Tratamiento, Limpieza y Selección de variables

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2025-02-17

1. TRATAMIENTO

En este primer paso, cargaremos los datos y aplicaremos un tratamiento previo, incluyendo la combinación de variables duplicadas y la renombración de columnas para mejorar su comprensión.

1.1 Carga de librerías

```
library(readxl)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(ggplot2)
library(mice)
```

```
##
## Attaching package: 'mice'

## The following object is masked from 'package:stats':
##
##     filter

## The following objects are masked from 'package:base':
##
##     cbind, rbind
```

```r
library(missForest)
```

```
## Warning: package 'missForest' was built under R version 4.3.3
```

1.2 Carga de datos

```r
# Reemplaza "datos.xlsx" y "hoja1" con el nombre real de tu archivo y hoja
datos <- read_excel("/Users/manuelrocamoravalenti/Desktop/TFG/Datos_Crudo/Base_Pembro_1L(febrero_24)_v2
```

```
## New names:
## * `Estudios` -> `Estudios...14`
## * `Est_civil` -> `Est_civil...15`
## * `Comp_hogar` -> `Comp_hogar...16`
## * `MOSs` -> `MOSs...17`
## * `Ansiedad` -> `Ansiedad...18`
## * `Depresion` -> `Depresion...19`
## * `MNA` -> `MNA...20`
## * `MNA` -> `MNA...27`
## * `Estudios` -> `Estudios...29`
## * `Est_civil` -> `Est_civil...31`
## * `Comp_hogar` -> `Comp_hogar...32`
## * `MOSs` -> `MOSs...33`
## * `Ansiedad` -> `Ansiedad...36`
## * `Depresion` -> `Depresion...37`
```

1.3 Cambios de algunos nombres

```r
names(datos)[names(datos) == "Joven(0)_Anciano(1)"] <- "Anciano"
names(datos)[names(datos) == "%_perd_peso"] <- "Porcentaje_perdpeso"
names(datos)[names(datos) == "PD-L1"] <- "PD_L1"
names(datos)[names(datos) == "1ª_eval"] <- "primera_eval"
names(datos)[names(datos) == "1ªeval_num"] <- "primera_eval_num"
names(datos)[names(datos) == "Toxicidad_si/no"] <- "Toxicidad"
names(datos)[names(datos) == "Progresión_sí/no"] <- "Progresion"
names(datos)[names(datos) == "2ªL_sí/no"] <- "segunda_eval"
names(datos)[names(datos) == "Exitus_sí/no"] <- "Exitus"
names(datos)[names(datos) == "T"] <- "Tamaño_tumor"
names(datos)[names(datos) == "N"] <- "Afectacion_ganglionar"
names(datos)[names(datos) == "M"] <- "Afectacion_metastasica"
```

1.4 Combinacion de variables repetidas

```r
datos <- datos %>%
  mutate(estudios = coalesce(`Estudios...14`, `Estudios...29`)) %>%
  select(-`Estudios...14`, -`Estudios...29`)
```

```r
datos <- datos %>%
  mutate(est_civil = coalesce(`Est_civil...15`, `Est_civil...31`)) %>%
  select(-`Est_civil...15`, -`Est_civil...31`)

datos <- datos %>%
  mutate(hogar = coalesce(`Comp_hogar...16`, `Comp_hogar...32`)) %>%
  select(-`Comp_hogar...16`, -`Comp_hogar...32`)

datos <- datos %>%
  mutate(MOOSs = coalesce(`MOSs...17`, `MOSs...33`)) %>%
  select(-`MOSs...17`, -`MOSs...33`)

datos <- datos %>%
  mutate(ansiedad = coalesce(`Ansiedad...18`, `Ansiedad...36`)) %>%
  select(-`Ansiedad...18`, -`Ansiedad...36`)

datos <- datos %>%
  mutate(depresion = coalesce(`Depresion...19`, `Depresion...37`)) %>%
  select(-`Depresion...19`, -`Depresion...37`)

datos <- datos %>%
  mutate(MNA = coalesce(`MNA...20`, `MNA...27`)) %>%
  select(-`MNA...20`, -`MNA...27`)
```

2. LIMPIEZA

Para garantizar la calidad del análisis, es necesario limpiar el conjunto de datos eliminando aquellas columnas con un alto porcentaje de valores faltantes.

En este caso, estableceremos un **umbral del 20%**, por lo que cualquier columna que supere este porcentaje será eliminada. Esto nos permite reducir el impacto de datos incompletos y mejorar la fiabilidad de los resultados obtenidos.

2.1 Eliminación de columnas previa

```r
datos <- datos %>% select(-Num_pac, -Fecha_nac, -Fecha_dx, -Peso, -Talla,
                          -G8, -Audicion, -Barthel, -Lawton_Brody, -SPPB,
                          -Caida_6m, -Pfeiffer, -Mini_mental, -Social_Gijon,
                          -Yesavage, -CIRS, -Charlson, -Polifarmacia, -Sd_geriatr,
                          -Clasif_geriatr_Balducci, -Clasif_geriatr_SIOG1,
                          -Biopsia_liq, -Tipo_mut_Liq, -Fecha_inicio_pem,
                          -primera_eval, -Mejor_resp, -Fecha_exitus, -Fecha_últ_control,
                          -Fecha_SLP, -Fecha_SG, -Fecha_progresión,-Observaciones, -'Leuc%', -'Linf%',
                          -'CD45+')
```

2.2 Análisis de datos faltantes (Columnas)

Ahora vamos a calcular el porcentaje de valores faltantes por columna, crear un resumen con los resultados y ordenarlos de mayor a menor segun su porcentaje.

```r
# Calcular el porcentaje de valores faltantes por columna
missing_percent <- colSums(is.na(datos)) / nrow(datos) * 100

# Crear un dataframe con el resumen de valores faltantes
missing_summary <- data.frame(Columna = names(missing_percent), Porcentaje_Faltante = missing_percent)

# Mostrar el resumen
dplyr::arrange(missing_summary, desc(Porcentaje_Faltante))
```

```
##                                      Columna Porcentaje_Faltante
## CD3_C_Leuc                         CD3_C_Leuc          100.000000
## CD4+_C_CD45                       CD4+_C_CD45          100.000000
## CD45+_C                             CD45+_C            100.000000
## CD127-/lowFoxP3+_%CD4     CD127-/lowFoxP3+_%CD4           88.888889
## CD25+FoxP3+_%Linf             CD25+FoxP3+_%Linf           88.888889
## CD39+FoxP3+_%CD4               CD39+FoxP3+_%CD4           88.888889
## CD4+_%CD45                           CD4+_%CD45           88.888889
## CD45RA+_%Linf                     CD45RA+_%Linf           88.888889
## CD45RA+FoxP3+_%CD4           CD45RA+FoxP3+_%CD4           88.888889
## Helios+FoxP3+_%CD4           Helios+FoxP3+_%CD4           88.888889
## CD127-/lowFoxP3+_C_CD4   CD127-/lowFoxP3+_C_CD4           88.888889
## CD25+FoxP3+_C_Linf           CD25+FoxP3+_C_Linf           88.888889
## CD39+FoxP3+_C_CD4             CD39+FoxP3+_C_CD4           88.888889
## CD45RA+_C_Linf                   CD45RA+_C_Linf           88.888889
## CD45RA+FoxP3+_C_CD4         CD45RA+FoxP3+_C_CD4           88.888889
## Helios+FoxP3+_C_CD4         Helios+FoxP3+_C_CD4           88.888889
## CD25+CD127low_%Linf         CD25+CD127low_%Linf           72.222222
## CD25+CD127low_C_Linf       CD25+CD127low_C_Linf           72.222222
## HLADR+Lin_%Leuc                 HLADR+Lin_%Leuc           63.888889
## mDC_%Leuc                             mDC_%Leuc           63.888889
## pDC_%Leuc                             pDC_%Leuc           63.888889
## CD4_Central_Mem_%Linf     CD4_Central_Mem_%Linf           63.888889
## CD4_Effector_Mem_%Linf   CD4_Effector_Mem_%Linf           63.888889
## CD4_Naïve_%Linf                 CD4_Naïve_%Linf           63.888889
## CD4_TEMRA_%Linf                 CD4_TEMRA_%Linf           63.888889
## CD8_Central_Mem_%Linf     CD8_Central_Mem_%Linf           63.888889
## CD8_Effector_Mem_%Linf   CD8_Effector_Mem_%Linf           63.888889
## CD8_Naïve_%Linf                 CD8_Naïve_%Linf           63.888889
## CD8_TEMRA_%Linf                 CD8_TEMRA_%Linf           63.888889
## mDC_CD16_%mDC                     mDC_CD16_%mDC           63.888889
## mDC_CD1c_%mDC                     mDC_CD1c_%mDC           63.888889
## mDC_Clec9A_%mDC                 mDC_Clec9A_%mDC           63.888889
## CD3+_%Linf                           CD3+_%Linf           63.888889
## CD27-CD57+CD3+_%Linf       CD27-CD57+CD3+_%Linf           63.888889
## CD27-CD57+CD4+_%CD3         CD27-CD57+CD4+_%CD3           63.888889
## CD27-CD57+CD8+_%CD3         CD27-CD57+CD8+_%CD3           63.888889
## CD3_%Leuc                             CD3_%Leuc           63.888889
## CD3+CD4+_%Linf                   CD3+CD4+_%Linf           63.888889
## CD3+CD57+_%Linf                 CD3+CD57+_%Linf           63.888889
## CD3+CD8+_%Linf                   CD3+CD8+_%Linf           63.888889
## CD45RA+CCR7+CD3+_%Linf   CD45RA+CCR7+CD3+_%Linf           63.888889
## CD8+_term_efect_%CD3       CD8+_term_efect_%CD3           63.888889
## CD8_exhausted_%CD3           CD8_exhausted_%CD3           63.888889
```

```
## CD4_TCR_ab+_%CD3               CD4_TCR_ab+_%CD3          63.888889
## CD4+_%Linf                           CD4+_%Linf          63.888889
## CD8+_TCR_ab+_%CD3             CD8+_TCR_ab+_%CD3          63.888889
## CD8+_%Linf                           CD8+_%Linf          63.888889
## CD8+CD4+_%Linf                 CD8+CD4+_%Linf          63.888889
## CD8-CD4-_%Linf                 CD8-CD4-_%Linf          63.888889
## HLADR+CD3+_%Linf               HLADR+CD3+_%Linf          63.888889
## TCR_ab+_%Linf                     TCR_ab+_%Linf          63.888889
## TCR_gd+_%Linf                     TCR_gd+_%Linf          63.888889
## gd_VD1+_%CD3                       gd_VD1+_%CD3          63.888889
## gd_VD1+VD2+_%CD3               gd_VD1+VD2+_%CD3          63.888889
## gd_VD1-VD2-_%CD3               gd_VD1-VD2-_%CD3          63.888889
## gd_VD2+_%CD3                       gd_VD2+_%CD3          63.888889
## LDH_PE                                 LDH_PE          61.111111
## CD25+CD4+_%Linf                CD25+CD4+_%Linf          61.111111
## HLADR+Lin_C_Leuc               HLADR+Lin_C_Leuc          61.111111
## mDC_C_Leuc                           mDC_C_Leuc          61.111111
## pDC_C_Leuc                           pDC_C_Leuc          61.111111
## CD4_Central_Mem_C_Linf   CD4_Central_Mem_C_Linf          61.111111
## CD4_Effector_Mem_C_Linf CD4_Effector_Mem_C_Linf          61.111111
## CD4_Naïve_C_Linf               CD4_Naïve_C_Linf          61.111111
## CD4_TEMRA_C_Linf               CD4_TEMRA_C_Linf          61.111111
## CD8_Central_Mem_C_Linf   CD8_Central_Mem_C_Linf          61.111111
## CD8_Effector_Mem_C_Linf CD8_Effector_Mem_C_Linf          61.111111
## CD8_Naïve_C_Linf               CD8_Naïve_C_Linf          61.111111
## CD8_TEMRA_C_Linf               CD8_TEMRA_C_Linf          61.111111
## mDC_CD16_C_mDC                 mDC_CD16_C_mDC          61.111111
## mDC_CD1c_C_mDC                 mDC_CD1c_C_mDC          61.111111
## mDC_Clec9A_C_mDC               mDC_Clec9A_C_mDC          61.111111
## CD3+_C_Linf                         CD3+_C_Linf          61.111111
## CD27-CD57+CD3+_C_Linf     CD27-CD57+CD3+_C_Linf          61.111111
## CD27-CD57+CD4+_C_CD3       CD27-CD57+CD4+_C_CD3          61.111111
## CD27-CD57+CD8+_C_CD3       CD27-CD57+CD8+_C_CD3          61.111111
## CD3+CD4+_C_Linf                 CD3+CD4+_C_Linf          61.111111
## CD3+CD57+_C_Linf               CD3+CD57+_C_Linf          61.111111
## CD3+CD8+_C_Linf                 CD3+CD8+_C_Linf          61.111111
## CD45RA+CCR7+CD3+_C_Linf CD45RA+CCR7+CD3+_C_Linf          61.111111
## CD8+_term_efect_C_CD3     CD8+_term_efect_C_CD3          61.111111
## CD8_exhausted_C_CD3         CD8_exhausted_C_CD3          61.111111
## CD4_TCR_ab+_C_CD3             CD4_TCR_ab+_C_CD3          61.111111
## CD4+_C_Linf                         CD4+_C_Linf          61.111111
## CD8+_TCR_ab+_C_CD3           CD8+_TCR_ab+_C_CD3          61.111111
## CD8+_C_Linf                         CD8+_C_Linf          61.111111
## CD8+CD4+_C_Linf                 CD8+CD4+_C_Linf          61.111111
## CD8-CD4-_C_Linf                 CD8-CD4-_C_Linf          61.111111
## HLADR+CD3+_C_Linf             HLADR+CD3+_C_Linf          61.111111
## TCR_ab+_C_Linf                   TCR_ab+_C_Linf          61.111111
## TCR_gd+_C_Linf                   TCR_gd+_C_Linf          61.111111
## gd_VD1+_C_CD3                     gd_VD1+_C_CD3          61.111111
## gd_VD1+VD2+_C_CD3             gd_VD1+VD2+_C_CD3          61.111111
## gd_VD1-VD2-_C_CD3             gd_VD1-VD2-_C_CD3          61.111111
## gd_VD2+_C_CD3                     gd_VD2+_C_CD3          61.111111
## CD25+CD4+_C_Linf               CD25+CD4+_C_Linf          61.111111
## MOOSs                                   MOOSs          61.111111
```

```
## IL-6                                 IL-6          58.333333
## IgM_CMV                           IgM_CMV          55.555556
## IgG_CMV                           IgG_CMV          55.555556
## LDH_2C                             LDH_2C          50.000000
## Tipo_mut_Tej                 Tipo_mut_Tej          47.222222
## Col_LDL                           Col_LDL          47.222222
## MNA                                   MNA          47.222222
## Prot_PE                           Prot_PE          44.444444
## ansiedad                         ansiedad          44.444444
## depresion                       depresion          44.444444
## Col_HDL                           Col_HDL          41.666667
## Alb_PE                             Alb_PE          41.666667
## Hb_PE                               Hb_PE          41.666667
## Leucoc_PE                       Leucoc_PE          41.666667
## Neutr_PE                         Neutr_PE          41.666667
## Linf_PE                           Linf_PE          41.666667
## Plaq_PE                           Plaq_PE          41.666667
## NLR_PE                             NLR_PE          41.666667
## NLRPE_corte 4               NLRPE_corte 4          41.666667
## NLRPE_corte 5               NLRPE_corte 5          41.666667
## PLR_PE                             PLR_PE          41.666667
## PNI_PE                             PNI_PE          41.666667
## SII_PE                             SII_PE          41.666667
## LDH_1C                             LDH_1C          36.111111
## LDH_1eval                       LDH_1eval          33.333333
## estudios                         estudios          27.777778
## est_civil                       est_civil          27.777778
## LinfT_cel                       LinfT_cel          25.000000
## LinfT_%                           LinfT_%          25.000000
## CD4_cel                           CD4_cel          25.000000
## CD4_%                               CD4_%          25.000000
## CD8_cel                           CD8_cel          25.000000
## CD8_%                               CD8_%          25.000000
## CD4:CD8                           CD4:CD8          25.000000
## LinfB_cel                       LinfB_cel          25.000000
## LinfB_%                           LinfB_%          25.000000
## LinfNK_cel                     LinfNK_cel          25.000000
## LinfNK_%                         LinfNK_%          25.000000
## hogar                               hogar          25.000000
## PCR                                   PCR          22.222222
## segunda_eval                segunda_eval          19.444444
## Estado_mut                    Estado_mut          16.666667
## Prot_2C                         Prot_2C           16.666667
## Alb_2C                           Alb_2C           13.888889
## PNI_2C                           PNI_2C           13.888889
## Prot_1eval                   Prot_1eval          13.888889
## Porcentaje_perdpeso Porcentaje_perdpeso          11.111111
## p_peso_no_sí               p_peso_no_sí          11.111111
## Prot_1C                         Prot_1C           11.111111
## Hb_2C                             Hb_2C           11.111111
## Leucoc_2C                     Leucoc_2C           11.111111
## Neutr_2C                       Neutr_2C           11.111111
## Linf_2C                         Linf_2C           11.111111
## Plaq_2C                         Plaq_2C           11.111111
```

```
## NLR_2C                                NLR_2C          11.111111
## NLR2C_corte4o5                NLR2C_corte4o5          11.111111
## PLR_2C                                PLR_2C          11.111111
## SII_2C                                SII_2C          11.111111
## Tipo_tox                            Tipo_tox          11.111111
## LDH                                     LDH           8.333333
## Alb_1C                                Alb_1C           8.333333
## Hab_tabaq                          Hab_tabaq           5.555556
## Exp_tab                              Exp_tab           5.555556
## NLR1C_corte5                  NLR1C_corte5           5.555556
## PNI_1C                                PNI_1C           5.555556
## primera_eval_num        primera_eval_num           5.555556
## Alb_1eval                      Alb_1eval           5.555556
## Hb_1eval                        Hb_1eval           5.555556
## Leucoc_1eval                Leucoc_1eval           5.555556
## Neutr_1eval                  Neutr_1eval           5.555556
## Linf_1eval                    Linf_1eval           5.555556
## Plaq_1eval                    Plaq_1eval           5.555556
## NLR_1eval                      NLR_1eval           5.555556
## PLR_1eval                      PLR_1eval           5.555556
## PNI_1eval                      PNI_1eval           5.555556
## SII_1eval                      SII_1eval           5.555556
## Mejor_resp_num            Mejor_resp_num           5.555556
## Tamaño_tumor                Tamaño_tumor           2.777778
## Afectacion_ganglionar  Afectacion_ganglionar           2.777778
## Afectacion_metastasica Afectacion_metastasica           2.777778
## Col_total                      Col_total           2.777778
## Prot_tot                        Prot_tot           2.777778
## Albumina                        Albumina           2.777778
## PNI_pre                          PNI_pre           2.777778
## ALI_pre                          ALI_pre           2.777778
## Hb_1C                              Hb_1C           2.777778
## Leucoc_1C                      Leucoc_1C           2.777778
## Neutr_1C                        Neutr_1C           2.777778
## Linf_1C                          Linf_1C           2.777778
## Plaq_1C                          Plaq_1C           2.777778
## NLR_1C                            NLR_1C           2.777778
## NLR1C_corte4                  NLR1C_corte4           2.777778
## PLR_1C                            PLR_1C           2.777778
## SII_1C                            SII_1C           2.777778
## Idpac                              Idpac           0.000000
## Sexo                                Sexo           0.000000
## Edad_dx                          Edad_dx           0.000000
## Anciano                          Anciano           0.000000
## ECOG                                ECOG           0.000000
## IMC                                  IMC           0.000000
## Diabetes                        Diabetes           0.000000
## Cardiop                          Cardiop           0.000000
## Enf_neurod                    Enf_neurod           0.000000
## Histologia                    Histologia           0.000000
## Histología_num          Histología_num           0.000000
## Estadio                          Estadio           0.000000
## Estadio_num                  Estadio_num           0.000000
## PD_L1                              PD_L1           0.000000
```

```
## Estatinas                    Estatinas     0.000000
## Hb                                Hb     0.000000
## Leucoc_tot                Leucoc_tot     0.000000
## Neutrofilos              Neutrofilos     0.000000
## Linf_tot                    Linf_tot     0.000000
## Plaquetas                  Plaquetas     0.000000
## NLR_pre                      NLR_pre     0.000000
## PLR_pre                      PLR_pre     0.000000
## SII_pre                      SII_pre     0.000000
## N_ciclos                    N_ciclos     0.000000
## Toxicidad                  Toxicidad     0.000000
## Grado_tox                  Grado_tox     0.000000
## Interrupc_tto          Interrupc_tto     0.000000
## Motivo_inter            Motivo_inter     0.000000
## Progresion                Progresion     0.000000
## Exitus                        Exitus     0.000000
## SLP                              SLP     0.000000
## SLP_cens                    SLP_cens     0.000000
## SG                                SG     0.000000
## SG_cens                      SG_cens     0.000000
```

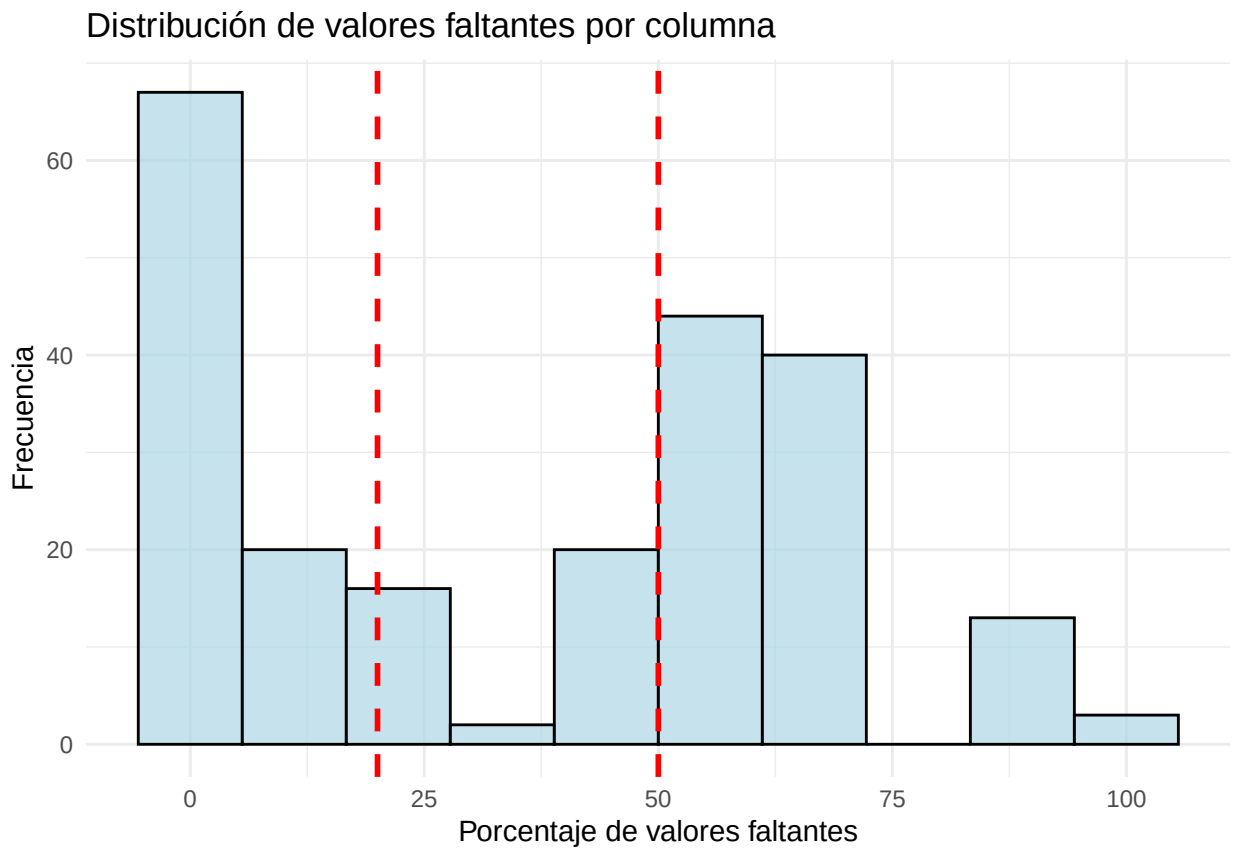
```r
# Crear un dataframe con los porcentajes de valores faltantes por columna
df_missing_col <- data.frame(Porcentaje_Faltante = missing_percent)

# Generar el histograma
ggplot(df_missing_col, aes(x = Porcentaje_Faltante)) +
  geom_histogram(bins = 10, fill = "lightblue", color = "black", alpha = 0.7) +
  geom_vline(xintercept = 20, color = "red", linetype = "dashed", size = 1, label = "Umbral 20%") +
  geom_vline(xintercept = 50, color = "red", linetype = "dashed", size = 1, label = "Umbral 50%") +
  labs(title = "Distribución de valores faltantes por columna",
       x = "Porcentaje de valores faltantes",
       y = "Frecuencia") +
  theme_minimal()
```

```
## Warning: Using ‘size‘ aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use ‘linewidth‘ instead.
## This warning is displayed once every 8 hours.
## Call ‘lifecycle::last_lifecycle_warnings()‘ to see where this warning was
## generated.
```

```
## Warning in geom_vline(xintercept = 20, color = "red", linetype = "dashed", :
## Ignoring unknown parameters: ‘label‘
```

```
## Warning in geom_vline(xintercept = 50, color = "red", linetype = "dashed", :
## Ignoring unknown parameters: ‘label‘
```



2.2.1 Eliminación de columnas con más del 20% de valores faltantes

```
threshold <- 20  # Umbral de eliminación
datos_limpios <- datos %>% select(which(missing_percent <= threshold))

# Verificar las columnas eliminadas
columnas_eliminadas <- names(missing_percent[missing_percent > threshold])
columnas_eliminadas
```

```
##   [1] "Tipo_mut_Tej"          "Col_HDL"
##   [3] "Col_LDL"               "PCR"
##   [5] "IL-6"                  "LinfT_cel"
##   [7] "LinfT_%"               "CD4_cel"
##   [9] "CD4_%"                 "CD8_cel"
##  [11] "CD8_%"                 "CD4:CD8"
##  [13] "LinfB_cel"             "LinfB_%"
##  [15] "LinfNK_cel"            "LinfNK_%"
##  [17] "IgM_CMV"               "IgG_CMV"
##  [19] "LDH_1C"                "LDH_2C"
##  [21] "LDH_1eval"             "LDH_PE"
##  [23] "Prot_PE"               "Alb_PE"
##  [25] "Hb_PE"                 "Leucoc_PE"
##  [27] "Neutr_PE"              "Linf_PE"
##  [29] "Plaq_PE"               "NLR_PE"
```

```
##  [31] "NLRPE_corte 4"           "NLRPE_corte 5"
##  [33] "PLR_PE"                  "PNI_PE"
##  [35] "SII_PE"                  "HLADR+Lin_%Leuc"
##  [37] "mDC_%Leuc"               "pDC_%Leuc"
##  [39] "CD4_Central_Mem_%Linf"   "CD4_Effector_Mem_%Linf"
##  [41] "CD4_Naïve_%Linf"         "CD4_TEMRA_%Linf"
##  [43] "CD8_Central_Mem_%Linf"   "CD8_Effector_Mem_%Linf"
##  [45] "CD8_Naïve_%Linf"         "CD8_TEMRA_%Linf"
##  [47] "mDC_CD16_%mDC"           "mDC_CD1c_%mDC"
##  [49] "mDC_Clec9A_%mDC"         "CD3+_%Linf"
##  [51] "CD27-CD57+CD3+_%Linf"    "CD27-CD57+CD4+_%CD3"
##  [53] "CD27-CD57+CD8+_%CD3"     "CD3_%Leuc"
##  [55] "CD3+CD4+_%Linf"          "CD3+CD57+_%Linf"
##  [57] "CD3+CD8+_%Linf"          "CD45RA+CCR7+CD3+_%Linf"
##  [59] "CD8+_term_efect_%CD3"    "CD8_exhausted_%CD3"
##  [61] "CD4_TCR_ab+_%CD3"        "CD4+_%Linf"
##  [63] "CD8+_TCR_ab+_%CD3"       "CD8+_%Linf"
##  [65] "CD8+CD4+_%Linf"          "CD8-CD4-_%Linf"
##  [67] "HLADR+CD3+_%Linf"        "TCR_ab+_%Linf"
##  [69] "TCR_gd+_%Linf"           "gd_VD1+_%CD3"
##  [71] "gd_VD1+VD2+_%CD3"        "gd_VD1-VD2-_%CD3"
##  [73] "gd_VD2+_%CD3"            "CD127-/lowFoxP3+_%CD4"
##  [75] "CD25+CD127low_%Linf"     "CD25+CD4+_%Linf"
##  [77] "CD25+FoxP3+_%Linf"       "CD39+FoxP3+_%CD4"
##  [79] "CD4+_%CD45"              "CD45RA+_%Linf"
##  [81] "CD45RA+FoxP3+_%CD4"      "Helios+FoxP3+_%CD4"
##  [83] "HLADR+Lin_C_Leuc"        "mDC_C_Leuc"
##  [85] "pDC_C_Leuc"              "CD4_Central_Mem_C_Linf"
##  [87] "CD4_Effector_Mem_C_Linf" "CD4_Naïve_C_Linf"
##  [89] "CD4_TEMRA_C_Linf"        "CD8_Central_Mem_C_Linf"
##  [91] "CD8_Effector_Mem_C_Linf" "CD8_Naïve_C_Linf"
##  [93] "CD8_TEMRA_C_Linf"        "mDC_CD16_C_mDC"
##  [95] "mDC_CD1c_C_mDC"          "mDC_Clec9A_C_mDC"
##  [97] "CD3+_C_Linf"             "CD27-CD57+CD3+_C_Linf"
##  [99] "CD27-CD57+CD4+_C_CD3"    "CD27-CD57+CD8+_C_CD3"
## [101] "CD3_C_Leuc"              "CD3+CD4+_C_Linf"
## [103] "CD3+CD57+_C_Linf"        "CD3+CD8+_C_Linf"
## [105] "CD45RA+CCR7+CD3+_C_Linf" "CD8+_term_efect_C_CD3"
## [107] "CD8_exhausted_C_CD3"     "CD4_TCR_ab+_C_CD3"
## [109] "CD4+_C_Linf"             "CD8+_TCR_ab+_C_CD3"
## [111] "CD8+_C_Linf"             "CD8+CD4+_C_Linf"
## [113] "CD8-CD4-_C_Linf"         "HLADR+CD3+_C_Linf"
## [115] "TCR_ab+_C_Linf"          "TCR_gd+_C_Linf"
## [117] "gd_VD1+_C_CD3"           "gd_VD1+VD2+_C_CD3"
## [119] "gd_VD1-VD2-_C_CD3"       "gd_VD2+_C_CD3"
## [121] "CD127-/lowFoxP3+_C_CD4"  "CD25+CD127low_C_Linf"
## [123] "CD25+CD4+_C_Linf"        "CD25+FoxP3+_C_Linf"
## [125] "CD39+FoxP3+_C_CD4"       "CD4+_C_CD45"
## [127] "CD45+_C"                 "CD45RA+_C_Linf"
## [129] "CD45RA+FoxP3+_C_CD4"     "Helios+FoxP3+_C_CD4"
## [131] "estudios"                "est_civil"
## [133] "hogar"                   "MOOSs"
## [135] "ansiedad"                "depresion"
## [137] "MNA"
```

Por lo que las columnas que quedan **dentro del analisis** son las sigueintes:

```
colnames(datos_limpios)
```

```
##  [1] "Idpac"                 "Sexo"                  "Edad_dx"
##  [4] "Anciano"               "ECOG"                  "IMC"
##  [7] "Porcentaje_perdpeso"   "p_peso_no_sí"          "Hab_tabaq"
## [10] "Exp_tab"               "Diabetes"              "Cardiop"
## [13] "Enf_neurod"            "Histologia"            "Histología_num"
## [16] "Tamaño_tumor"          "Afectacion_ganglionar" "Afectacion_metastasica"
## [19] "Estadio"               "Estadio_num"           "PD_L1"
## [22] "Estado_mut"            "Estatinas"             "Col_total"
## [25] "LDH"                   "Prot_tot"              "Albumina"
## [28] "Hb"                    "Leucoc_tot"            "Neutrofilos"
## [31] "Linf_tot"              "Plaquetas"             "NLR_pre"
## [34] "PLR_pre"               "PNI_pre"               "ALI_pre"
## [37] "SII_pre"               "Prot_1C"               "Alb_1C"
## [40] "Hb_1C"                 "Leucoc_1C"             "Neutr_1C"
## [43] "Linf_1C"               "Plaq_1C"               "NLR_1C"
## [46] "NLR1C_corte4"          "NLR1C_corte5"          "PLR_1C"
## [49] "PNI_1C"                "SII_1C"                "Prot_2C"
## [52] "Alb_2C"                "Hb_2C"                 "Leucoc_2C"
## [55] "Neutr_2C"              "Linf_2C"               "Plaq_2C"
## [58] "NLR_2C"                "NLR2C_corte4o5"        "PLR_2C"
## [61] "PNI_2C"                "SII_2C"                "primera_eval_num"
## [64] "Prot_1eval"            "Alb_1eval"             "Hb_1eval"
## [67] "Leucoc_1eval"          "Neutr_1eval"           "Linf_1eval"
## [70] "Plaq_1eval"            "NLR_1eval"             "PLR_1eval"
## [73] "PNI_1eval"             "SII_1eval"             "Mejor_resp_num"
## [76] "N_ciclos"              "Toxicidad"             "Tipo_tox"
## [79] "Grado_tox"             "Interrupc_tto"         "Motivo_inter"
## [82] "Progresion"            "segunda_eval"          "Exitus"
## [85] "SLP"                   "SLP_cens"              "SG"
## [88] "SG_cens"
```

2.3 Análisis de datos faltantes (Filas)

Hasta ahora, hemos analizado los datos faltantes por columna, pero ahora es momento de hacerlo por filas, así que procedamos con ello.

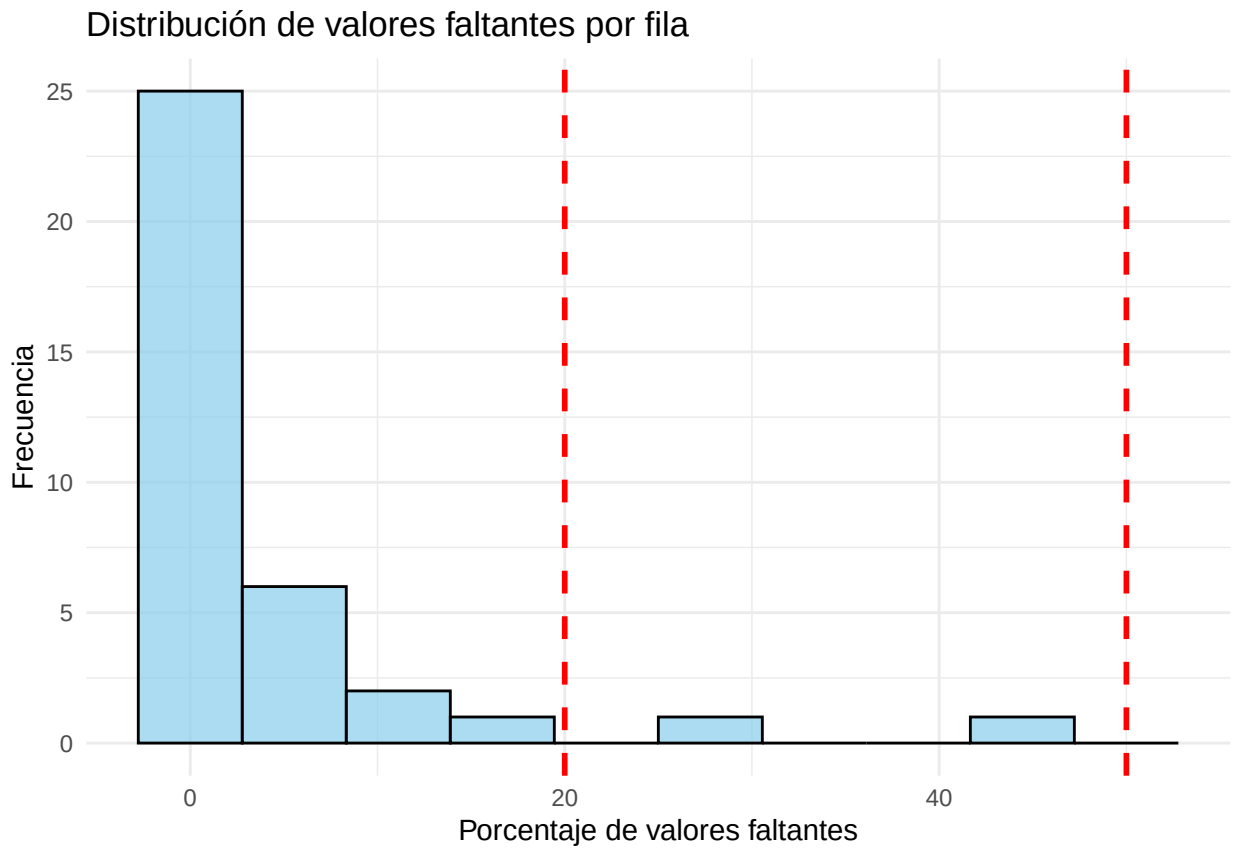
```
datos_limpios$Porcentaje_NA_Fila <- rowSums(is.na(datos_limpios)) / ncol(datos_limpios) * 100

# Crear un dataframe con los porcentajes de valores faltantes
df_missing <- data.frame(Porcentaje_NA_Fila = datos_limpios$Porcentaje_NA_Fila)

ggplot(df_missing, aes(x = Porcentaje_NA_Fila)) +
  geom_histogram(bins = 10, fill = "skyblue", color = "black", alpha = 0.7) +
  geom_vline(xintercept = 20, color = "red", linetype = "dashed", linewidth = 1, label = "Umbral 20%") +
  geom_vline(xintercept = 50, color = "red", linetype = "dashed", linewidth = 1, label = "Umbral 50%") +
  labs(title = "Distribución de valores faltantes por fila",
       x = "Porcentaje de valores faltantes",
       y = "Frecuencia") +
  theme_minimal()
```

```
## Warning in geom_vline(xintercept = 20, color = "red", linetype = "dashed", :
## Ignoring unknown parameters: 'label'

## Warning in geom_vline(xintercept = 50, color = "red", linetype = "dashed", :
## Ignoring unknown parameters: 'label'
```



Dado que solo dos pacientes tienen un porcentaje de valores faltantes del 28.4% y 45.45%, respectivamente, y considerando que la cantidad de datos perdidos en estas filas es significativa, procederemos a eliminarlos para evitar posibles sesgos o problemas en el análisis.

```
# Filtrar las filas donde el porcentaje de valores faltantes es menor al 28%
datos_limpios <- datos_limpios %>%
  filter(Porcentaje_NA_Fila < 28)

datos = datos_limpios
```

3. IMPUTACION

En este apartado abordaremos la imputación de datos faltantes, explorando distintos métodos para su tratamiento, como la imputación por la media, la mediana y técnicas más avanzadas según el tipo de variable y el patrón de los datos perdidos.

```r
tipos_var <- data.frame(Columna = names(datos))
tipos_var$Tipo <- sapply(datos, function(x) class(x)[1])
tipos_var
```

```
##                   Columna      Tipo
## 1                   Idpac character
## 2                    Sexo   numeric
## 3                Edad_dx   numeric
## 4                Anciano   numeric
## 5                   ECOG   numeric
## 6                    IMC   numeric
## 7     Porcentaje_perdpeso   numeric
## 8            p_peso_no_sí   numeric
## 9               Hab_tabaq   numeric
## 10                Exp_tab   numeric
## 11               Diabetes   numeric
## 12                Cardiop   numeric
## 13             Enf_neurod   numeric
## 14             Histologia character
## 15         Histología_num   numeric
## 16           Tamaño_tumor character
## 17  Afectacion_ganglionar character
## 18 Afectacion_metastasica character
## 19                Estadio character
## 20            Estadio_num   numeric
## 21                  PD_L1   numeric
## 22             Estado_mut character
## 23              Estatinas character
## 24              Col_total   numeric
## 25                    LDH   numeric
## 26               Prot_tot   numeric
## 27               Albumina   numeric
## 28                     Hb   numeric
## 29             Leucoc_tot   numeric
## 30            Neutrofilos   numeric
## 31               Linf_tot   numeric
## 32              Plaquetas   numeric
## 33                NLR_pre   numeric
## 34                PLR_pre   numeric
## 35                PNI_pre   numeric
## 36                ALI_pre   numeric
## 37                SII_pre   numeric
## 38                Prot_1C   numeric
## 39                 Alb_1C   numeric
## 40                  Hb_1C   numeric
## 41              Leucoc_1C   numeric
## 42               Neutr_1C   numeric
## 43               Linf_1C   numeric
## 44               Plaq_1C   numeric
## 45                NLR_1C   numeric
## 46           NLR1C_corte4   numeric
## 47           NLR1C_corte5   numeric
## 48                PLR_1C   numeric
```

```
## 49                PNI_1C   numeric
## 50                SII_1C   numeric
## 51               Prot_2C   numeric
## 52                Alb_2C   numeric
## 53                 Hb_2C   numeric
## 54              Leucoc_2C   numeric
## 55               Neutr_2C   numeric
## 56               Linf_2C   numeric
## 57               Plaq_2C   numeric
## 58                NLR_2C   numeric
## 59         NLR2C_corte4o5   numeric
## 60                PLR_2C   numeric
## 61                PNI_2C   numeric
## 62                SII_2C   numeric
## 63       primera_eval_num   numeric
## 64             Prot_1eval   numeric
## 65              Alb_1eval   numeric
## 66               Hb_1eval   numeric
## 67           Leucoc_1eval   numeric
## 68            Neutr_1eval   numeric
## 69             Linf_1eval   numeric
## 70             Plaq_1eval   numeric
## 71              NLR_1eval   numeric
## 72              PLR_1eval   numeric
## 73              PNI_1eval   numeric
## 74              SII_1eval   numeric
## 75         Mejor_resp_num   numeric
## 76               N_ciclos   numeric
## 77              Toxicidad   numeric
## 78               Tipo_tox character
## 79              Grado_tox character
## 80          Interrupc_tto   numeric
## 81           Motivo_inter character
## 82             Progresion   numeric
## 83           segunda_eval   numeric
## 84                 Exitus   numeric
## 85                    SLP   numeric
## 86               SLP_cens   numeric
## 87                    SG   numeric
## 88                SG_cens   numeric
## 89     Porcentaje_NA_Fila   numeric
```

Antes de continuar, tenemos que transformar a *factor* aquellas variables que son de naturaleza categorica.

```
datos$Idpac <- as.factor(datos$Idpac)
datos$Sexo <- as.factor(datos$Sexo)
datos$ECOG <- as.factor(datos$ECOG)
datos$Hab_tabaq <- as.factor(datos$Hab_tabaq)
datos$p_peso_no_sí <- as.factor(datos$p_peso_no_sí)
datos$Diabetes <- as.factor(datos$Diabetes)
datos$Cardiop <- as.factor(datos$Cardiop)
datos$Enf_neurod <- as.factor(datos$Enf_neurod)
datos$Histologia <- as.factor(datos$Histologia)
datos$Histología_num <- as.factor(datos$Histología_num)
```

```r
datos$Tamaño_tumor <- as.factor(datos$Tamaño_tumor)
datos$Afectacion_ganglionar <- as.factor(datos$Afectacion_ganglionar)
datos$Afectacion_metastasica <- as.factor(datos$Afectacion_metastasica)
datos$Estadio <- as.factor(datos$Estadio)
datos$Estadio_num <- as.factor(datos$Estadio_num)
datos$Estado_mut <- as.factor(datos$Estado_mut)
datos$Estatinas <- as.factor(datos$Estatinas)
datos$Mejor_resp_num <- as.factor(datos$Mejor_resp_num)
datos$NLR1C_corte4 <- as.factor(datos$NLR1C_corte4)
datos$NLR1C_corte5 <- as.factor(datos$NLR1C_corte5)
datos$primera_eval_num <- as.factor(datos$primera_eval_num)
datos$Toxicidad <- as.factor(datos$Toxicidad)
datos$Tipo_tox <- as.factor(datos$Tipo_tox)
datos$Grado_tox <- as.factor(datos$Grado_tox)
datos$Interrupc_tto <- as.factor(datos$Interrupc_tto)
datos$Motivo_inter <- as.factor(datos$Motivo_inter)
datos$Progresion <- as.factor(datos$Progresion)
datos$segunda_eval <- as.factor(datos$segunda_eval)
datos$Exitus <- as.factor(datos$Exitus)
```

Comprobamos que el cambio ha sido correcto

```r
tipos_var <- data.frame(Columna = names(datos))
tipos_var$Tipo <- sapply(datos, function(x) class(x)[1])
tipos_var
```

```
##                   Columna    Tipo
## 1                   Idpac  factor
## 2                    Sexo  factor
## 3                Edad_dx numeric
## 4                Anciano numeric
## 5                   ECOG  factor
## 6                    IMC numeric
## 7     Porcentaje_perdpeso numeric
## 8            p_peso_no_sí  factor
## 9               Hab_tabaq  factor
## 10                Exp_tab numeric
## 11               Diabetes  factor
## 12                Cardiop  factor
## 13             Enf_neurod  factor
## 14             Histologia  factor
## 15         Histología_num  factor
## 16           Tamaño_tumor  factor
## 17  Afectacion_ganglionar  factor
## 18 Afectacion_metastasica  factor
## 19                Estadio  factor
## 20            Estadio_num  factor
## 21                  PD_L1 numeric
## 22             Estado_mut  factor
## 23              Estatinas  factor
## 24              Col_total numeric
## 25                    LDH numeric
## 26               Prot_tot numeric
```

```
## 27              Albumina numeric
## 28                    Hb numeric
## 29           Leucoc_tot numeric
## 30           Neutrofilos numeric
## 31              Linf_tot numeric
## 32             Plaquetas numeric
## 33               NLR_pre numeric
## 34               PLR_pre numeric
## 35               PNI_pre numeric
## 36               ALI_pre numeric
## 37               SII_pre numeric
## 38               Prot_1C numeric
## 39                Alb_1C numeric
## 40                 Hb_1C numeric
## 41            Leucoc_1C numeric
## 42             Neutr_1C numeric
## 43              Linf_1C numeric
## 44              Plaq_1C numeric
## 45               NLR_1C numeric
## 46         NLR1C_corte4  factor
## 47         NLR1C_corte5  factor
## 48               PLR_1C numeric
## 49               PNI_1C numeric
## 50               SII_1C numeric
## 51              Prot_2C numeric
## 52               Alb_2C numeric
## 53                Hb_2C numeric
## 54            Leucoc_2C numeric
## 55             Neutr_2C numeric
## 56              Linf_2C numeric
## 57              Plaq_2C numeric
## 58               NLR_2C numeric
## 59       NLR2C_corte4o5 numeric
## 60               PLR_2C numeric
## 61               PNI_2C numeric
## 62               SII_2C numeric
## 63      primera_eval_num  factor
## 64            Prot_1eval numeric
## 65             Alb_1eval numeric
## 66              Hb_1eval numeric
## 67          Leucoc_1eval numeric
## 68           Neutr_1eval numeric
## 69            Linf_1eval numeric
## 70            Plaq_1eval numeric
## 71             NLR_1eval numeric
## 72             PLR_1eval numeric
## 73             PNI_1eval numeric
## 74             SII_1eval numeric
## 75        Mejor_resp_num  factor
## 76              N_ciclos numeric
## 77             Toxicidad  factor
## 78              Tipo_tox  factor
## 79             Grado_tox  factor
## 80         Interrupc_tto  factor
```

```
## 81           Motivo_inter  factor
## 82             Progresion  factor
## 83           segunda_eval  factor
## 84                 Exitus  factor
## 85                    SLP numeric
## 86               SLP_cens numeric
## 87                     SG numeric
## 88                SG_cens numeric
## 89     Porcentaje_NA_Fila numeric
```

3.1. Metodo de la media

Una vez localizados los tipos de variables, vamos a imputar las variables numericas haciendo uso de la libreria **Mice**

```
# Excluir automáticamente todas las variables que sean factores
imputed_data1 <- mice(datos %>%
                        select(which(!sapply(datos, is.factor))),
                      method = "mean", print = FALSE)
```

```
## Warning: Number of logged events: 720
```

```
df_imputado1 <- complete(imputed_data1)
df_imputado1
```

```
##     Edad_dx Anciano      IMC Porcentaje_perdpeso   Exp_tab PD_L1 Col_total
## 1  46.00000       0 28.08899          0.04583871  20.00000   100  217.0000
## 2  68.00000       0 35.37981          0.00000000   0.00000    70  154.0000
## 3  59.00000       0 25.71101          0.00000000  45.00000    50  146.0000
## 4  72.00000       1 28.24859          0.00000000  92.00000     2  149.0000
## 5  50.00000       0 29.05475          0.10000000  55.00000    60  210.0000
## 6  71.00000       1 28.83059          0.00000000 200.00000    90  162.0000
## 7  71.00000       1 29.77778          0.07600000  60.00000   100  142.0000
## 8  79.00000       1 25.84777          0.00000000  40.00000    70  167.0000
## 9  73.14168       1 22.32143          0.04583871  50.00000    90  153.0000
## 10 68.51745       0 23.65618          0.00000000  50.00000    70  132.0000
## 11 56.48734       0 24.09796          0.04583871  36.00000    80  113.0000
## 12 66.27242       0 24.95389          0.22900000  50.00000    50  182.0000
## 13 61.96304       0 26.21631          0.13800000   0.00000    80  242.0000
## 14 64.45996       0 20.28651          0.11000000  50.00000   100  133.0000
## 15 58.70500       0 22.06035          0.00000000  25.00000    95  215.0000
## 16 60.30664       0 24.62296          0.00000000  82.00000    90  202.0000
## 17 63.00000       0 29.77778          0.00000000  60.00000   100  262.0000
## 18 82.00000       1 22.95909          0.00000000 100.00000    90  200.0000
## 19 66.00000       0 24.76756          0.00000000  50.00000    60  199.0000
## 20 50.00000       0 20.70082          0.00000000  51.65625   100  194.0000
## 21 78.00000       1 28.72008          0.06700000  75.00000    70  176.0000
## 22 73.00000       1 27.95976          0.01000000  83.00000    70  160.0000
## 23 60.00000       0 22.38631          0.13000000  40.00000   100  111.0000
## 24 70.00000       1 25.27344          0.03000000  51.65625    90  276.0000
## 25 64.00000       0 18.35937          0.03100000  40.00000    70  155.0000
## 26 57.00000       0 23.24341          0.04000000  30.00000    70  197.0000
```

```
## 27 71.00000       1 21.36752          0.05500000   0.00000    80  206.0000
## 28 75.00000       1 24.21875          0.08800000  25.00000   100  208.0000
## 29 68.00000       0 26.57313          0.03800000  40.00000    90  191.0000
## 30 62.00000       0 27.04164          0.00000000  60.00000    90  201.0000
## 31 51.00000       0 18.92494          0.07500000  45.00000    60  142.0000
## 32 80.00000       1 21.23057          0.15900000  40.00000    80  187.4545
## 33 65.00000       0 31.22130          0.04500000  85.00000    95  192.0000
## 34 62.00000       0 35.62902          0.00000000  25.00000    70  397.0000
##          LDH Prot_tot Albumina   Hb Leucoc_tot Neutrofilos Linf_tot Plaquetas
## 1   163.0000 7.000000 4.100000 15.3      10100        8000     1400    273000
## 2   171.0000 6.000000 3.700000 11.8       9800        8200      800    124000
## 3   197.0000 7.200000 4.300000 16.7       9900        7400     1400    349000
## 4   159.0000 7.100000 4.000000 14.6       5600        3000     1800    220000
## 5   198.0000 7.900000 4.400000 15.7       8900        5300     2300    350000
## 6   220.0000 8.000000 4.300000 13.1       8800        6000     1600    279000
## 7   198.0000 6.400000 3.600000 11.5      10000        9000      400    269000
## 8   184.0000 7.000000 3.900000 12.3       7700        5300     1600    201000
## 9   176.0000 6.900000 3.700000 12.9      16200       13200     1900    317000
## 10  199.0000 7.300000 4.000000 13.0      15700       13400     1400    324000
## 11  190.0000 7.300000 3.500000 13.6      10600        8000     1500    489000
## 12  198.0000 6.500000 3.700000 11.4       8700        5000     2500    216000
## 13  184.0000 7.300000 4.100000 13.7      12600        8700     2200    455000
## 14  183.0000 7.000000 4.100000 13.7      11400        7600     2300    274000
## 15  204.0000 7.200000 4.400000 11.9      13400        9400     2900    208000
## 16  276.0000 5.600000 3.200000 15.5      13100       12300      500    112000
## 17  201.0000 5.400000 2.800000 11.6       4100        2500      800    293000
## 18  383.0000 8.900000 3.900000 12.1      11700        7100     2700    358000
## 19  382.0000 6.300000 3.700000 10.6       4000        2600      900    338000
## 20  156.0000 7.300000 4.300000 11.5      10800        9400      500    464000
## 21  175.0000 7.100000 4.300000 11.5      10600        7300     1200    158000
## 22  195.0000 7.300000 4.100000 12.6       7700        4800     1900    248000
## 23  326.0000 6.400000 3.000000 13.5       6800        5400      700    335000
## 24  263.6452 7.000000 3.900000 14.1       6000        3500     2000    143000
## 25 1644.0000 6.900000 3.400000 10.9      13800        8700     3000    709000
## 26  279.0000 6.900000 4.400000 13.0       6300        4300     1100    287000
## 27  164.0000 6.600000 4.000000 14.0       6200        4800      800    295000
## 28  222.0000 7.400000 4.100000 12.4       7200        4900     1500    228000
## 29  267.0000 6.900000 3.500000 14.5      20500       11500     3300    271000
## 30  248.0000 7.300000 4.200000 13.6      14100        8400     3500    461000
## 31  263.6452 7.100000 3.900000 12.8       9600        7100     1300    327000
## 32  263.6452 7.006061 3.912121 12.6       7600        5300     1300    249000
## 33  230.0000 7.700000 4.400000 15.3       8400        5400     1800    306000
## 34  201.0000 7.000000 4.200000 14.2      12500       10700     1300    234000
##      NLR_pre   PLR_pre  PNI_pre   ALI_pre   SII_pre  Prot_1C  Alb_1C Hb_1C
## 1   5.714286 195.00000 48.00000 20.153851 1560000.0 7.500000 4.60000  15.9
## 2  10.250000 155.00000 41.00000 12.771249 1271000.0 6.200000 3.90000  11.7
## 3   5.285714 249.28571 50.00000 20.916253 1844714.3 7.200000 4.40000  16.1
## 4   1.666667 122.22222 49.00000 67.796610  366666.7 7.048387 3.90625  15.5
## 5   2.304348 152.17391 55.50000 55.478130  806521.7 7.400000 4.50000  15.9
## 6   3.750000 174.37500 51.00000 33.059079 1046250.0 8.100000 4.20000  14.5
## 7  22.500000 672.50000 38.00000  4.764444 6052500.0 6.500000 4.00000  11.6
## 8   3.312500 125.62500 47.00000 30.432089  665812.5 7.700000 4.00000  12.1
## 9   6.947368 166.84211 46.50000 11.887852 2202315.8 7.048387 3.90000  14.5
## 10  9.571429 231.42857 47.00000  9.886163 3101142.9 7.400000 4.00000  13.5
```

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## 11  5.333333 326.00000 42.50000 15.814286 2608000.0 7.000000 3.40000  11.4
## 12  2.000000  86.40000 49.50000 46.164703  432000.0 7.100000 4.10000  11.6
## 13  3.954545 206.81818 52.00000 27.180583 1799318.2 7.300000 4.00000  14.3
## 14  3.304348 119.13043 52.50000 25.171285  905391.3 7.000000 3.70000  10.8
## 15  3.241379  71.72414 58.50000 29.945757  674206.9 6.900000 3.70000  11.3
## 16 24.600000 224.00000 34.50000  3.202987 2755200.0 7.800000 4.20000  13.7
## 17  3.125000 366.25000 32.00000 26.680889  915625.0 4.600000 3.10000   8.4
## 18  2.629630 132.59259 52.50000 34.050591  941407.4 9.100000 4.00000  11.9
## 19  2.888889 375.55556 41.50000 31.721533  976444.4 6.000000 3.10000  11.1
## 20 18.800000 928.00000 45.50000  4.734761 8723200.0 8.000000 4.50000  11.9
## 21  6.083333 131.66667 49.00000 20.300771  961166.7 7.200000 4.20000  10.2
## 22  2.526316 130.52632 50.50000 45.376360  626526.3 7.300000 3.80000  12.5
## 23  7.714286 478.57143 33.50000  8.705789 2584285.7 6.800000 3.60000  16.0
## 24  1.750000  71.50000 49.00000 56.323661  250250.0 7.400000 3.90000  12.9
## 25  2.900000 236.33333 49.00000 21.524784 2056100.0 7.300000 3.60000  11.1
## 26  3.909091 260.90909 49.50000 26.162348 1121909.1 6.400000 3.70000  11.7
## 27  6.000000 368.75000 44.00000 14.245014 1770000.0 6.900000 4.10000  13.6
## 28  3.266667 152.00000 48.50000 30.397003  744800.0 7.100000 4.00000  11.7
## 29  3.484848  82.12121 51.50000 26.688665  944393.9 6.800000 3.30000  14.5
## 30  2.400000 131.71429 59.50000 47.322877 1106400.0 6.300000 3.80000  11.6
## 31  5.461538 251.53846 45.50000 13.514007 1785923.1 6.500000 3.30000  10.5
## 32  4.076923 191.53846 47.42424 26.858982 1015153.8 7.100000 4.30000  13.2
## 33  3.000000 170.00000 53.00000 45.791246  918000.0 7.048387 3.90625  15.6
## 34  8.230769 180.00000 48.50000 18.180788 1926000.0 6.600000 4.10000  15.4
##    Leucoc_1C Neutr_1C Linf_1C Plaq_1C    NLR_1C    PLR_1C   PNI_1C    SII_1C
## 1       8100     6000    1600  369000  3.750000 230.62500 54.00000 1383750.0
## 2       8500     7000     800  112000  8.750000 140.00000 43.00000  980000.0
## 3      12000     8000    2500  382000  3.200000 152.80000 56.50000 1222400.0
## 4       7300     4400    2000  266000  2.200000 133.00000 10.00000  585200.0
## 5       9200     4900    3100  364000  1.580645 117.41935 60.50000  575354.8
## 6       8000     5300    1600  293000  3.312500 183.12500 50.00000  970562.5
## 7       4500     3200     900  218000  3.555556 242.22222 44.50000  775111.1
## 8       3600     1900     900  131000  2.111111 145.55556 44.50000  276555.6
## 9      16100    12100    2900  380000  4.172414 131.03448 53.50000 1585517.2
## 10     12800     9800    1900  214000  5.157895 112.63158 49.50000 1103789.5
## 11     12500    10400    1000  463000 10.400000 463.00000 39.00000 4815200.0
## 12      7600     3700    2900  242000  1.275862  83.44828 55.50000  308758.6
## 13     11300     6200    3600  452000  1.722222 125.55556 58.00000  778444.4
## 14     15400    11300    2500  444000  4.520000 177.60000 49.50000 2006880.0
## 15     10400     8400    1000  272000  8.400000 272.00000 42.00000 2284800.0
## 16     14100     9700    3100  494000  3.129032 159.35484 57.50000 1545741.9
## 17      4800     3300     700  226000  4.714286 322.85714 34.50000 1065428.6
## 18     11100     6000    3000  380000  2.000000 126.66667 55.00000  760000.0
## 19      3600     1700    1100  338000  1.545455 307.27273 36.50000  522363.6
## 20     10900     8900    1200  465000  7.416667 387.50000 51.00000 3448750.0
## 21     13800     9300    1600  205000  5.812500 128.12500 50.00000 1191562.5
## 22      7400     4600    1800  304000  2.555556 168.88889 47.00000  776888.9
## 23      4600     3000    1100  274000  2.727273 249.09091 41.50000  747272.7
## 24      6000     3000    2200  277000  1.363636 125.90909 50.00000  377727.3
## 25     12600     7000    3600  650000  1.944444 180.55556 54.00000 1263888.9
## 26      9000     6300     800  457000  7.875000 571.25000 41.00000 3598875.0
## 27      4900     2700    1600  192000  1.687500 120.00000 49.00000  324000.0
## 28      6900     5900     600  259000  9.833333 431.66667 43.00000 2546833.3
## 29     12800     6800    2800  366000  2.428571 130.71429 47.00000  888857.1
```

```
## 30      8700     4600    2200  553000  2.090909 251.36364 49.00000 1156272.7
## 31      9000     6300    1200  513000  5.250000 427.50000 39.00000 2693250.0
## 32     13100     8700    2900  345000  3.000000 118.96552 57.50000 1035000.0
## 33     10000     6800    2000  323000  3.400000 161.50000 47.33333 1098200.0
## 34     10200     7600    1700  208000  4.470588 122.35294 49.50000  929882.4
##     Prot_2C   Alb_2C    Hb_2C Leucoc_2C  Neutr_2C  Linf_2C  Plaq_2C    NLR_2C
## 1  7.900000 4.500000 16.50000   6400.00  3400.000 2300.000 253000.0  1.478261
## 2  6.100000 3.700000 11.40000   8300.00  6200.000 1200.000 126000.0  5.166667
## 3  7.200000 4.400000 16.70000   8400.00  4500.000 3000.000 329000.0  1.500000
## 4  7.200000 4.100000 15.30000   7200.00  4300.000 1900.000 254000.0  2.263158
## 5  8.000000 4.500000 16.30000   9200.00  5100.000 2800.000 313000.0  1.821429
## 6  8.100000 4.500000 15.50000   8000.00  5300.000 1800.000    285.0  2.944444
## 7  7.200000 4.100000 12.40000   8200.00  6400.000 1100.000 265000.0  5.818182
## 8  7.223333 4.012903 13.15312   9106.25  5796.875 2090.625 305883.9  3.348731
## 9  7.223333 3.700000 13.40000  19400.00 16100.000 2300.000 406000.0  7.000000
## 10 7.500000 4.100000 13.40000   8700.00  5500.000 2200.000 226000.0  2.500000
## 11 6.500000 2.900000  8.60000  14500.00 12100.000 1200.000 858000.0 10.083333
## 12 6.800000 3.900000 11.40000   9400.00  4400.000 3100.000 260000.0  1.419355
## 13 7.100000 4.200000 15.00000  10200.00  5100.000 2900.000 319000.0  1.758621
## 14 7.200000 4.000000 10.90000  14700.00  9900.000 3500.000 408000.0  2.828571
## 15 7.200000 3.900000 11.20000  10600.00  7900.000 1400.000 254000.0  5.642857
## 16 7.200000 3.900000 13.30000   9900.00  6100.000 2500.000 297000.0  2.440000
## 17 5.300000 3.000000 10.30000   3800.00  2300.000  800.000 218000.0  2.875000
## 18 8.800000 4.100000 12.90000  11200.00  6100.000 3300.000 272000.0  1.848485
## 19 6.700000 3.700000 11.60000   4000.00  1800.000 1500.000 394000.0  1.200000
## 20 7.900000 4.600000 12.30000   8600.00  6300.000 1200.000 425000.0  5.250000
## 21 6.900000 4.400000 10.40000  12500.00  8500.000 1500.000 217000.0  5.666667
## 22 7.700000 3.900000 13.40000   6400.00  3600.000 1800.000 194000.0  2.000000
## 23 7.800000 3.600000 15.80000   5400.00  3700.000 1000.000 237000.0  3.700000
## 24 7.400000 4.000000 13.20000   5100.00  2400.000 2100.000 240000.0  1.142857
## 25 7.500000 3.800000 11.40000  13900.00  7900.000 3900.000 615000.0  2.025641
## 26 7.223333 4.012903 13.15312   9106.25  5796.875 2090.625 305883.9  3.348731
## 27 6.800000 4.200000 13.50000   5300.00  3300.000 1400.000 235000.0  2.357143
## 28 7.100000 4.000000 11.70000   6900.00  5900.000  600.000 259000.0  9.833333
## 29 7.500000 3.700000 13.80000  12000.00  5700.000 4000.000 256000.0  1.425000
## 30 6.300000 4.100000 13.00000   8300.00  4100.000 2900.000 343000.0  1.413793
## 31 7.223333 4.012903 11.40000   7600.00  4900.000 1300.000 412000.0  3.769231
## 32 7.500000 4.500000 12.90000   8800.00  5800.000 1800.000 337000.0  3.222222
## 33 7.700000 4.300000 15.70000   9600.00  5900.000 2200.000 312000.0  2.681818
## 34 6.600000 4.100000 16.30000   8900.00  5000.000 2400.000 254000.0  2.083333
##    NLR2C_corte4o5      PLR_2C   PNI_2C       SII_2C Prot_1eval Alb_1eval
## 1            0.00 110.0000000 56.50000  374000.0000   7.300000       4.4
## 2            1.00 105.0000000 43.00000  651000.0000   6.000000       3.9
## 3            0.00 109.6666667 59.00000  493500.0000   7.100000       4.5
## 4            0.00 133.6842105 50.50000  574842.1053   7.200000       4.0
## 5            0.00 111.7857143 59.00000  570107.1429   7.087097       4.3
## 6            0.00   0.1583333 54.00000     839.1667   7.600000       4.4
## 7            1.00 240.9090909 46.50000 1541818.1818   6.700000       3.9
## 8            0.25 177.5906414 50.70968 1134689.6890   6.400000       4.2
## 9            1.00 176.5217391 48.50000 2842000.0000   6.900000       3.7
## 10           0.00 102.7272727 52.00000  565000.0000   7.700000       4.5
## 11           1.00 715.0000000 35.00000 8651500.0000   7.000000       3.1
## 12           0.00  83.8709677 54.50000  369032.2581   7.200000       4.0
## 13           0.00 110.0000000 56.50000  561000.0000   7.100000       4.2
```

```
## 14           0.00 116.5714286 57.50000 1154057.1429   8.000000       4.5
## 15           1.00 181.4285714 46.00000 1433285.7143   7.087097       3.8
## 16           0.00 118.8000000 51.50000  724680.0000   7.000000       4.1
## 17           0.00 272.5000000 34.00000  626750.0000   5.500000       3.6
## 18           0.00  82.4242424 57.50000  502787.8788   8.500000       4.1
## 19           0.00 262.6666667 44.50000  472800.0000   7.100000       3.9
## 20           1.00 354.1666667 52.00000 2231250.0000   7.300000       3.7
## 21           1.00 144.6666667 51.50000 1229666.6667   6.400000       3.9
## 22           0.00 107.7777778 48.00000  388000.0000   7.700000       3.9
## 23           0.00 237.0000000 41.00000  876900.0000   7.087097       3.1
## 24           0.00 114.2857143 50.50000  274285.7143   7.700000       4.1
## 25           0.00 157.6923077 57.50000 1245769.2308   7.800000       3.9
## 26           0.25 177.5906414 50.70968 1134689.6890   6.400000       3.7
## 27           0.00 167.8571429 49.00000  553928.5714   7.000000       4.2
## 28           1.00 431.6666667 43.00000 2546833.3333   7.100000       4.0
## 29           0.00  64.0000000 57.00000  364800.0000   6.900000       3.9
## 30           0.00 118.2758621 55.50000  484931.0345   6.300000       4.1
## 31           0.00 316.9230769 50.70968 1552923.0769   7.000000       4.0
## 32           0.00 187.2222222 54.00000 1085888.8889   7.700000       4.6
## 33           0.00 141.8181818 54.00000  836727.2727   7.500000       4.3
## 34           0.00 105.8333333 53.00000  529166.6667   6.600000       4.1
##    Hb_1eval Leucoc_1eval Neutr_1eval Linf_1eval Plaq_1eval NLR_1eval  PLR_1eval
## 1      16.9         8000        5300       2100     262000  2.523810  124.76190
## 2      11.2         7500        5500       1300      96000  4.230769   73.84615
## 3      16.6         8700        4900       2900     315000  1.689655  108.62069
## 4      15.7         7800        4400       2500     259000  1.760000  103.60000
## 5      16.5         8700        4600       2800     285000  1.642857  101.78571
## 6      15.4         8000        5900       1400     263000  4.214286  187.85714
## 7      11.1         7600        6000       1000     229000  6.000000  229.00000
## 8      11.6         8600        6300       1400     124000  4.500000   88.57143
## 9      12.9        16200       13200       1900     317000  6.947368  166.84211
## 10     14.6         7400        4700       1900     219000  2.473684  115.26316
## 11      8.8        10200        9100        500     527000 18.200000 1054.00000
## 12     10.8        11100        7200       2600     227000  2.769231   87.30769
## 13     15.1         9100        5000       2900     308000  1.724138  106.20690
## 14     12.9        18400       13600       3200     328000  4.250000  102.50000
## 15     11.3         9400        7200        900     309000  8.000000  343.33333
## 16     15.8         9800        6000       2600     205000  2.307692   78.84615
## 17     13.7         4600        2600       1100     220000  2.363636  200.00000
## 18     12.7        10200        5400       3100     282000  1.741935   90.96774
## 19     12.2         3100        1400       1300     290000  1.076923  223.07692
## 20     12.5         9200        7100       1100     400000  6.454545  363.63636
## 21      9.9        10000        7500        800     216000  9.375000  270.00000
## 22     13.4         6400        3600       1800     194000  2.000000  107.77778
## 23     14.9         4500        2900       1000     220000  2.900000  220.00000
## 24     13.8         4300        2200       1600     234000  1.375000  146.25000
## 25     11.8        13900        7700       4000     647000  1.925000  161.75000
## 26     11.7         9000        6300        800     457000  7.875000  571.25000
## 27     13.8         4600        3100       1100     257000  2.818182  233.63636
## 28     11.7         6900        5900        600     259000  9.833333  431.66667
## 29     14.5         9100        4200       3500     199000  1.200000   56.85714
## 30     13.0         8300        4100       2900     343000  1.413793  118.27586
## 31     11.3         7300        4300       1800     353000  2.388889  196.11111
## 32     12.9         9700        6500       2100     308000  3.095238  146.66667
```

```
## 33     15.9         8700        6000       1600     320000  3.750000  200.00000
## 34     16.3         8900        5000       2400     254000  2.083333  105.83333
##    PNI_1eval SII_1eval N_ciclos        SLP SLP_cens        SG SG_cens
## 1       54.5  661238.1       35 29.8644764        1 29.864476       1
## 2       45.5  406153.8       35 60.3860370        1 60.386037       1
## 3       59.5  532241.4        7 35.1868583        0 57.626283       1
## 4       52.5  455840.0       11  7.3921971        0 33.741273       0
## 5       57.0  468214.3        7  4.5010267        0 18.825462       0
## 6       51.0 1108357.1        4 41.4948665        1 41.494867       1
## 7       44.0 1374000.0       19 24.0164271        0 30.225873       0
## 8       49.0  558000.0        1  7.8850103        1  7.885010       1
## 9       46.5 2202315.8        3  1.8069815        0  1.806982       0
## 10      54.5  541736.8       26 19.9425051        1 19.942505       0
## 11      33.5 9591400.0        3  1.8726899        0 17.478439       0
## 12      53.0  628615.4        5 40.7392197        1 40.739220       0
## 13      56.5  531034.5       11  7.4579055        0 41.002053       0
## 14      61.0 1394000.0        6  5.6509240        0  8.837782       0
## 15      42.5 2472000.0        6  3.6796715        0  6.570842       0
## 16      54.0  473076.9       32 22.3737166        0 28.747433       0
## 17      41.5  520000.0       25 21.9794661        1 21.979466       0
## 18      56.5  491225.8       35 46.3244353        1 46.324435       1
## 19      45.5  312307.7       16 35.3182752        0 35.318275       1
## 20      42.5 2581818.2       25 45.6344969        1 45.634497       1
## 21      43.0 2025000.0        3  1.9055441        0  5.749487       0
## 22      48.0  388000.0        5  7.2607803        0 22.078029       0
## 23      36.0  638000.0        8  9.3305955        1  9.330595       0
## 24      49.0  321750.0        8  7.1293634        0 16.131417       0
## 25      59.0 1245475.0        8  5.6180698        0 10.611910       0
## 26      41.0 3598875.0        1  0.7556468        0 41.166324       0
## 27      47.5  724272.7       35 31.1457906        1 31.145791       1
## 28      43.0 2546833.3        2  1.3798768        0  1.839836       0
## 29      56.5  238800.0       27 17.8069815        0 26.579055       0
## 30      55.5  484931.0       13 11.1704312        0 22.702259       0
## 31      49.0  843277.8        4  1.8069815        0 16.000000       0
## 32      56.5  953333.3       35 40.2135524        1 40.213552       1
## 33      51.0 1200000.0       23 16.1642710        0 35.778234       0
## 34      53.0  529166.7       35 39.4579055        1 39.457906       1
##    Porcentaje_NA_Fila
## 1            3.409091
## 2            0.000000
## 3            0.000000
## 4            3.409091
## 5            2.272727
## 6            1.136364
## 7            1.136364
## 8           14.772727
## 9            5.681818
## 10           0.000000
## 11           2.272727
## 12           0.000000
## 13           0.000000
## 14           0.000000
## 15           1.136364
## 16           0.000000
```

```
## 17           1.136364
## 18           1.136364
## 19           0.000000
## 20           2.272727
## 21           0.000000
## 22           1.136364
## 23           2.272727
## 24           6.818182
## 25           0.000000
## 26          13.636364
## 27           0.000000
## 28           1.136364
## 29           0.000000
## 30           0.000000
## 31           5.681818
## 32          10.227273
## 33           4.545455
## 34           1.136364
```

```
df_imputado1$Edad_dx <- round(df_imputado1$Edad_dx, 0)
df_imputado1$LDH <- round(df_imputado1$LDH, 0)
df_imputado1$LDH <- round(df_imputado1$LDH, 0)
df_imputado1$Exp_tab <- round(df_imputado1$Exp_tab, 0)
df_imputado1$Col_total <- round(df_imputado1$Col_total, 0)
df_imputado1$Leucoc_1C <- round(df_imputado1$Leucoc_1C, 0)
df_imputado1$Neutr_1C <- round(df_imputado1$Neutr_1C, 0)
df_imputado1$Linf_1C <- round(df_imputado1$Linf_1C, 0)
df_imputado1$Plaq_1C <- round(df_imputado1$Plaq_1C, 0)
df_imputado1$Prot_1C <- round(df_imputado1$Prot_1C, 1)
df_imputado1$Alb_1C <- round(df_imputado1$Alb_1C, 1)
df_imputado1$Hb_1C <- round(df_imputado1$Hb_1C, 1)
df_imputado1$Prot_tot <- round(df_imputado1$Prot_tot, 1)
df_imputado1$Albumina <- round(df_imputado1$Albumina, 1)
df_imputado1$Porcentaje_perdpeso <- round(df_imputado1$Porcentaje_perdpeso, 4)
df_imputado1$NLR_pre <- round(df_imputado1$NLR_pre, 2)
df_imputado1$PLR_pre <- round(df_imputado1$PLR_pre, 2)
df_imputado1$PNI_pre <- round(df_imputado1$PNI_pre, 2)
df_imputado1$ALI_pre <- round(df_imputado1$ALI_pre, 2)
df_imputado1$SII_pre <- round(df_imputado1$SII_pre, 2)
df_imputado1$NLR_1C <- round(df_imputado1$NLR_1C, 2)
df_imputado1$PLR_2C <- round(df_imputado1$PLR_2C, 2)
df_imputado1$SII_2C <- round(df_imputado1$SII_2C, 2)
df_imputado1$IMC <- round(df_imputado1$IMC , 2)
df_imputado1$PLR_1C <- round(df_imputado1$PLR_1C, 2)
df_imputado1$PNI_1C <- round(df_imputado1$PNI_1C, 2)
df_imputado1$Prot_2C <- round(df_imputado1$Prot_2C, 2)
df_imputado1$Alb_2C <- round(df_imputado1$Alb_2C, 2)
df_imputado1$Hb_2C <- round(df_imputado1$Hb_2C, 2)
df_imputado1$Leucoc_2C <- round(df_imputado1$Leucoc_2C, 2)
df_imputado1$Neutr_2C <- round(df_imputado1$Neutr_2C, 2)
df_imputado1$Linf_2C <- round(df_imputado1$Linf_2C, 2)
df_imputado1$PNI_2C <- round(df_imputado1$PNI_2C, 2)
df_imputado1$Prot_1eval <- round(df_imputado1$Prot_1eval, 2)
df_imputado1$NLR_1eval <- round(df_imputado1$NLR_1eval, 2)
```

```r
df_imputado1$PLR_1eval <- round(df_imputado1$PLR_1eval, 2)
df_imputado1$SLP <- round(df_imputado1$SLP, 2)
df_imputado1$SG <- round(df_imputado1$SG, 2)
```

```r
df_imputado1
```

```
##    Edad_dx Anciano   IMC Porcentaje_perdpeso Exp_tab PD_L1 Col_total  LDH
## 1       46       0 28.09               0.0458      20   100       217  163
## 2       68       0 35.38               0.0000       0    70       154  171
## 3       59       0 25.71               0.0000      45    50       146  197
## 4       72       1 28.25               0.0000      92     2       149  159
## 5       50       0 29.05               0.1000      55    60       210  198
## 6       71       1 28.83               0.0000     200    90       162  220
## 7       71       1 29.78               0.0760      60   100       142  198
## 8       79       1 25.85               0.0000      40    70       167  184
## 9       73       1 22.32               0.0458      50    90       153  176
## 10      69       0 23.66               0.0000      50    70       132  199
## 11      56       0 24.10               0.0458      36    80       113  190
## 12      66       0 24.95               0.2290      50    50       182  198
## 13      62       0 26.22               0.1380       0    80       242  184
## 14      64       0 20.29               0.1100      50   100       133  183
## 15      59       0 22.06               0.0000      25    95       215  204
## 16      60       0 24.62               0.0000      82    90       202  276
## 17      63       0 29.78               0.0000      60   100       262  201
## 18      82       1 22.96               0.0000     100    90       200  383
## 19      66       0 24.77               0.0000      50    60       199  382
## 20      50       0 20.70               0.0000      52   100       194  156
## 21      78       1 28.72               0.0670      75    70       176  175
## 22      73       1 27.96               0.0100      83    70       160  195
## 23      60       0 22.39               0.1300      40   100       111  326
## 24      70       1 25.27               0.0300      52    90       276  264
## 25      64       0 18.36               0.0310      40    70       155 1644
## 26      57       0 23.24               0.0400      30    70       197  279
## 27      71       1 21.37               0.0550       0    80       206  164
## 28      75       1 24.22               0.0880      25   100       208  222
## 29      68       0 26.57               0.0380      40    90       191  267
## 30      62       0 27.04               0.0000      60    90       201  248
## 31      51       0 18.92               0.0750      45    60       142  264
## 32      80       1 21.23               0.1590      40    80       187  264
## 33      65       0 31.22               0.0450      85    95       192  230
## 34      62       0 35.63               0.0000      25    70       397  201
##    Prot_tot Albumina   Hb Leucoc_tot Neutrofilos Linf_tot Plaquetas NLR_pre
## 1       7.0      4.1 15.3      10100        8000     1400    273000    5.71
## 2       6.0      3.7 11.8       9800        8200      800    124000   10.25
## 3       7.2      4.3 16.7       9900        7400     1400    349000    5.29
## 4       7.1      4.0 14.6       5600        3000     1800    220000    1.67
## 5       7.9      4.4 15.7       8900        5300     2300    350000    2.30
## 6       8.0      4.3 13.1       8800        6000     1600    279000    3.75
## 7       6.4      3.6 11.5      10000        9000      400    269000   22.50
## 8       7.0      3.9 12.3       7700        5300     1600    201000    3.31
## 9       6.9      3.7 12.9      16200       13200     1900    317000    6.95
## 10      7.3      4.0 13.0      15700       13400     1400    324000    9.57
## 11      7.3      3.5 13.6      10600        8000     1500    489000    5.33
```

```
## 12      6.5      3.7 11.4       8700        5000     2500    216000    2.00
## 13      7.3      4.1 13.7      12600        8700     2200    455000    3.95
## 14      7.0      4.1 13.7      11400        7600     2300    274000    3.30
## 15      7.2      4.4 11.9      13400        9400     2900    208000    3.24
## 16      5.6      3.2 15.5      13100       12300      500    112000   24.60
## 17      5.4      2.8 11.6       4100        2500      800    293000    3.12
## 18      8.9      3.9 12.1      11700        7100     2700    358000    2.63
## 19      6.3      3.7 10.6       4000        2600      900    338000    2.89
## 20      7.3      4.3 11.5      10800        9400      500    464000   18.80
## 21      7.1      4.3 11.5      10600        7300     1200    158000    6.08
## 22      7.3      4.1 12.6       7700        4800     1900    248000    2.53
## 23      6.4      3.0 13.5       6800        5400      700    335000    7.71
## 24      7.0      3.9 14.1       6000        3500     2000    143000    1.75
## 25      6.9      3.4 10.9      13800        8700     3000    709000    2.90
## 26      6.9      4.4 13.0       6300        4300     1100    287000    3.91
## 27      6.6      4.0 14.0       6200        4800      800    295000    6.00
## 28      7.4      4.1 12.4       7200        4900     1500    228000    3.27
## 29      6.9      3.5 14.5      20500       11500     3300    271000    3.48
## 30      7.3      4.2 13.6      14100        8400     3500    461000    2.40
## 31      7.1      3.9 12.8       9600        7100     1300    327000    5.46
## 32      7.0      3.9 12.6       7600        5300     1300    249000    4.08
## 33      7.7      4.4 15.3       8400        5400     1800    306000    3.00
## 34      7.0      4.2 14.2      12500       10700     1300    234000    8.23
##    PLR_pre PNI_pre ALI_pre   SII_pre Prot_1C Alb_1C Hb_1C Leucoc_1C Neutr_1C
## 1   195.00   48.00   20.15 1560000.0     7.5    4.6  15.9      8100      6000
## 2   155.00   41.00   12.77 1271000.0     6.2    3.9  11.7      8500      7000
## 3   249.29   50.00   20.92 1844714.3     7.2    4.4  16.1     12000      8000
## 4   122.22   49.00   67.80  366666.7     7.0    3.9  15.5      7300      4400
## 5   152.17   55.50   55.48  806521.7     7.4    4.5  15.9      9200      4900
## 6   174.38   51.00   33.06 1046250.0     8.1    4.2  14.5      8000      5300
## 7   672.50   38.00    4.76 6052500.0     6.5    4.0  11.6      4500      3200
## 8   125.62   47.00   30.43  665812.5     7.7    4.0  12.1      3600      1900
## 9   166.84   46.50   11.89 2202315.8     7.0    3.9  14.5     16100     12100
## 10  231.43   47.00    9.89 3101142.9     7.4    4.0  13.5     12800      9800
## 11  326.00   42.50   15.81 2608000.0     7.0    3.4  11.4     12500     10400
## 12   86.40   49.50   46.16  432000.0     7.1    4.1  11.6      7600      3700
## 13  206.82   52.00   27.18 1799318.2     7.3    4.0  14.3     11300      6200
## 14  119.13   52.50   25.17  905391.3     7.0    3.7  10.8     15400     11300
## 15   71.72   58.50   29.95  674206.9     6.9    3.7  11.3     10400      8400
## 16  224.00   34.50    3.20 2755200.0     7.8    4.2  13.7     14100      9700
## 17  366.25   32.00   26.68  915625.0     4.6    3.1   8.4      4800      3300
## 18  132.59   52.50   34.05  941407.4     9.1    4.0  11.9     11100      6000
## 19  375.56   41.50   31.72  976444.4     6.0    3.1  11.1      3600      1700
## 20  928.00   45.50    4.73 8723200.0     8.0    4.5  11.9     10900      8900
## 21  131.67   49.00   20.30  961166.7     7.2    4.2  10.2     13800      9300
## 22  130.53   50.50   45.38  626526.3     7.3    3.8  12.5      7400      4600
## 23  478.57   33.50    8.71 2584285.7     6.8    3.6  16.0      4600      3000
## 24   71.50   49.00   56.32  250250.0     7.4    3.9  12.9      6000      3000
## 25  236.33   49.00   21.52 2056100.0     7.3    3.6  11.1     12600      7000
## 26  260.91   49.50   26.16 1121909.1     6.4    3.7  11.7      9000      6300
## 27  368.75   44.00   14.25 1770000.0     6.9    4.1  13.6      4900      2700
## 28  152.00   48.50   30.40  744800.0     7.1    4.0  11.7      6900      5900
## 29   82.12   51.50   26.69  944393.9     6.8    3.3  14.5     12800      6800
## 30  131.71   59.50   47.32 1106400.0     6.3    3.8  11.6      8700      4600
```

```
## 31  251.54   45.50   13.51 1785923.1     6.5    3.3  10.5      9000     6300
## 32  191.54   47.42   26.86 1015153.8     7.1    4.3  13.2     13100     8700
## 33  170.00   53.00   45.79  918000.0     7.0    3.9  15.6     10000     6800
## 34  180.00   48.50   18.18 1926000.0     6.6    4.1  15.4     10200     7600
##    Linf_1C Plaq_1C NLR_1C PLR_1C PNI_1C    SII_1C Prot_2C Alb_2C Hb_2C
## 1     1600  369000   3.75 230.62  54.00 1383750.0    7.90   4.50 16.50
## 2      800  112000   8.75 140.00  43.00  980000.0    6.10   3.70 11.40
## 3     2500  382000   3.20 152.80  56.50 1222400.0    7.20   4.40 16.70
## 4     2000  266000   2.20 133.00  10.00  585200.0    7.20   4.10 15.30
## 5     3100  364000   1.58 117.42  60.50  575354.8    8.00   4.50 16.30
## 6     1600  293000   3.31 183.12  50.00  970562.5    8.10   4.50 15.50
## 7      900  218000   3.56 242.22  44.50  775111.1    7.20   4.10 12.40
## 8      900  131000   2.11 145.56  44.50  276555.6    7.22   4.01 13.15
## 9     2900  380000   4.17 131.03  53.50 1585517.2    7.22   3.70 13.40
## 10    1900  214000   5.16 112.63  49.50 1103789.5    7.50   4.10 13.40
## 11    1000  463000  10.40 463.00  39.00 4815200.0    6.50   2.90  8.60
## 12    2900  242000   1.28  83.45  55.50  308758.6    6.80   3.90 11.40
## 13    3600  452000   1.72 125.56  58.00  778444.4    7.10   4.20 15.00
## 14    2500  444000   4.52 177.60  49.50 2006880.0    7.20   4.00 10.90
## 15    1000  272000   8.40 272.00  42.00 2284800.0    7.20   3.90 11.20
## 16    3100  494000   3.13 159.35  57.50 1545741.9    7.20   3.90 13.30
## 17     700  226000   4.71 322.86  34.50 1065428.6    5.30   3.00 10.30
## 18    3000  380000   2.00 126.67  55.00  760000.0    8.80   4.10 12.90
## 19    1100  338000   1.55 307.27  36.50  522363.6    6.70   3.70 11.60
## 20    1200  465000   7.42 387.50  51.00 3448750.0    7.90   4.60 12.30
## 21    1600  205000   5.81 128.12  50.00 1191562.5    6.90   4.40 10.40
## 22    1800  304000   2.56 168.89  47.00  776888.9    7.70   3.90 13.40
## 23    1100  274000   2.73 249.09  41.50  747272.7    7.80   3.60 15.80
## 24    2200  277000   1.36 125.91  50.00  377727.3    7.40   4.00 13.20
## 25    3600  650000   1.94 180.56  54.00 1263888.9    7.50   3.80 11.40
## 26     800  457000   7.88 571.25  41.00 3598875.0    7.22   4.01 13.15
## 27    1600  192000   1.69 120.00  49.00  324000.0    6.80   4.20 13.50
## 28     600  259000   9.83 431.67  43.00 2546833.3    7.10   4.00 11.70
## 29    2800  366000   2.43 130.71  47.00  888857.1    7.50   3.70 13.80
## 30    2200  553000   2.09 251.36  49.00 1156272.7    6.30   4.10 13.00
## 31    1200  513000   5.25 427.50  39.00 2693250.0    7.22   4.01 11.40
## 32    2900  345000   3.00 118.97  57.50 1035000.0    7.50   4.50 12.90
## 33    2000  323000   3.40 161.50  47.33 1098200.0    7.70   4.30 15.70
## 34    1700  208000   4.47 122.35  49.50  929882.4    6.60   4.10 16.30
##    Leucoc_2C Neutr_2C Linf_2C  Plaq_2C    NLR_2C NLR2C_corte4o5 PLR_2C PNI_2C
## 1    6400.00  3400.00 2300.00 253000.0  1.478261           0.00 110.00  56.50
## 2    8300.00  6200.00 1200.00 126000.0  5.166667           1.00 105.00  43.00
## 3    8400.00  4500.00 3000.00 329000.0  1.500000           0.00 109.67  59.00
## 4    7200.00  4300.00 1900.00 254000.0  2.263158           0.00 133.68  50.50
## 5    9200.00  5100.00 2800.00 313000.0  1.821429           0.00 111.79  59.00
## 6    8000.00  5300.00 1800.00    285.0  2.944444           0.00   0.16  54.00
## 7    8200.00  6400.00 1100.00 265000.0  5.818182           1.00 240.91  46.50
## 8    9106.25  5796.88 2090.62 305883.9  3.348731           0.25 177.59  50.71
## 9   19400.00 16100.00 2300.00 406000.0  7.000000           1.00 176.52  48.50
## 10   8700.00  5500.00 2200.00 226000.0  2.500000           0.00 102.73  52.00
## 11  14500.00 12100.00 1200.00 858000.0 10.083333           1.00 715.00  35.00
## 12   9400.00  4400.00 3100.00 260000.0  1.419355           0.00  83.87  54.50
## 13  10200.00  5100.00 2900.00 319000.0  1.758621           0.00 110.00  56.50
## 14  14700.00  9900.00 3500.00 408000.0  2.828571           0.00 116.57  57.50
```

```
## 15  10600.00  7900.00 1400.00 254000.0  5.642857          1.00 181.43  46.00
## 16   9900.00  6100.00 2500.00 297000.0  2.440000          0.00 118.80  51.50
## 17   3800.00  2300.00  800.00 218000.0  2.875000          0.00 272.50  34.00
## 18  11200.00  6100.00 3300.00 272000.0  1.848485          0.00  82.42  57.50
## 19   4000.00  1800.00 1500.00 394000.0  1.200000          0.00 262.67  44.50
## 20   8600.00  6300.00 1200.00 425000.0  5.250000          1.00 354.17  52.00
## 21  12500.00  8500.00 1500.00 217000.0  5.666667          1.00 144.67  51.50
## 22   6400.00  3600.00 1800.00 194000.0  2.000000          0.00 107.78  48.00
## 23   5400.00  3700.00 1000.00 237000.0  3.700000          0.00 237.00  41.00
## 24   5100.00  2400.00 2100.00 240000.0  1.142857          0.00 114.29  50.50
## 25  13900.00  7900.00 3900.00 615000.0  2.025641          0.00 157.69  57.50
## 26   9106.25  5796.88 2090.62 305883.9  3.348731          0.25 177.59  50.71
## 27   5300.00  3300.00 1400.00 235000.0  2.357143          0.00 167.86  49.00
## 28   6900.00  5900.00  600.00 259000.0  9.833333          1.00 431.67  43.00
## 29  12000.00  5700.00 4000.00 256000.0  1.425000          0.00  64.00  57.00
## 30   8300.00  4100.00 2900.00 343000.0  1.413793          0.00 118.28  55.50
## 31   7600.00  4900.00 1300.00 412000.0  3.769231          0.00 316.92  50.71
## 32   8800.00  5800.00 1800.00 337000.0  3.222222          0.00 187.22  54.00
## 33   9600.00  5900.00 2200.00 312000.0  2.681818          0.00 141.82  54.00
## 34   8900.00  5000.00 2400.00 254000.0  2.083333          0.00 105.83  53.00
##        SII_2C Prot_1eval Alb_1eval Hb_1eval Leucoc_1eval Neutr_1eval Linf_1eval
## 1   374000.00       7.30       4.4     16.9         8000        5300        2100
## 2   651000.00       6.00       3.9     11.2         7500        5500        1300
## 3   493500.00       7.10       4.5     16.6         8700        4900        2900
## 4   574842.11       7.20       4.0     15.7         7800        4400        2500
## 5   570107.14       7.09       4.3     16.5         8700        4600        2800
## 6      839.17       7.60       4.4     15.4         8000        5900        1400
## 7  1541818.18       6.70       3.9     11.1         7600        6000        1000
## 8  1134689.69       6.40       4.2     11.6         8600        6300        1400
## 9  2842000.00       6.90       3.7     12.9        16200       13200        1900
## 10  565000.00       7.70       4.5     14.6         7400        4700        1900
## 11 8651500.00       7.00       3.1      8.8        10200        9100         500
## 12  369032.26       7.20       4.0     10.8        11100        7200        2600
## 13  561000.00       7.10       4.2     15.1         9100        5000        2900
## 14 1154057.14       8.00       4.5     12.9        18400       13600        3200
## 15 1433285.71       7.09       3.8     11.3         9400        7200         900
## 16  724680.00       7.00       4.1     15.8         9800        6000        2600
## 17  626750.00       5.50       3.6     13.7         4600        2600        1100
## 18  502787.88       8.50       4.1     12.7        10200        5400        3100
## 19  472800.00       7.10       3.9     12.2         3100        1400        1300
## 20 2231250.00       7.30       3.7     12.5         9200        7100        1100
## 21 1229666.67       6.40       3.9      9.9        10000        7500         800
## 22  388000.00       7.70       3.9     13.4         6400        3600        1800
## 23  876900.00       7.09       3.1     14.9         4500        2900        1000
## 24  274285.71       7.70       4.1     13.8         4300        2200        1600
## 25 1245769.23       7.80       3.9     11.8        13900        7700        4000
## 26 1134689.69       6.40       3.7     11.7         9000        6300         800
## 27  553928.57       7.00       4.2     13.8         4600        3100        1100
## 28 2546833.33       7.10       4.0     11.7         6900        5900         600
## 29  364800.00       6.90       3.9     14.5         9100        4200        3500
## 30  484931.03       6.30       4.1     13.0         8300        4100        2900
## 31 1552923.08       7.00       4.0     11.3         7300        4300        1800
## 32 1085888.89       7.70       4.6     12.9         9700        6500        2100
## 33  836727.27       7.50       4.3     15.9         8700        6000        1600
```

```
## 34  529166.67       6.60       4.1     16.3         8900        5000       2400
##    Plaq_1eval NLR_1eval PLR_1eval PNI_1eval SII_1eval N_ciclos   SLP SLP_cens
## 1      262000      2.52    124.76      54.5  661238.1       35 29.86        1
## 2       96000      4.23     73.85      45.5  406153.8       35 60.39        1
## 3      315000      1.69    108.62      59.5  532241.4        7 35.19        0
## 4      259000      1.76    103.60      52.5  455840.0       11  7.39        0
## 5      285000      1.64    101.79      57.0  468214.3        7  4.50        0
## 6      263000      4.21    187.86      51.0 1108357.1        4 41.49        1
## 7      229000      6.00    229.00      44.0 1374000.0       19 24.02        0
## 8      124000      4.50     88.57      49.0  558000.0        1  7.89        1
## 9      317000      6.95    166.84      46.5 2202315.8        3  1.81        0
## 10     219000      2.47    115.26      54.5  541736.8       26 19.94        1
## 11     527000     18.20   1054.00      33.5 9591400.0        3  1.87        0
## 12     227000      2.77     87.31      53.0  628615.4        5 40.74        1
## 13     308000      1.72    106.21      56.5  531034.5       11  7.46        0
## 14     328000      4.25    102.50      61.0 1394000.0        6  5.65        0
## 15     309000      8.00    343.33      42.5 2472000.0        6  3.68        0
## 16     205000      2.31     78.85      54.0  473076.9       32 22.37        0
## 17     220000      2.36    200.00      41.5  520000.0       25 21.98        1
## 18     282000      1.74     90.97      56.5  491225.8       35 46.32        1
## 19     290000      1.08    223.08      45.5  312307.7       16 35.32        0
## 20     400000      6.45    363.64      42.5 2581818.2       25 45.63        1
## 21     216000      9.38    270.00      43.0 2025000.0        3  1.91        0
## 22     194000      2.00    107.78      48.0  388000.0        5  7.26        0
## 23     220000      2.90    220.00      36.0  638000.0        8  9.33        1
## 24     234000      1.38    146.25      49.0  321750.0        8  7.13        0
## 25     647000      1.93    161.75      59.0 1245475.0        8  5.62        0
## 26     457000      7.88    571.25      41.0 3598875.0        1  0.76        0
## 27     257000      2.82    233.64      47.5  724272.7       35 31.15        1
## 28     259000      9.83    431.67      43.0 2546833.3        2  1.38        0
## 29     199000      1.20     56.86      56.5  238800.0       27 17.81        0
## 30     343000      1.41    118.28      55.5  484931.0       13 11.17        0
## 31     353000      2.39    196.11      49.0  843277.8        4  1.81        0
## 32     308000      3.10    146.67      56.5  953333.3       35 40.21        1
## 33     320000      3.75    200.00      51.0 1200000.0       23 16.16        0
## 34     254000      2.08    105.83      53.0  529166.7       35 39.46        1
##       SG SG_cens Porcentaje_NA_Fila
## 1  29.86       1           3.409091
## 2  60.39       1           0.000000
## 3  57.63       1           0.000000
## 4  33.74       0           3.409091
## 5  18.83       0           2.272727
## 6  41.49       1           1.136364
## 7  30.23       0           1.136364
## 8   7.89       1          14.772727
## 9   1.81       0           5.681818
## 10 19.94       0           0.000000
## 11 17.48       0           2.272727
## 12 40.74       0           0.000000
## 13 41.00       0           0.000000
## 14  8.84       0           0.000000
## 15  6.57       0           1.136364
## 16 28.75       0           0.000000
## 17 21.98       0           1.136364
```

```
## 18 46.32       1           1.136364
## 19 35.32       1           0.000000
## 20 45.63       1           2.272727
## 21  5.75       0           0.000000
## 22 22.08       0           1.136364
## 23  9.33       0           2.272727
## 24 16.13       0           6.818182
## 25 10.61       0           0.000000
## 26 41.17       0          13.636364
## 27 31.15       1           0.000000
## 28  1.84       0           1.136364
## 29 26.58       0           0.000000
## 30 22.70       0           0.000000
## 31 16.00       0           5.681818
## 32 40.21       1          10.227273
## 33 35.78       0           4.545455
## 34 39.46       1           1.136364
```

3.2. Metodo Cart

```
imputed_data2 <- mice(datos %>%
                        select(which(sapply(datos, is.factor))),
                      method = "cart", print = FALSE)
```

```
## Warning: Number of logged events: 270
```

```
df_imputado2 <- complete(imputed_data2)
df_imputado2
```

```
##    Idpac Sexo ECOG p_peso_no_sí Hab_tabaq Diabetes Cardiop Enf_neurod
## 1   P_01    2    1            0         1        0       0          0
## 2   P_02    1    2            0         0        0       0          0
## 3   P_03    2    0            0         2        0       0          0
## 4   P_04    2    0            0         2        0       1          0
## 5   P_05    2    1            1         1        0       0          0
## 6   P_06    2    1            0         2        0       0          0
## 7   P_07    1    1            1         2        1       0          0
## 8   P_08    2    2            0         2        0       1          1
## 9   P_09    2    1            0         2        0       1          1
## 10  P_10    2    1            0         1        0       0          0
## 11  P_11    2    2            1         1        0       0          0
## 12  P_12    2    1            1         1        0       1          0
## 13  P_13    1    1            1         0        1       0          0
## 14  P_14    2    1            1         1        0       0          0
## 15  P_15    1    2            0         1        0       0          0
## 16  P_16    2    1            0         1        0       0          0
## 17  P_18    1    0            0         1        0       0          0
## 18  P_19    2    1            0         2        0       0          0
## 19  P_20    1    1            0         2        0       0          0
## 20  P_22    2    0            0         2        0       0          0
## 21  P_23    2    2            1         2        1       0          1
```

```
## 22  P_24    2    1           0         1        0       0          0
## 23  P_25    2    1           1         1        0       0          0
## 24  P_26    1    1           0         1        0       0          0
## 25  P_27    2    1           0         2        0       0          0
## 26  P_28    1    1           0         2        0       0          0
## 27  P_29    1    1           1         0        0       0          0
## 28  P_30    2    1           1         2        0       0          0
## 29  P_31    2    1           0         2        0       0          0
## 30  P_32    2    1           0         1        0       0          0
## 31  P_33    2    1           1         1        0       0          0
## 32  P_34    2    0           1         2        1       0          0
## 33  P_35    1    2           0         1        0       0          0
## 34  P_36    2    1           0         1        0       0          0
##            Histologia Histología_num Tamaño_tumor Afectacion_ganglionar
## 1      Adenocarcinoma              0          2b                    2
## 2              Otros              2           X                    2
## 3      Adenocarcinoma              0          2b                    1
## 4            Escamoso              1           4                    2
## 5            Escamoso              1          2a                    2
## 6               Otros              2           x                    3
## 7            Escamoso              1           3                    2
## 8            Escamoso              1          1c                    2
## 9            Escamoso              1           4                    2
## 10     Adenocarcinoma              0           3                    2
## 11     Adenocarcinoma              0           4                    3
## 12     Adenocarcinoma              0          2b                    1
## 13     Adenocarcinoma              0           4                    3
## 14             Otros               2           x                    0
## 15     Adenocarcinoma              0           4                    0
## 16     Adenocarcinoma              0           x                    2
## 17     Adenocarcinoma              0          2b                    2
## 18     Adenocarcinoma              0           4                    3
## 19 Ca. indiferenciado              2           4                    2
## 20     Adenocarcinoma              0           x                    x
## 21     Adenocarcinoma              0           3                    0
## 22           Escamoso              1           3                    2
## 23     Adenocarcinoma              0           3                    3
## 24     Adenocarcinoma              0           4                    3
## 25     Adenocarcinoma              0           4                    3
## 26     Adenocarcinoma              0           4                    3
## 27             Otros               2           4                    3
## 28     Adenocarcinoma              0           4                    3
## 29     Adenocarcinoma              0           4                    2
## 30     Adenocarcinoma              0           4                    3
## 31     Adenocarcinoma              0           4                    2
## 32             Otros               2           3                    3
## 33     Adenocarcinoma              0           4                    2
## 34     Adenocarcinoma              0           4                    0
##    Afectacion_metastasica Estadio Estadio_num Estado_mut   Estatinas
## 1                      1c     IVB           4          0           0
## 2                      1c     IVB           4          0           0
## 3                      1c     IVB           4          0           1
## 4                       0    IIIB           3          0           1
## 5                      1a     IVA           4          0           0
```

```
## 6                    1c     IVB           4          0           0
## 7                    1c     IVB           4          0           1
## 8                     0    IIIA           3          0           0
## 9                     0    IIIB           3          0           1
## 10                   1c     IVB           4          0           0
## 11                   1c     IVB           4          0           0
## 12                   1b     IVA           4          0           1
## 13                   1a     IVA           4          0           0
## 14                   1b     IVA           4          0           0
## 15                   1c     IVB           4          0           0
## 16                   1b     IVB           4          0           0
## 17                   1c     IVB           4          0           0
## 18                   1c     IVB           4          0           0
## 19                   1c     IVB           4          0           0
## 20                   1a     IVA           4          0           0
## 21                   1c     IVB           4          0           1
## 22                   1c     IVB           4          0           0
## 23                   1c     IVB           4          0           0
## 24                   1b     IVB           4       EGFR           0
## 25                   1c     IVB           4          0 0 (fibrato)
## 26                   1c     IVB           4          0           1
## 27                   1b     IVB           4          0           0
## 28                   1b     IVB           4          0           0
## 29                   1a     IVA           4          0           0
## 30                   1c     IVB           4          0           0
## 31                   1b     IVB           4          0           0
## 32                    0    IIIC           3          0           1
## 33                   1c     IVB           4          0           1
## 34                   1c     IVB           4          0           0
##    NLR1C_corte4 NLR1C_corte5 primera_eval_num Mejor_resp_num Toxicidad
## 1             0            0                2             0         1
## 2             1            1                1             0         1
## 3             0            0                1             1         1
## 4             0            0                2             2         0
## 5             0            0                2             2         0
## 6             0            0                1             0         1
## 7             0            0                2             1         1
## 8             0            0                1             1         1
## 9             1            0                2             2         0
## 10            1            1                1             1         1
## 11            1            1                3             3         0
## 12            0            0                2             1         0
## 13            0            0                1             1         1
## 14            1            0                2             2         0
## 15            1            1                2             2         1
## 16            0            0                1             1         1
## 17            1            0                2             1         0
## 18            0            0                1             1         1
## 19            0            0                1             1         1
## 20            1            1                1             0         1
## 21            1            1                3             3         0
## 22            0            0                2             1         1
## 23            0            0                1             1         0
## 24            0            0                2             2         0
```

```
## 25            0            0               1             1         0
## 26            1            1               3             3         0
## 27            0            0               1             0         1
## 28            1            1               3             3         0
## 29            0            0               3             2         1
## 30            0            0               2             1         1
## 31            0            0               3             3         0
## 32            0            0               1             1         0
## 33            0            0               1             1         0
## 34            1            0               2             1         1
##                 Tipo_tox Grado_tox Interrupc_tto                 Motivo_inter
## 1            Miocarditis         3             1 Fin del tratamiento previsto
## 2             Dermatitis         1             1 Fin del tratamiento previsto
## 3              Hepatitis         3             1                    Toxicidad
## 4                      0         0             1                   Progresión
## 5                      0         0             1                   Progresión
## 6                 Uveítis        2             1                    Toxicidad
## 7             Neumonitis         3             1                    Toxicidad
## 8              Hepatitis         3             1                    Toxicidad
## 9                      0         0             1                       Exitus
## 10                Uveítis        1             1          Exitus (otra causa)
## 11                     0         0             1                   Progresión
## 12            Neumonitis         3             1                    Toxicidad
## 13 Queratitis/Dermatitis         1             1                   Progresión
## 14                     0         0             1                   Progresión
## 15            Dermatitis         1             1                   Progresión
## 16              Artritis         1             1                   Progresión
## 17                     0         0             1          Exitus (otra causa)
## 18            Tiroiditis         1             1 Fin del tratamiento previsto
## 19           Encefalitis         3             1                    Toxicidad
## 20            Neumonitis         2             1                    Toxicidad
## 21                     0         0             1                   Progresión
## 22            Neumonitis         3             1                    Toxicidad
## 23                     0         0             1    2º tumor/ hepatocarcinoma
## 24                     0         0             1                   Progresión
## 25                     0         0             1                   Progresión
## 26                     0         0             1                   Progresión
## 27            Tiroiditis         2             1 Fin del tratamiento previsto
## 28                     0         0             1                   Progresión
## 29            Dermatitis         3             1                    Toxicidad
## 30            Dermatitis         1             1                   Progresión
## 31                     0         0             1                   Progresión
## 32            Dermatitis         0             1 Fin del tratamiento previsto
## 33           Miocarditis         0             0                   Progresión
## 34              Artritis        G2             1 Fin del tratamiento previsto
##    Progresion segunda_eval Exitus
## 1           0            0      1
## 2           0            0      0
## 3           1            0      0
## 4           1            1      1
## 5           1            1      1
## 6           0            0      0
## 7           1            1      1
## 8           0            0      1
```

```
## 9           1            0      1
## 10          0            0      1
## 11          1            1      1
## 12          0            0      1
## 13          1            1      1
## 14          1            0      1
## 15          1            1      1
## 16          1            1      1
## 17          0            0      1
## 18          0            0      0
## 19          1            0      0
## 20          0            0      0
## 21          1            0      1
## 22          1            1      1
## 23          0            0      1
## 24          1            1      1
## 25          1            1      0
## 26          1            1      1
## 27          0            0      0
## 28          1            0      1
## 29          1            0      1
## 30          1            1      1
## 31          1            1      1
## 32          0            0      0
## 33          1            1      1
## 34          0            0      0
```

```
df_completo <- cbind(df_imputado1, df_imputado2)
df_completo
```

```
##    Edad_dx Anciano   IMC Porcentaje_perdpeso Exp_tab PD_L1 Col_total  LDH
## 1       46       0 28.09              0.0458      20   100       217  163
## 2       68       0 35.38              0.0000       0    70       154  171
## 3       59       0 25.71              0.0000      45    50       146  197
## 4       72       1 28.25              0.0000      92     2       149  159
## 5       50       0 29.05              0.1000      55    60       210  198
## 6       71       1 28.83              0.0000     200    90       162  220
## 7       71       1 29.78              0.0760      60   100       142  198
## 8       79       1 25.85              0.0000      40    70       167  184
## 9       73       1 22.32              0.0458      50    90       153  176
## 10      69       0 23.66              0.0000      50    70       132  199
## 11      56       0 24.10              0.0458      36    80       113  190
## 12      66       0 24.95              0.2290      50    50       182  198
## 13      62       0 26.22              0.1380       0    80       242  184
## 14      64       0 20.29              0.1100      50   100       133  183
## 15      59       0 22.06              0.0000      25    95       215  204
## 16      60       0 24.62              0.0000      82    90       202  276
## 17      63       0 29.78              0.0000      60   100       262  201
## 18      82       1 22.96              0.0000     100    90       200  383
## 19      66       0 24.77              0.0000      50    60       199  382
## 20      50       0 20.70              0.0000      52   100       194  156
## 21      78       1 28.72              0.0670      75    70       176  175
## 22      73       1 27.96              0.0100      83    70       160  195
## 23      60       0 22.39              0.1300      40   100       111  326
```

```
## 24      70       1 25.27             0.0300      52    90       276  264
## 25      64       0 18.36             0.0310      40    70       155 1644
## 26      57       0 23.24             0.0400      30    70       197  279
## 27      71       1 21.37             0.0550       0    80       206  164
## 28      75       1 24.22             0.0880      25   100       208  222
## 29      68       0 26.57             0.0380      40    90       191  267
## 30      62       0 27.04             0.0000      60    90       201  248
## 31      51       0 18.92             0.0750      45    60       142  264
## 32      80       1 21.23             0.1590      40    80       187  264
## 33      65       0 31.22             0.0450      85    95       192  230
## 34      62       0 35.63             0.0000      25    70       397  201
##    Prot_tot Albumina   Hb Leucoc_tot Neutrofilos Linf_tot Plaquetas NLR_pre
## 1       7.0      4.1 15.3      10100        8000     1400    273000    5.71
## 2       6.0      3.7 11.8       9800        8200      800    124000   10.25
## 3       7.2      4.3 16.7       9900        7400     1400    349000    5.29
## 4       7.1      4.0 14.6       5600        3000     1800    220000    1.67
## 5       7.9      4.4 15.7       8900        5300     2300    350000    2.30
## 6       8.0      4.3 13.1       8800        6000     1600    279000    3.75
## 7       6.4      3.6 11.5      10000        9000      400    269000   22.50
## 8       7.0      3.9 12.3       7700        5300     1600    201000    3.31
## 9       6.9      3.7 12.9      16200       13200     1900    317000    6.95
## 10      7.3      4.0 13.0      15700       13400     1400    324000    9.57
## 11      7.3      3.5 13.6      10600        8000     1500    489000    5.33
## 12      6.5      3.7 11.4       8700        5000     2500    216000    2.00
## 13      7.3      4.1 13.7      12600        8700     2200    455000    3.95
## 14      7.0      4.1 13.7      11400        7600     2300    274000    3.30
## 15      7.2      4.4 11.9      13400        9400     2900    208000    3.24
## 16      5.6      3.2 15.5      13100       12300      500    112000   24.60
## 17      5.4      2.8 11.6       4100        2500      800    293000    3.12
## 18      8.9      3.9 12.1      11700        7100     2700    358000    2.63
## 19      6.3      3.7 10.6       4000        2600      900    338000    2.89
## 20      7.3      4.3 11.5      10800        9400      500    464000   18.80
## 21      7.1      4.3 11.5      10600        7300     1200    158000    6.08
## 22      7.3      4.1 12.6       7700        4800     1900    248000    2.53
## 23      6.4      3.0 13.5       6800        5400      700    335000    7.71
## 24      7.0      3.9 14.1       6000        3500     2000    143000    1.75
## 25      6.9      3.4 10.9      13800        8700     3000    709000    2.90
## 26      6.9      4.4 13.0       6300        4300     1100    287000    3.91
## 27      6.6      4.0 14.0       6200        4800      800    295000    6.00
## 28      7.4      4.1 12.4       7200        4900     1500    228000    3.27
## 29      6.9      3.5 14.5      20500       11500     3300    271000    3.48
## 30      7.3      4.2 13.6      14100        8400     3500    461000    2.40
## 31      7.1      3.9 12.8       9600        7100     1300    327000    5.46
## 32      7.0      3.9 12.6       7600        5300     1300    249000    4.08
## 33      7.7      4.4 15.3       8400        5400     1800    306000    3.00
## 34      7.0      4.2 14.2      12500       10700     1300    234000    8.23
##    PLR_pre PNI_pre ALI_pre   SII_pre Prot_1C Alb_1C Hb_1C Leucoc_1C Neutr_1C
## 1   195.00   48.00   20.15 1560000.0     7.5    4.6  15.9      8100      6000
## 2   155.00   41.00   12.77 1271000.0     6.2    3.9  11.7      8500      7000
## 3   249.29   50.00   20.92 1844714.3     7.2    4.4  16.1     12000      8000
## 4   122.22   49.00   67.80  366666.7     7.0    3.9  15.5      7300      4400
## 5   152.17   55.50   55.48  806521.7     7.4    4.5  15.9      9200      4900
## 6   174.38   51.00   33.06 1046250.0     8.1    4.2  14.5      8000      5300
## 7   672.50   38.00    4.76 6052500.0     6.5    4.0  11.6      4500      3200
```

```
## 8   125.62   47.00   30.43  665812.5     7.7    4.0  12.1      3600     1900
## 9   166.84   46.50   11.89 2202315.8     7.0    3.9  14.5     16100    12100
## 10  231.43   47.00    9.89 3101142.9     7.4    4.0  13.5     12800     9800
## 11  326.00   42.50   15.81 2608000.0     7.0    3.4  11.4     12500    10400
## 12   86.40   49.50   46.16  432000.0     7.1    4.1  11.6      7600     3700
## 13  206.82   52.00   27.18 1799318.2     7.3    4.0  14.3     11300     6200
## 14  119.13   52.50   25.17  905391.3     7.0    3.7  10.8     15400    11300
## 15   71.72   58.50   29.95  674206.9     6.9    3.7  11.3     10400     8400
## 16  224.00   34.50    3.20 2755200.0     7.8    4.2  13.7     14100     9700
## 17  366.25   32.00   26.68  915625.0     4.6    3.1   8.4      4800     3300
## 18  132.59   52.50   34.05  941407.4     9.1    4.0  11.9     11100     6000
## 19  375.56   41.50   31.72  976444.4     6.0    3.1  11.1      3600     1700
## 20  928.00   45.50    4.73 8723200.0     8.0    4.5  11.9     10900     8900
## 21  131.67   49.00   20.30  961166.7     7.2    4.2  10.2     13800     9300
## 22  130.53   50.50   45.38  626526.3     7.3    3.8  12.5      7400     4600
## 23  478.57   33.50    8.71 2584285.7     6.8    3.6  16.0      4600     3000
## 24   71.50   49.00   56.32  250250.0     7.4    3.9  12.9      6000     3000
## 25  236.33   49.00   21.52 2056100.0     7.3    3.6  11.1     12600     7000
## 26  260.91   49.50   26.16 1121909.1     6.4    3.7  11.7      9000     6300
## 27  368.75   44.00   14.25 1770000.0     6.9    4.1  13.6      4900     2700
## 28  152.00   48.50   30.40  744800.0     7.1    4.0  11.7      6900     5900
## 29   82.12   51.50   26.69  944393.9     6.8    3.3  14.5     12800     6800
## 30  131.71   59.50   47.32 1106400.0     6.3    3.8  11.6      8700     4600
## 31  251.54   45.50   13.51 1785923.1     6.5    3.3  10.5      9000     6300
## 32  191.54   47.42   26.86 1015153.8     7.1    4.3  13.2     13100     8700
## 33  170.00   53.00   45.79  918000.0     7.0    3.9  15.6     10000     6800
## 34  180.00   48.50   18.18 1926000.0     6.6    4.1  15.4     10200     7600
##    Linf_1C Plaq_1C NLR_1C PLR_1C PNI_1C    SII_1C Prot_2C Alb_2C Hb_2C
## 1     1600  369000   3.75 230.62  54.00 1383750.0    7.90   4.50 16.50
## 2      800  112000   8.75 140.00  43.00  980000.0    6.10   3.70 11.40
## 3     2500  382000   3.20 152.80  56.50 1222400.0    7.20   4.40 16.70
## 4     2000  266000   2.20 133.00  10.00  585200.0    7.20   4.10 15.30
## 5     3100  364000   1.58 117.42  60.50  575354.8    8.00   4.50 16.30
## 6     1600  293000   3.31 183.12  50.00  970562.5    8.10   4.50 15.50
## 7      900  218000   3.56 242.22  44.50  775111.1    7.20   4.10 12.40
## 8      900  131000   2.11 145.56  44.50  276555.6    7.22   4.01 13.15
## 9     2900  380000   4.17 131.03  53.50 1585517.2    7.22   3.70 13.40
## 10    1900  214000   5.16 112.63  49.50 1103789.5    7.50   4.10 13.40
## 11    1000  463000  10.40 463.00  39.00 4815200.0    6.50   2.90  8.60
## 12    2900  242000   1.28  83.45  55.50  308758.6    6.80   3.90 11.40
## 13    3600  452000   1.72 125.56  58.00  778444.4    7.10   4.20 15.00
## 14    2500  444000   4.52 177.60  49.50 2006880.0    7.20   4.00 10.90
## 15    1000  272000   8.40 272.00  42.00 2284800.0    7.20   3.90 11.20
## 16    3100  494000   3.13 159.35  57.50 1545741.9    7.20   3.90 13.30
## 17     700  226000   4.71 322.86  34.50 1065428.6    5.30   3.00 10.30
## 18    3000  380000   2.00 126.67  55.00  760000.0    8.80   4.10 12.90
## 19    1100  338000   1.55 307.27  36.50  522363.6    6.70   3.70 11.60
## 20    1200  465000   7.42 387.50  51.00 3448750.0    7.90   4.60 12.30
## 21    1600  205000   5.81 128.12  50.00 1191562.5    6.90   4.40 10.40
## 22    1800  304000   2.56 168.89  47.00  776888.9    7.70   3.90 13.40
## 23    1100  274000   2.73 249.09  41.50  747272.7    7.80   3.60 15.80
## 24    2200  277000   1.36 125.91  50.00  377727.3    7.40   4.00 13.20
## 25    3600  650000   1.94 180.56  54.00 1263888.9    7.50   3.80 11.40
## 26     800  457000   7.88 571.25  41.00 3598875.0    7.22   4.01 13.15
```

```
## 27    1600  192000   1.69 120.00  49.00  324000.0    6.80   4.20 13.50
## 28     600  259000   9.83 431.67  43.00 2546833.3    7.10   4.00 11.70
## 29    2800  366000   2.43 130.71  47.00  888857.1    7.50   3.70 13.80
## 30    2200  553000   2.09 251.36  49.00 1156272.7    6.30   4.10 13.00
## 31    1200  513000   5.25 427.50  39.00 2693250.0    7.22   4.01 11.40
## 32    2900  345000   3.00 118.97  57.50 1035000.0    7.50   4.50 12.90
## 33    2000  323000   3.40 161.50  47.33 1098200.0    7.70   4.30 15.70
## 34    1700  208000   4.47 122.35  49.50  929882.4    6.60   4.10 16.30
##    Leucoc_2C Neutr_2C Linf_2C  Plaq_2C    NLR_2C NLR2C_corte4o5 PLR_2C PNI_2C
## 1    6400.00  3400.00 2300.00 253000.0  1.478261           0.00 110.00  56.50
## 2    8300.00  6200.00 1200.00 126000.0  5.166667           1.00 105.00  43.00
## 3    8400.00  4500.00 3000.00 329000.0  1.500000           0.00 109.67  59.00
## 4    7200.00  4300.00 1900.00 254000.0  2.263158           0.00 133.68  50.50
## 5    9200.00  5100.00 2800.00 313000.0  1.821429           0.00 111.79  59.00
## 6    8000.00  5300.00 1800.00    285.0  2.944444           0.00   0.16  54.00
## 7    8200.00  6400.00 1100.00 265000.0  5.818182           1.00 240.91  46.50
## 8    9106.25  5796.88 2090.62 305883.9  3.348731           0.25 177.59  50.71
## 9   19400.00 16100.00 2300.00 406000.0  7.000000           1.00 176.52  48.50
## 10   8700.00  5500.00 2200.00 226000.0  2.500000           0.00 102.73  52.00
## 11  14500.00 12100.00 1200.00 858000.0 10.083333           1.00 715.00  35.00
## 12   9400.00  4400.00 3100.00 260000.0  1.419355           0.00  83.87  54.50
## 13  10200.00  5100.00 2900.00 319000.0  1.758621           0.00 110.00  56.50
## 14  14700.00  9900.00 3500.00 408000.0  2.828571           0.00 116.57  57.50
## 15  10600.00  7900.00 1400.00 254000.0  5.642857           1.00 181.43  46.00
## 16   9900.00  6100.00 2500.00 297000.0  2.440000           0.00 118.80  51.50
## 17   3800.00  2300.00  800.00 218000.0  2.875000           0.00 272.50  34.00
## 18  11200.00  6100.00 3300.00 272000.0  1.848485           0.00  82.42  57.50
## 19   4000.00  1800.00 1500.00 394000.0  1.200000           0.00 262.67  44.50
## 20   8600.00  6300.00 1200.00 425000.0  5.250000           1.00 354.17  52.00
## 21  12500.00  8500.00 1500.00 217000.0  5.666667           1.00 144.67  51.50
## 22   6400.00  3600.00 1800.00 194000.0  2.000000           0.00 107.78  48.00
## 23   5400.00  3700.00 1000.00 237000.0  3.700000           0.00 237.00  41.00
## 24   5100.00  2400.00 2100.00 240000.0  1.142857           0.00 114.29  50.50
## 25  13900.00  7900.00 3900.00 615000.0  2.025641           0.00 157.69  57.50
## 26   9106.25  5796.88 2090.62 305883.9  3.348731           0.25 177.59  50.71
## 27   5300.00  3300.00 1400.00 235000.0  2.357143           0.00 167.86  49.00
## 28   6900.00  5900.00  600.00 259000.0  9.833333           1.00 431.67  43.00
## 29  12000.00  5700.00 4000.00 256000.0  1.425000           0.00  64.00  57.00
## 30   8300.00  4100.00 2900.00 343000.0  1.413793           0.00 118.28  55.50
## 31   7600.00  4900.00 1300.00 412000.0  3.769231           0.00 316.92  50.71
## 32   8800.00  5800.00 1800.00 337000.0  3.222222           0.00 187.22  54.00
## 33   9600.00  5900.00 2200.00 312000.0  2.681818           0.00 141.82  54.00
## 34   8900.00  5000.00 2400.00 254000.0  2.083333           0.00 105.83  53.00
##        SII_2C Prot_1eval Alb_1eval Hb_1eval Leucoc_1eval Neutr_1eval Linf_1eval
## 1   374000.00       7.30       4.4     16.9         8000        5300       2100
## 2   651000.00       6.00       3.9     11.2         7500        5500       1300
## 3   493500.00       7.10       4.5     16.6         8700        4900       2900
## 4   574842.11       7.20       4.0     15.7         7800        4400       2500
## 5   570107.14       7.09       4.3     16.5         8700        4600       2800
## 6      839.17       7.60       4.4     15.4         8000        5900       1400
## 7  1541818.18       6.70       3.9     11.1         7600        6000       1000
## 8  1134689.69       6.40       4.2     11.6         8600        6300       1400
## 9  2842000.00       6.90       3.7     12.9        16200       13200       1900
## 10  565000.00       7.70       4.5     14.6         7400        4700       1900
```

```
## 11 8651500.00       7.00       3.1      8.8        10200        9100        500
## 12  369032.26       7.20       4.0     10.8        11100        7200       2600
## 13  561000.00       7.10       4.2     15.1         9100        5000       2900
## 14 1154057.14       8.00       4.5     12.9        18400       13600       3200
## 15 1433285.71       7.09       3.8     11.3         9400        7200        900
## 16  724680.00       7.00       4.1     15.8         9800        6000       2600
## 17  626750.00       5.50       3.6     13.7         4600        2600       1100
## 18  502787.88       8.50       4.1     12.7        10200        5400       3100
## 19  472800.00       7.10       3.9     12.2         3100        1400       1300
## 20 2231250.00       7.30       3.7     12.5         9200        7100       1100
## 21 1229666.67       6.40       3.9      9.9        10000        7500        800
## 22  388000.00       7.70       3.9     13.4         6400        3600       1800
## 23  876900.00       7.09       3.1     14.9         4500        2900       1000
## 24  274285.71       7.70       4.1     13.8         4300        2200       1600
## 25 1245769.23       7.80       3.9     11.8        13900        7700       4000
## 26 1134689.69       6.40       3.7     11.7         9000        6300        800
## 27  553928.57       7.00       4.2     13.8         4600        3100       1100
## 28 2546833.33       7.10       4.0     11.7         6900        5900        600
## 29  364800.00       6.90       3.9     14.5         9100        4200       3500
## 30  484931.03       6.30       4.1     13.0         8300        4100       2900
## 31 1552923.08       7.00       4.0     11.3         7300        4300       1800
## 32 1085888.89       7.70       4.6     12.9         9700        6500       2100
## 33  836727.27       7.50       4.3     15.9         8700        6000       1600
## 34  529166.67       6.60       4.1     16.3         8900        5000       2400
##    Plaq_1eval NLR_1eval PLR_1eval PNI_1eval SII_1eval N_ciclos   SLP SLP_cens
## 1      262000      2.52    124.76      54.5  661238.1       35 29.86        1
## 2       96000      4.23     73.85      45.5  406153.8       35 60.39        1
## 3      315000      1.69    108.62      59.5  532241.4        7 35.19        0
## 4      259000      1.76    103.60      52.5  455840.0       11  7.39        0
## 5      285000      1.64    101.79      57.0  468214.3        7  4.50        0
## 6      263000      4.21    187.86      51.0 1108357.1        4 41.49        1
## 7      229000      6.00    229.00      44.0 1374000.0       19 24.02        0
## 8      124000      4.50     88.57      49.0  558000.0        1  7.89        1
## 9      317000      6.95    166.84      46.5 2202315.8        3  1.81        0
## 10     219000      2.47    115.26      54.5  541736.8       26 19.94        1
## 11     527000     18.20   1054.00      33.5 9591400.0        3  1.87        0
## 12     227000      2.77     87.31      53.0  628615.4        5 40.74        1
## 13     308000      1.72    106.21      56.5  531034.5       11  7.46        0
## 14     328000      4.25    102.50      61.0 1394000.0        6  5.65        0
## 15     309000      8.00    343.33      42.5 2472000.0        6  3.68        0
## 16     205000      2.31     78.85      54.0  473076.9       32 22.37        0
## 17     220000      2.36    200.00      41.5  520000.0       25 21.98        1
## 18     282000      1.74     90.97      56.5  491225.8       35 46.32        1
## 19     290000      1.08    223.08      45.5  312307.7       16 35.32        0
## 20     400000      6.45    363.64      42.5 2581818.2       25 45.63        1
## 21     216000      9.38    270.00      43.0 2025000.0        3  1.91        0
## 22     194000      2.00    107.78      48.0  388000.0        5  7.26        0
## 23     220000      2.90    220.00      36.0  638000.0        8  9.33        1
## 24     234000      1.38    146.25      49.0  321750.0        8  7.13        0
## 25     647000      1.93    161.75      59.0 1245475.0        8  5.62        0
## 26     457000      7.88    571.25      41.0 3598875.0        1  0.76        0
## 27     257000      2.82    233.64      47.5  724272.7       35 31.15        1
## 28     259000      9.83    431.67      43.0 2546833.3        2  1.38        0
## 29     199000      1.20     56.86      56.5  238800.0       27 17.81        0
```

```
## 30     343000      1.41    118.28      55.5  484931.0       13 11.17        0
## 31     353000      2.39    196.11      49.0  843277.8        4  1.81        0
## 32     308000      3.10    146.67      56.5  953333.3       35 40.21        1
## 33     320000      3.75    200.00      51.0 1200000.0       23 16.16        0
## 34     254000      2.08    105.83      53.0  529166.7       35 39.46        1
##       SG SG_cens Porcentaje_NA_Fila Idpac Sexo ECOG p_peso_no_sí Hab_tabaq
## 1  29.86       1           3.409091  P_01    2    1            0         1
## 2  60.39       1           0.000000  P_02    1    2            0         0
## 3  57.63       1           0.000000  P_03    2    0            0         2
## 4  33.74       0           3.409091  P_04    2    0            0         2
## 5  18.83       0           2.272727  P_05    2    1            1         1
## 6  41.49       1           1.136364  P_06    2    1            0         2
## 7  30.23       0           1.136364  P_07    1    1            1         2
## 8   7.89       1          14.772727  P_08    2    2            0         2
## 9   1.81       0           5.681818  P_09    2    1            0         2
## 10 19.94       0           0.000000  P_10    2    1            0         1
## 11 17.48       0           2.272727  P_11    2    2            1         1
## 12 40.74       0           0.000000  P_12    2    1            1         1
## 13 41.00       0           0.000000  P_13    1    1            1         0
## 14  8.84       0           0.000000  P_14    2    1            1         1
## 15  6.57       0           1.136364  P_15    1    2            0         1
## 16 28.75       0           0.000000  P_16    2    1            0         1
## 17 21.98       0           1.136364  P_18    1    0            0         1
## 18 46.32       1           1.136364  P_19    2    1            0         2
## 19 35.32       1           0.000000  P_20    1    1            0         2
## 20 45.63       1           2.272727  P_22    2    0            0         2
## 21  5.75       0           0.000000  P_23    2    2            1         2
## 22 22.08       0           1.136364  P_24    2    1            0         1
## 23  9.33       0           2.272727  P_25    2    1            1         1
## 24 16.13       0           6.818182  P_26    1    1            0         1
## 25 10.61       0           0.000000  P_27    2    1            0         2
## 26 41.17       0          13.636364  P_28    1    1            0         2
## 27 31.15       1           0.000000  P_29    1    1            1         0
## 28  1.84       0           1.136364  P_30    2    1            1         2
## 29 26.58       0           0.000000  P_31    2    1            0         2
## 30 22.70       0           0.000000  P_32    2    1            0         1
## 31 16.00       0           5.681818  P_33    2    1            1         1
## 32 40.21       1          10.227273  P_34    2    0            1         2
## 33 35.78       0           4.545455  P_35    1    2            0         1
## 34 39.46       1           1.136364  P_36    2    1            0         1
##    Diabetes Cardiop Enf_neurod         Histologia Histología_num Tamaño_tumor
## 1         0       0          0     Adenocarcinoma             0          2b
## 2         0       0          0              Otros             2           X
## 3         0       0          0     Adenocarcinoma             0          2b
## 4         0       1          0           Escamoso             1           4
## 5         0       0          0           Escamoso             1          2a
## 6         0       0          0              Otros             2           x
## 7         1       0          0           Escamoso             1           3
## 8         0       1          1           Escamoso             1          1c
## 9         0       1          1           Escamoso             1           4
## 10        0       0          0     Adenocarcinoma             0           3
## 11        0       0          0     Adenocarcinoma             0           4
## 12        0       1          0     Adenocarcinoma             0          2b
## 13        1       0          0     Adenocarcinoma             0           4
```

```
## 14        0       0         0             Otros             2           x
## 15        0       0         0     Adenocarcinoma            0           4
## 16        0       0         0     Adenocarcinoma            0           x
## 17        0       0         0     Adenocarcinoma            0          2b
## 18        0       0         0     Adenocarcinoma            0           4
## 19        0       0         0 Ca. indiferenciado            2           4
## 20        0       0         0     Adenocarcinoma            0           x
## 21        1       0         1     Adenocarcinoma            0           3
## 22        0       0         0          Escamoso             1           3
## 23        0       0         0     Adenocarcinoma            0           3
## 24        0       0         0     Adenocarcinoma            0           4
## 25        0       0         0     Adenocarcinoma            0           4
## 26        0       0         0     Adenocarcinoma            0           4
## 27        0       0         0             Otros             2           4
## 28        0       0         0     Adenocarcinoma            0           4
## 29        0       0         0     Adenocarcinoma            0           4
## 30        0       0         0     Adenocarcinoma            0           4
## 31        0       0         0     Adenocarcinoma            0           4
## 32        1       0         0             Otros             2           3
## 33        0       0         0     Adenocarcinoma            0           4
## 34        0       0         0     Adenocarcinoma            0           4
##    Afectacion_ganglionar Afectacion_metastasica Estadio Estadio_num Estado_mut
## 1                      2                    1c     IVB           4          0
## 2                      2                    1c     IVB           4          0
## 3                      1                    1c     IVB           4          0
## 4                      2                     0    IIIB           3          0
## 5                      2                    1a     IVA           4          0
## 6                      3                    1c     IVB           4          0
## 7                      2                    1c     IVB           4          0
## 8                      2                     0    IIIA           3          0
## 9                      2                     0    IIIB           3          0
## 10                     2                    1c     IVB           4          0
## 11                     3                    1c     IVB           4          0
## 12                     1                    1b     IVA           4          0
## 13                     3                    1a     IVA           4          0
## 14                     0                    1b     IVA           4          0
## 15                     0                    1c     IVB           4          0
## 16                     2                    1b     IVB           4          0
## 17                     2                    1c     IVB           4          0
## 18                     3                    1c     IVB           4          0
## 19                     2                    1c     IVB           4          0
## 20                     x                    1a     IVA           4          0
## 21                     0                    1c     IVB           4          0
## 22                     2                    1c     IVB           4          0
## 23                     3                    1c     IVB           4          0
## 24                     3                    1b     IVB           4       EGFR
## 25                     3                    1c     IVB           4          0
## 26                     3                    1c     IVB           4          0
## 27                     3                    1b     IVB           4          0
## 28                     3                    1b     IVB           4          0
## 29                     2                    1a     IVA           4          0
## 30                     3                    1c     IVB           4          0
## 31                     2                    1b     IVB           4          0
## 32                     3                     0    IIIC           3          0
```

```
## 33                   2                    1c     IVB           4          0
## 34                   0                    1c     IVB           4          0
##      Estatinas NLR1C_corte4 NLR1C_corte5 primera_eval_num Mejor_resp_num
## 1            0            0            0                2              0
## 2            0            1            1                1              0
## 3            1            0            0                1              1
## 4            1            0            0                2              2
## 5            0            0            0                2              2
## 6            0            0            0                1              0
## 7            1            0            0                2              1
## 8            0            0            0                1              1
## 9            1            1            0                2              2
## 10           0            1            1                1              1
## 11           0            1            1                3              3
## 12           1            0            0                2              1
## 13           0            0            0                1              1
## 14           0            1            0                2              2
## 15           0            1            1                2              2
## 16           0            0            0                1              1
## 17           0            1            0                2              1
## 18           0            0            0                1              1
## 19           0            0            0                1              1
## 20           0            1            1                1              0
## 21           1            1            1                3              3
## 22           0            0            0                2              1
## 23           0            0            0                1              1
## 24           0            0            0                2              2
## 25 0 (fibrato)            0            0                1              1
## 26           1            1            1                3              3
## 27           0            0            0                1              0
## 28           0            1            1                3              3
## 29           0            0            0                3              2
## 30           0            0            0                2              1
## 31           0            0            0                3              3
## 32           1            0            0                1              1
## 33           1            0            0                1              1
## 34           0            1            0                2              1
##    Toxicidad             Tipo_tox Grado_tox Interrupc_tto
## 1          1           Miocarditis         3             1
## 2          1            Dermatitis         1             1
## 3          1             Hepatitis         3             1
## 4          0                     0         0             1
## 5          0                     0         0             1
## 6          1               Uveítis         2             1
## 7          1            Neumonitis         3             1
## 8          1             Hepatitis         3             1
## 9          0                     0         0             1
## 10         1               Uveítis         1             1
## 11         0                     0         0             1
## 12         0            Neumonitis         3             1
## 13         1 Queratitis/Dermatitis         1             1
## 14         0                     0         0             1
## 15         1            Dermatitis         1             1
## 16         1              Artritis         1             1
```

```
## 17         0                     0         0             1
## 18         1            Tiroiditis         1             1
## 19         1           Encefalitis         3             1
## 20         1            Neumonitis         2             1
## 21         0                     0         0             1
## 22         1            Neumonitis         3             1
## 23         0                     0         0             1
## 24         0                     0         0             1
## 25         0                     0         0             1
## 26         0                     0         0             1
## 27         1            Tiroiditis         2             1
## 28         0                     0         0             1
## 29         1            Dermatitis         3             1
## 30         1            Dermatitis         1             1
## 31         0                     0         0             1
## 32         0            Dermatitis         0             1
## 33         0           Miocarditis         0             0
## 34         1               Artritis        G2             1
##                    Motivo_inter Progresion segunda_eval Exitus
## 1  Fin del tratamiento previsto          0            0      1
## 2  Fin del tratamiento previsto          0            0      0
## 3                     Toxicidad          1            0      0
## 4                    Progresión          1            1      1
## 5                    Progresión          1            1      1
## 6                     Toxicidad          0            0      0
## 7                     Toxicidad          1            1      1
## 8                     Toxicidad          0            0      1
## 9                        Exitus          1            0      1
## 10          Exitus (otra causa)          0            0      1
## 11                   Progresión          1            1      1
## 12                    Toxicidad          0            0      1
## 13                   Progresión          1            1      1
## 14                   Progresión          1            0      1
## 15                   Progresión          1            1      1
## 16                   Progresión          1            1      1
## 17          Exitus (otra causa)          0            0      1
## 18 Fin del tratamiento previsto          0            0      0
## 19                    Toxicidad          1            0      0
## 20                    Toxicidad          0            0      0
## 21                   Progresión          1            0      1
## 22                    Toxicidad          1            1      1
## 23    2º tumor/ hepatocarcinoma          0            0      1
## 24                   Progresión          1            1      1
## 25                   Progresión          1            1      0
## 26                   Progresión          1            1      1
## 27 Fin del tratamiento previsto          0            0      0
## 28                   Progresión          1            0      1
## 29                    Toxicidad          1            0      1
## 30                   Progresión          1            1      1
## 31                   Progresión          1            1      1
## 32 Fin del tratamiento previsto          0            0      0
## 33                   Progresión          1            1      1
## 34 Fin del tratamiento previsto          0            0      0
```

3.3. missForest

Por último vamos a usar el método missForest, esta técnica de imputación basada en **bosques aleatorios** (Random Forest) permite estimar valores faltantes en datasets de manera no paramétrica y eficiente. Su funcionamiento se basa en entrenar un modelo de Random Forest para cada variable con valores ausentes, utilizando el resto de las variables como predictores.

La idea es imputar con missForest los valores numericos y los cateogricos con el metodo anterior (Cart), crear dos conjuntos diferentes es por probar si existen diferencias entre los dos metodos de imputación y usar el que mejor resultado genere.

```
datos_num <- datos %>% select(where(is.numeric))
datos_num <- as.data.frame(datos_num)


imputed_num <- missForest(
  xmis = datos_num,  # Dataset con valores faltantes
  maxiter = 20,      # Máximo número de iteraciones
  ntree = 100,       # Número de árboles en cada Random Forest
  mtry = floor(ncol(datos_num) / 3),  # Número de variables usadas en cada árbol
  replace = TRUE,    # Si se reemplazan las muestras en cada árbol
  decreasing = TRUE, # Imputar primero las variables con menos NA
  verbose = TRUE,    # Mostrar el progreso de la imputación
  variablewise = FALSE,  # Imputación por bloque o variable por variable
)
```

```
##   missForest iteration 1 in progress...

## Warning in randomForest.default(x = obsX, y = obsY, ntree = ntree, mtry = mtry,
## : The response has five or fewer unique values.  Are you sure you want to do
## regression?

## done!
##     estimated error(s): 0.3070776
##     difference(s): 0.001737426
##     time: 0.37 seconds
##
##   missForest iteration 2 in progress...

## Warning in randomForest.default(x = obsX, y = obsY, ntree = ntree, mtry = mtry,
## : The response has five or fewer unique values.  Are you sure you want to do
## regression?

## done!
##     estimated error(s): 0.3156882
##     difference(s): 0.0004710156
##     time: 0.379 seconds
##
##   missForest iteration 3 in progress...

## Warning in randomForest.default(x = obsX, y = obsY, ntree = ntree, mtry = mtry,
## : The response has five or fewer unique values.  Are you sure you want to do
## regression?
```

```
## done!
##     estimated error(s): 0.3103979
##     difference(s): 3.731954e-05
##     time: 0.365 seconds
##
##   missForest iteration 4 in progress...

## Warning in randomForest.default(x = obsX, y = obsY, ntree = ntree, mtry = mtry,
## : The response has five or fewer unique values.  Are you sure you want to do
## regression?

## done!
##     estimated error(s): 0.3100008
##     difference(s): 0.0004069164
##     time: 0.367 seconds
```

```
imputed_num$OOBerror
```

```
##     NRMSE
## 0.3103979
```

```
df_completo_missForest <- cbind(df_imputado2, imputed_num$ximp)
```

El error **NRMSE** se interpreta como:

NRMSE	Calidad de Imputación
0 - 0.2	Excelente, la imputación es casi perfecta.
0.2 - 0.4	Buena, la imputación introduce un pequeño sesgo.
0.4 - 0.6	Moderada, puede haber errores significativos en la imputación.
0.6 - 1	Mala, la imputación se aleja demasiado de los valores reales.
< 1	Inaceptable, los datos imputados no son confiables.

Exportar los datos completos

```
# Cargar la librería
library(openxlsx)
```

```
## Warning: package 'openxlsx' was built under R version 4.3.3
```

```
# Guardar en formato Excel
write.xlsx(datos_limpios, "datos_limpios.xlsx", rowNames = FALSE)
write.xlsx(df_completo_missForest, "df_completo_missForest.xlsx", rowNames = FALSE)
```