sample estimates:
## mean of x mean of y
##  15.82759  15.08621
```

```r
t.test(split_data[["35.0"]]$Placentalweight, split_data[["35.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["35.0"]]$Placentalweight and split_data[["35.1"]]$Placentalweight
## t = 0.40784, df = 55.476, p-value = 0.685
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -42.69060  64.51129
## sample estimates:
## mean of x mean of y
##  371.0345  360.1241
```

```r
t.test(split_data[["35.0"]]$Placentalthickness, split_data[["35.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["35.0"]]$Placentalthickness and split_data[["35.1"]]$Placentalthickness
## t = -0.23528, df = 55.989, p-value = 0.8149
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3608904  0.2850283
## sample estimates:
## mean of x mean of y
##  2.472414  2.510345
```

```r
t.test(split_data[["35.0"]]$Fetalweight, split_data[["35.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["35.0"]]$Fetalweight and split_data[["35.1"]]$Fetalweight
## t = -0.68002, df = 54.003, p-value = 0.4994
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -342.1384  168.8280
## sample estimates:
## mean of x mean of y
##  2244.345  2331.000
```

36 semanas

```r
t.test(split_data[["36.0"]]$Diameter1, split_data[["36.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["36.0"]]$Diameter1 and split_data[["36.1"]]$Diameter1
## t = -1.6609, df = 47.68, p-value = 0.1033
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.1256404  0.2026622
## sample estimates:
## mean of x mean of y
##  16.52632  17.48780
```

```r
t.test(split_data[["36.0"]]$Diameter2, split_data[["36.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["36.0"]]$Diameter2 and split_data[["36.1"]]$Diameter2
## t = -1.1565, df = 48.364, p-value = 0.2531
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -2.1124904  0.5694866
## sample estimates:
## mean of x mean of y
##  14.78947  15.56098
```

```
t.test(split_data[["36.0"]]$Placentalweight, split_data[["36.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["36.0"]]$Placentalweight and split_data[["36.1"]]$Placentalweight
## t = 1.0201, df = 39.19, p-value = 0.3139
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -21.97348  66.70006
## sample estimates:
## mean of x mean of y
##  383.6316  361.2683
```

```
t.test(split_data[["36.0"]]$Placentalthickness, split_data[["36.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["36.0"]]$Placentalthickness and split_data[["36.1"]]$Placentalthickness
## t = 1.8999, df = 40.57, p-value = 0.06458
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.01547338  0.50404848
## sample estimates:
## mean of x mean of y
##  2.605263  2.360976
```

```
t.test(split_data[["36.0"]]$Fetalweight, split_data[["36.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["36.0"]]$Fetalweight and split_data[["36.1"]]$Fetalweight
## t = -0.70958, df = 31.232, p-value = 0.4832
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -366.7727  177.3915
## sample estimates:
## mean of x mean of y
##  2466.895  2561.585
```

37 semanas

```r
t.test(split_data[["37.0"]]$Diameter1, split_data[["37.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["37.0"]]$Diameter1 and split_data[["37.1"]]$Diameter1
## t = 1.2135, df = 43.531, p-value = 0.2315
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.6557054  2.6389582
## sample estimates:
## mean of x mean of y
##  19.04815  18.05652
```

```r
t.test(split_data[["37.0"]]$Diameter2, split_data[["37.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["37.0"]]$Diameter2 and split_data[["37.1"]]$Diameter2
## t = 0.23924, df = 46.653, p-value = 0.812
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9701694  1.2320052
## sample estimates:
## mean of x mean of y
##  15.22222  15.09130
```

```r
t.test(split_data[["37.0"]]$Placentalweight, split_data[["37.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["37.0"]]$Placentalweight and split_data[["37.1"]]$Placentalweight
## t = -0.20535, df = 45.072, p-value = 0.8382
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -56.82397  46.30835
## sample estimates:
## mean of x mean of y
##  383.4074  388.6652
```

```r
t.test(split_data[["37.0"]]$Placentalthickness, split_data[["37.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["37.0"]]$Placentalthickness and split_data[["37.1"]]$Placentalthickness
```

```
## t = -0.94483, df = 44.53, p-value = 0.3498
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.6229365  0.2251910
## sample estimates:
## mean of x mean of y
##  2.418519  2.617391
```

```
t.test(split_data[["37.0"]]$Fetalweight, split_data[["37.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["37.0"]]$Fetalweight and split_data[["37.1"]]$Fetalweight
## t = -1.6743, df = 38.83, p-value = 0.1021
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -528.85145   49.87883
## sample estimates:
## mean of x mean of y
##  2533.296  2772.783
```

38 semanas

```
t.test(split_data[["38.0"]]$Diameter1, split_data[["38.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["38.0"]]$Diameter1 and split_data[["38.1"]]$Diameter1
## t = 0.95056, df = 45.91, p-value = 0.3468
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9672402  2.6980094
## sample estimates:
## mean of x mean of y
##  18.61538  17.75000
```

```
t.test(split_data[["38.0"]]$Diameter2, split_data[["38.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["38.0"]]$Diameter2 and split_data[["38.1"]]$Diameter2
## t = 0.65029, df = 45.913, p-value = 0.5187
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9451982  1.8472961
## sample estimates:
## mean of x mean of y
##  16.01923  15.56818
```

```r
t.test(split_data[["38.0"]]$Placentalweight, split_data[["38.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["38.0"]]$Placentalweight and split_data[["38.1"]]$Placentalweight
## t = -0.45655, df = 39.576, p-value = 0.6505
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -88.53084  55.91266
## sample estimates:
## mean of x mean of y
##  425.6000  441.9091
```

```r
t.test(split_data[["38.0"]]$Placentalthickness, split_data[["38.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["38.0"]]$Placentalthickness and split_data[["38.1"]]$Placentalthickness
## t = -0.45707, df = 44.498, p-value = 0.6498
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.4821739  0.3038522
## sample estimates:
## mean of x mean of y
##  2.565385  2.654545
```

```r
t.test(split_data[["38.0"]]$Fetalweight, split_data[["38.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["38.0"]]$Fetalweight and split_data[["38.1"]]$Fetalweight
## t = 0.088906, df = 39.151, p-value = 0.9296
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -307.5910  335.8777
## sample estimates:
## mean of x mean of y
##  2845.462  2831.318
```

39 semanas

```r
t.test(split_data[["39.0"]]$Diameter1, split_data[["39.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["39.0"]]$Diameter1 and split_data[["39.1"]]$Diameter1
## t = -2.1265, df = 36.22, p-value = 0.04034
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.5944826 -0.0855174
## sample estimates:
## mean of x mean of y
##     18.16     20.00
```

```r
t.test(split_data[["39.0"]]$Diameter2, split_data[["39.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["39.0"]]$Diameter2 and split_data[["39.1"]]$Diameter2
## t = -2.9704, df = 31.119, p-value = 0.005688
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.5320339 -0.6565375
## sample estimates:
## mean of x mean of y
##  15.12000  17.21429
```

```r
t.test(split_data[["39.0"]]$Placentalweight, split_data[["39.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["39.0"]]$Placentalweight and split_data[["39.1"]]$Placentalweight
## t = -0.6427, df = 43.882, p-value = 0.5238
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -95.90865  49.53151
## sample estimates:
## mean of x mean of y
##  457.2400  480.4286
```

```r
t.test(split_data[["39.0"]]$Placentalthickness, split_data[["39.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["39.0"]]$Placentalthickness and split_data[["39.1"]]$Placentalthickness
## t = 1.2156, df = 36.287, p-value = 0.232
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1419133  0.5668657
## sample estimates:
## mean of x mean of y
##  2.672000  2.459524
```

```r
t.test(split_data[["39.0"]]$Fetalweight, split_data[["39.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["39.0"]]$Fetalweight and split_data[["39.1"]]$Fetalweight
## t = -1.2938, df = 43.906, p-value = 0.2025
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -534.3275  116.5180
## sample estimates:
## mean of x mean of y
##  2908.000  3116.905
```

40 semanas

```r
t.test(split_data[["40.0"]]$Diameter1, split_data[["40.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["40.0"]]$Diameter1 and split_data[["40.1"]]$Diameter1
## t = 1.0295, df = 52.408, p-value = 0.308
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.6666686  2.0719716
## sample estimates:
## mean of x mean of y
##  18.85417  18.15152
```

```r
t.test(split_data[["40.0"]]$Diameter2, split_data[["40.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["40.0"]]$Diameter2 and split_data[["40.1"]]$Diameter2
## t = 0.21955, df = 53.846, p-value = 0.827
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.9549141  1.1897626
## sample estimates:
## mean of x mean of y
##  16.37500  16.25758
```

```r
t.test(split_data[["40.0"]]$Placentalweight, split_data[["40.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  split_data[["40.0"]]$Placentalweight and split_data[["40.1"]]$Placentalweight
## t = -0.15524, df = 42.016, p-value = 0.8774
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -54.22103  46.47481
## sample estimates:
## mean of x mean of y
##  471.8542  475.7273
```

```r
t.test(split_data[["40.0"]]$Placentalthickness, split_data[["40.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["40.0"]]$Placentalthickness and split_data[["40.1"]]$Placentalthickness
## t = -1.3893, df = 47.276, p-value = 0.1712
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.6267839  0.1146627
## sample estimates:
## mean of x mean of y
##  2.500000  2.756061
```

```r
t.test(split_data[["40.0"]]$Fetalweight, split_data[["40.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["40.0"]]$Fetalweight and split_data[["40.1"]]$Fetalweight
## t = -2.3734, df = 39.651, p-value = 0.02256
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -525.12828  -42.03082
## sample estimates:
## mean of x mean of y
##  3106.875  3390.455
```

41 semanas

```r
t.test(split_data[["41.0"]]$Diameter1, split_data[["41.1"]]$Diameter1)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["41.0"]]$Diameter1 and split_data[["41.1"]]$Diameter1
## t = 0.27839, df = 41.624, p-value = 0.7821
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.614397  2.130919
## sample estimates:
## mean of x mean of y
##  18.78000  18.52174
```

```r
t.test(split_data[["41.0"]]$Diameter2, split_data[["41.1"]]$Diameter2)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["41.0"]]$Diameter2 and split_data[["41.1"]]$Diameter2
## t = -0.21009, df = 44.289, p-value = 0.8346
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.620907  1.314820
## sample estimates:
## mean of x mean of y
##  16.16000  16.31304
```

```r
t.test(split_data[["41.0"]]$Placentalweight, split_data[["41.1"]]$Placentalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["41.0"]]$Placentalweight and split_data[["41.1"]]$Placentalweight
## t = -0.19599, df = 45.84, p-value = 0.8455
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -67.64838  55.64490
## sample estimates:
## mean of x mean of y
##  467.5200  473.5217
```

```r
t.test(split_data[["41.0"]]$Placentalthickness, split_data[["41.1"]]$Placentalthickness)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["41.0"]]$Placentalthickness and split_data[["41.1"]]$Placentalthickness
## t = 0.0079561, df = 42.414, p-value = 0.9937
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.3733753  0.3763318
## sample estimates:
## mean of x mean of y
##  2.608000  2.606522
```

```r
t.test(split_data[["41.0"]]$Fetalweight, split_data[["41.1"]]$Fetalweight)
```

```
##
##  Welch Two Sample t-test
##
## data:  split_data[["41.0"]]$Fetalweight and split_data[["41.1"]]$Fetalweight
## t = -0.23794, df = 45.501, p-value = 0.813
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
```

```
## -318.7467 251.3728
## sample estimates:
## mean of x mean of y
## 3282.400 3316.087
```

Análise geral

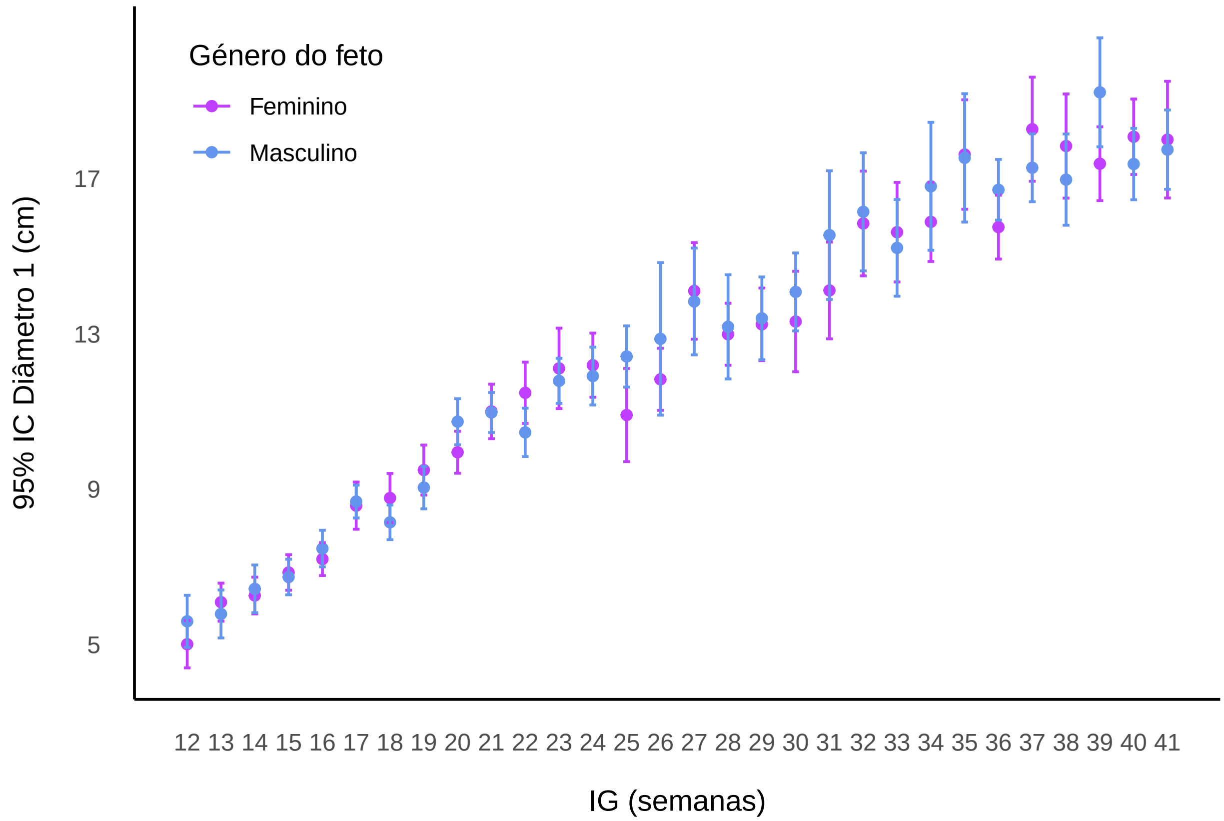
Os resultados obtidos apresentam diferentes graus de significância. Em certas IG e variáveis, foram constatadas diferenças estatisticamente significativas entre os géneros feminino e masculino. Por exemplo, para o D1, observou-se uma diferença estatisticamente significativa na semana 39 (valor-p = 0,04). Já para o D2, verificaram-se tais diferenças nas semanas 12 (valor-p = 0,009), 14 (valor-p = 0,03) e 39 (valor-p = 0,006). A EP apresentou diferenças estatisticamente significativas nas semanas 14 (valor-p = 0,02), 20 (valor-p = 0,04) e 40 (valor-p = 0,02). Por fim, o PF revelou diferenças significativas nas semanas 16 (valor-p = 0,009) e 40 (valor-p = 0,002). Importante mencionar que o PP não apresentou diferenças significativas em nenhuma IG.

Gráficos dos sexos separados em cada idade gestacional

Gráfico da média e respectivos intervalos de confiança de 95% do peso placentário de acordo com o sexo fetal para cada IG. Representação visual dos testes de significância.

```r
# Retirar os géneros 2 e 9, só incluir o 0 e 1
placental_data_filtered <- data %>%
  filter(Fetalgender %in% c(0, 1))

# Calcular a média e o erro padrão da média (SEM) para o diametro1 para cada combinação de GA e Fetalge
mean_sem_data <- placental_data_filtered %>%
  group_by(GA, Fetalgender) %>%
  summarize(mean_Diameter1 = mean(Diameter1),
            sem_Diameter1 = sd(Diameter1) / sqrt(n()))



#Gráfico
plot <- ggplot(mean_sem_data, aes(x = GA, y = mean_Diameter1, color = factor(Fetalgender))) +
  geom_point() +
  geom_errorbar(aes(ymin = mean_Diameter1 - 1.96*sem_Diameter1, ymax = mean_Diameter1 + 1.96*sem_Diamete
  labs(x = "IG (semanas)", y = "95% IC Diâmetro 1 (cm)", color = "Género do feto") +
  theme_minimal() +
  theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left"
  ) +
  scale_color_manual(values = c("0" = "darkorchid1", "1" = "cornflowerblue"),
                     breaks = c("0", "1"),
                     labels = c("Feminino", "Masculino")) +
```

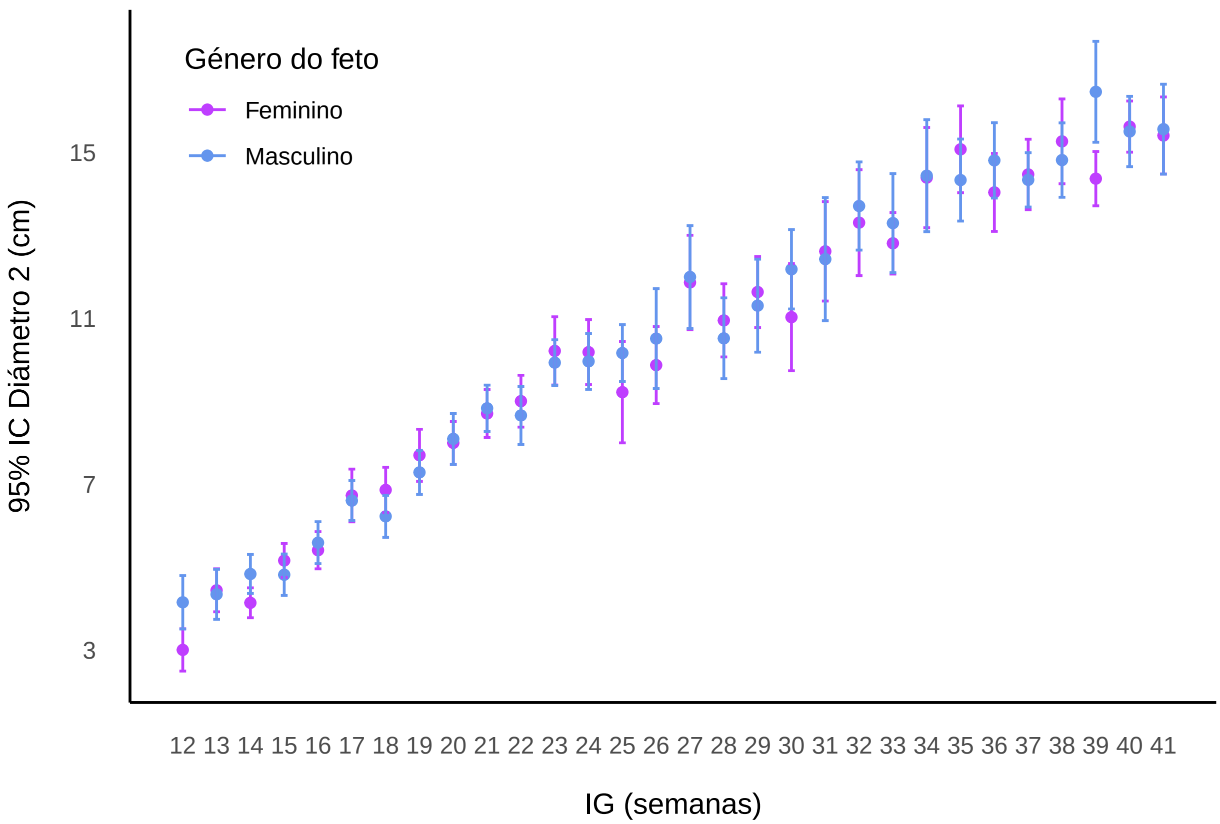
```r
  scale_x_continuous(breaks = seq(min(mean_sem_data$GA), max(mean_sem_data$GA), by = 1)) +
  scale_y_continuous(
    breaks = seq(min(mean_sem_data$mean_Diameter1), max(mean_sem_data$mean_Diameter1), by = 4),
    labels = function(x) as.integer(x))

plot
```




```r
ggsave("gender_D1.pdf", plot, dpi = 1200)
```

```r
# Calcular a média e o erro padrão da média (SEM) para o diametro2 para cada combinação de GA e Fetalge
mean_sem_data2 <- placental_data_filtered %>%
  group_by(GA, Fetalgender) %>%
  summarize(mean_Diameter2 = mean(Diameter2),
            sem_Diameter2 = sd(Diameter2) / sqrt(n()))



#Gráfico
plot <- ggplot(mean_sem_data2, aes(x = GA, y = mean_Diameter2, color = factor(Fetalgender))) +
  geom_point() +
  geom_errorbar(aes(ymin = mean_Diameter2 - 1.96*sem_Diameter2, ymax = mean_Diameter2 + 1.96*sem_Diamet
  labs(x = "IG (semanas)", y = "95% IC Diámetro 2 (cm)", color = "Género do feto") +
  theme_minimal() +
  theme(
    panel.grid = element_blank(),
```

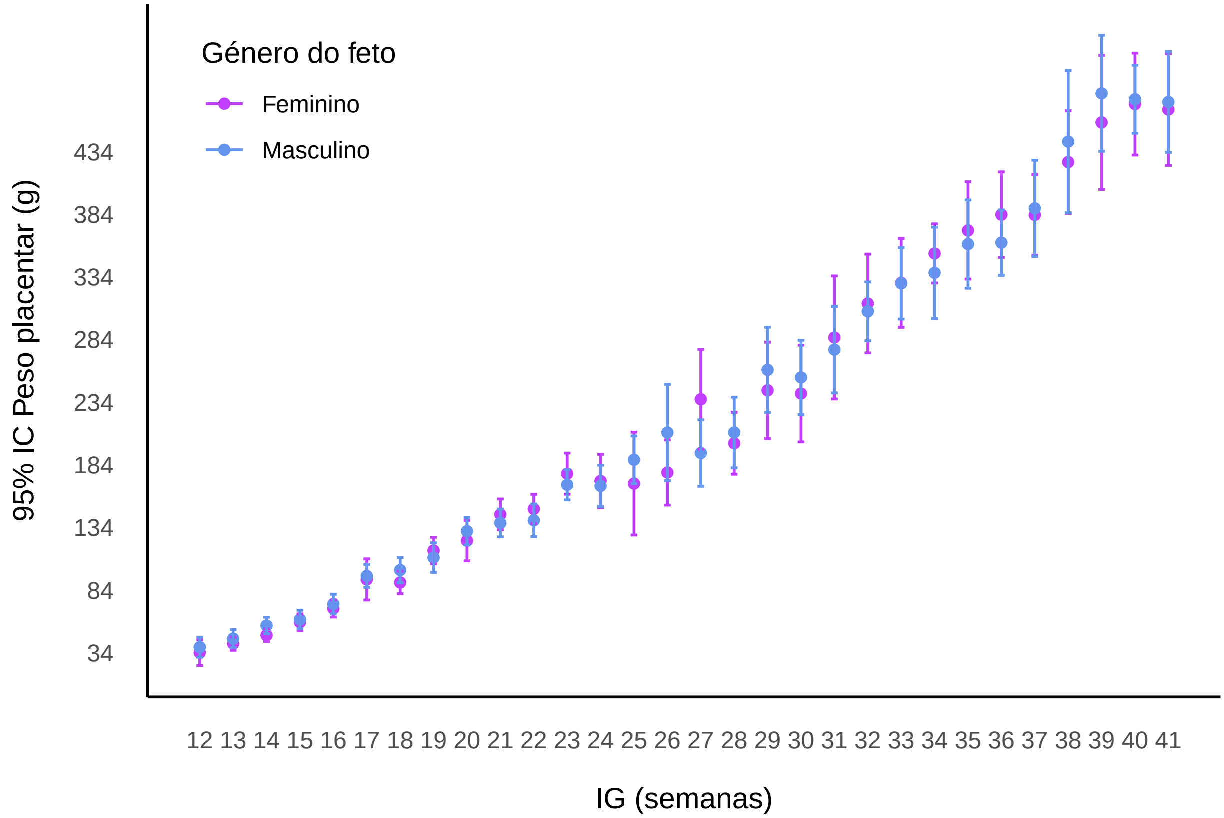
```
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left"
  ) +
  scale_color_manual(values = c("0" = "darkorchid1", "1" = "cornflowerblue"),
                     breaks = c("0", "1"),
                     labels = c("Feminino", "Masculino")) +
  scale_x_continuous(breaks = seq(min(mean_sem_data2$GA), max(mean_sem_data2$GA), by = 1)) +
  scale_y_continuous(
    breaks = seq(min(mean_sem_data2$mean_Diameter2), max(mean_sem_data2$mean_Diameter2), by = 4),
    labels = function(x) as.integer(x))

plot
```




```
ggsave("gender_D2.pdf", plot, dpi = 1200)
```

```
# Calcular a média e o erro padrão da média (SEM) para o placentalweight para cada combinação de GA e F
mean_sem_data3 <- placental_data_filtered %>%
  group_by(GA, Fetalgender) %>%
  summarize(mean_Placentalweight = mean(Placentalweight),
```

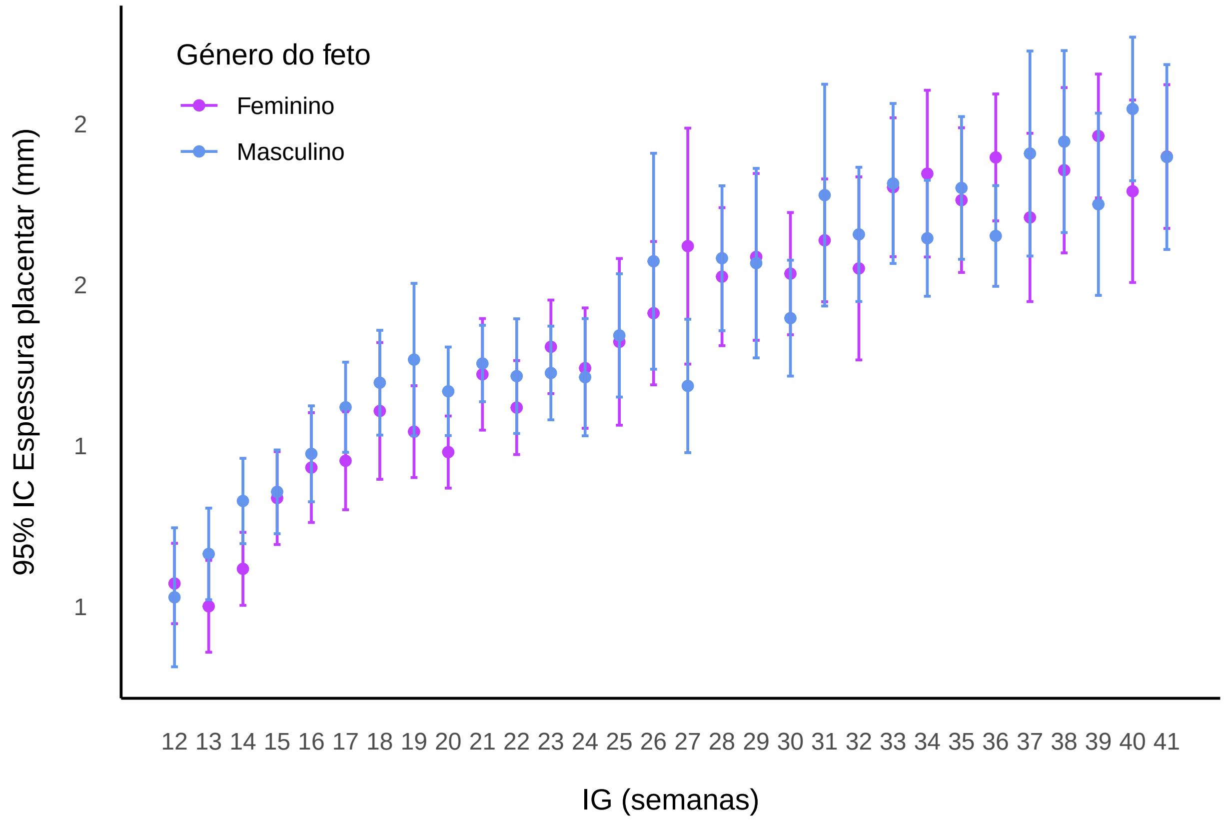
```r
            sem_Placentalweight = sd(Placentalweight) / sqrt(n()))


#Gráfico
plot <- ggplot(mean_sem_data3, aes(x = GA, y = mean_Placentalweight, color = factor(Fetalgender))) +
  geom_point() +
  geom_errorbar(aes(ymin = mean_Placentalweight - 1.96*sem_Placentalweight, ymax = mean_Placentalweight
  labs(x = "IG (semanas)", y = "95% IC Peso placentar (g)", color = "Género do feto") +
  theme_minimal() +
  theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left"
  ) +
  scale_color_manual(values = c("0" = "darkorchid1", "1" = "cornflowerblue"),
                     breaks = c("0", "1"),
                     labels = c("Feminino", "Masculino")) +
  scale_x_continuous(breaks = seq(min(mean_sem_data3$GA), max(mean_sem_data3$GA), by = 1)) +
  scale_y_continuous(
    breaks = seq(min(mean_sem_data3$mean_Placentalweight), max(mean_sem_data3$mean_Placentalweight), by
    labels = function(x) as.integer(x))

plot
```




```
ggsave("gender_Placentalweight.pdf", plot, dpi = 1200)
```

```
# Calcular a média e o erro padrão da média (SEM) para o placentalthickness para cada combinação de GA
mean_sem_data4 <- placental_data_filtered %>%
  group_by(GA, Fetalgender) %>%
  summarize(mean_Placentalthickness = mean(Placentalthickness),
            sem_Placentalthickness = sd(Placentalthickness) / sqrt(n()))



#Gráfico
plot <- ggplot(mean_sem_data4, aes(x = GA, y = mean_Placentalthickness, color = factor(Fetalgender))) +
  geom_point() +
  geom_errorbar(aes(ymin = mean_Placentalthickness- 1.96*sem_Placentalthickness, ymax = mean_Placentalt
  labs(x = "IG (semanas)", y = "95% IC Espessura placentar (mm)", color = "Género do feto") +
  theme_minimal() +
  theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
```

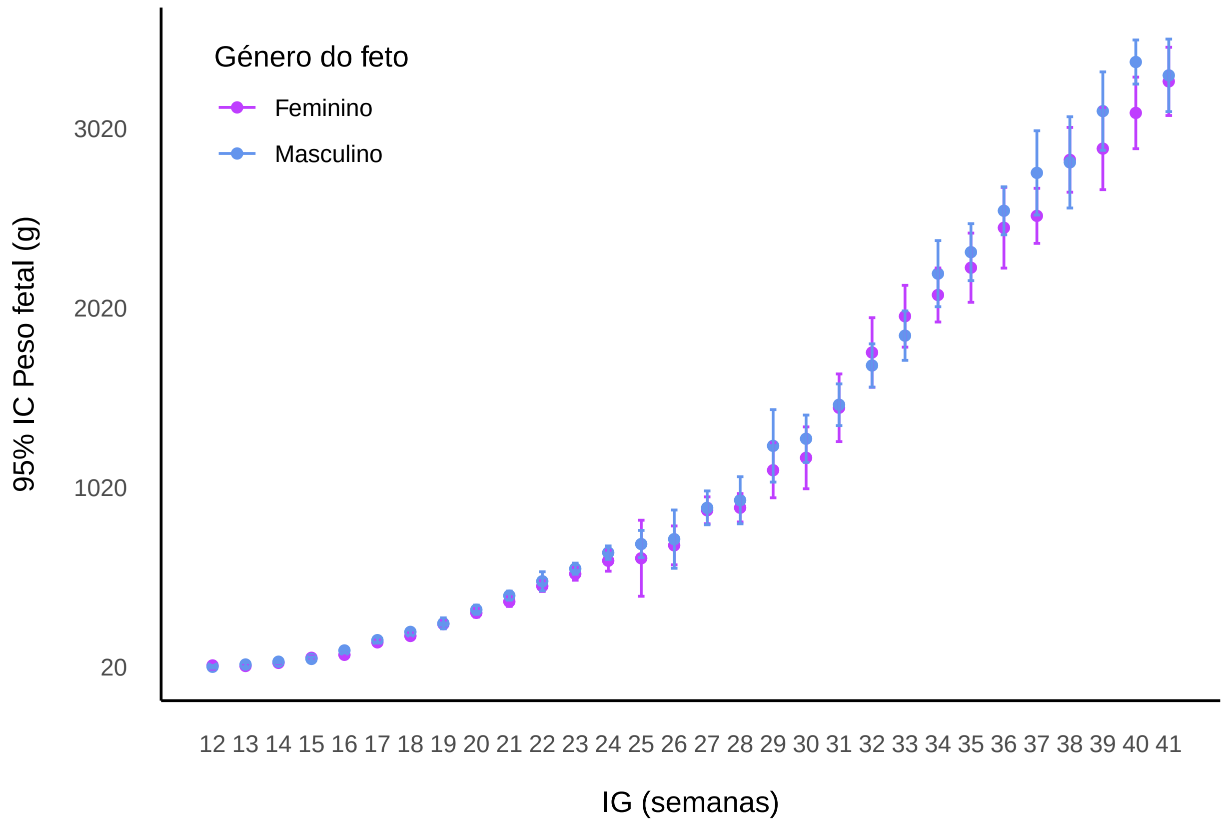
```
    legend.box.just = "left"
  ) +
  scale_color_manual(values = c("0" = "darkorchid1", "1" = "cornflowerblue"),
                     breaks = c("0", "1"),
                     labels = c("Feminino", "Masculino")) +
  scale_x_continuous(breaks = seq(min(mean_sem_data4$GA), max(mean_sem_data4$GA), by = 1)) +
  scale_y_continuous(
    breaks = seq(min(mean_sem_data4$mean_Placentalthickness), max(mean_sem_data4$mean_Placentalthicknes
    labels = function(x) as.integer(x))

plot
```




```
ggsave("gender_Placentalthickness.pdf", plot, dpi = 1200)
```

```
# Calcular a média e o erro padrão da média (SEM) para o fetahlweight para cada combinação de GA e Feta
mean_sem_data7 <- placental_data_filtered %>%
  group_by(GA, Fetalgender) %>%
  summarize(mean_Fetalweight = mean(Fetalweight),
            sem_Fetalweight = sd(Fetalweight) / sqrt(n()))

#Gráfico
plot <- ggplot(mean_sem_data7, aes(x = GA, y = mean_Fetalweight, color = factor(Fetalgender))) +
```

```
  geom_point() +
  geom_errorbar(aes(ymin = mean_Fetalweight- 1.96*sem_Fetalweight, ymax = mean_Fetalweight + 1.96*sem_Fe
  labs(x = "IG (semanas)", y = "95% IC Peso fetal (g)", color = "Género do feto") +
  theme_minimal() +
  theme(
    panel.grid = element_blank(),
    plot.margin = margin(10, 5, 10, 10),
    axis.text.y = element_text(margin = margin(0, 10, 0, 10)),
    axis.text.x = element_text(margin = margin(10, 0, 10, 0)),
    legend.margin = margin(0, 0, 0, 0),
    axis.line = element_line(size = 0.5),
    legend.position = c(0.05, 0.95),
    legend.justification = c(0, 1),
    legend.box.just = "left"
  ) +
  scale_color_manual(values = c("0" = "darkorchid1", "1" = "cornflowerblue"),
                     breaks = c("0", "1"),
                     labels = c("Feminino", "Masculino")) +
  scale_x_continuous(breaks = seq(min(mean_sem_data7$GA), max(mean_sem_data7$GA), by = 1)) +
  scale_y_continuous(
    breaks = seq(min(mean_sem_data7$mean_Fetalweight), max(mean_sem_data7$mean_Fetalweight), by = 1000)
    labels = function(x) as.integer(x))

plot
```



```r
ggsave("gender_Fetalweight.pdf", plot, dpi = 1200)
```

Exportar dataset tratado

```r
write.csv(data, file = "dataset_placenta_tratado.csv", row.names = FALSE)
```