A1.Gasto Sanitario por Función

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Contents

1.PROCESAMIENTO DE LOS DATOS.

- En primer lugar leemos el fichero:

```
gasto_fun<-read.csv("C:/temp/GastoSanitario_Funcion.csv",sep= ",")
```

- Realicemos una breve inspección de los datos:

```
str(gasto_fun)
```

```
## 'data.frame':    2000 obs. of  6 variables:
##  $ TIME              : int  2009 2009 2009 2009 2009 2009 2009 2009 2009 2009 ...
##  $ GEO               : Factor w/ 40 levels "Austria","Belgium",..: 15 15 15 15 15 16 16 16 16 16 ...
##  $ UNIT              : Factor w/ 1 level "Million euro": 1 1 1 1 1 1 1 1 1 1 ...
##  $ ICHA11_HC         : Factor w/ 5 levels "Curative care",..: 3 2 1 4 5 3 2 1 4 5 ...
##  $ Value             : Factor w/ 1378 levels ":","1,001,514.67",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ Flag.and.Footnotes: Factor w/ 2 levels "","b": 1 1 1 1 1 1 1 1 1 1 ...
```

```
colnames(gasto_fun) #Nombre de las variables
```

```
## [1] "TIME"               "GEO"                "UNIT"
## [4] "ICHA11_HC"          "Value"              "Flag.and.Footnotes"
```

```
nrow(gasto_fun) #Número de registros
```

```
## [1] 2000
```

```
ncol(gasto_fun) #Número de variables
```

```
## [1] 6
```

*Observamos las siguientes variables:

- **TIME**: variable cuantitativa. Indica el año en el que se ha realizado la medida, en este caso el valor de la variable "Value". Se ha cargado bien como número entero.
- **GEO**: variable cualitativa. Indica el país o región en el que se ha realizado la medida.Se ha cargado bien como factor.
- **UNIT**: variable cualitativa. Indica la medida de la variable valor.Se ha cargado bien como factor.
- **ICHA11_HC**: variable cualitativa. Indica cómo se aplica el gasto sanitario por función.
- **Value**: Variable cuantitativa. Indica el valor en Millones de Euros de esta financiación.Se ha cargado mal como factor. Haremos la transformación a valor numérico.
- **Fal.and.footnotes**. Notas sobre etiquetas. Eliminamos esta columna.

*Años de las mediciones:

```
unique(gasto_fun$TIME)
```

```
##  [1] 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
```

*Paises:

```r
unique(gasto_fun$GEO)
```

```
##  [1] European Union - 27 countries (from 2020)
##  [2] European Union - 28 countries (2013-2020)
##  [3] European Union - 27 countries (2007-2013)
##  [4] European Union - 15 countries (1995-2004)
##  [5] Euro area - 19 countries  (from 2015)
##  [6] Euro area - 18 countries (2014)
##  [7] Euro area - 12 countries (2001-2006)
##  [8] Belgium
##  [9] Bulgaria
## [10] Czechia
## [11] Denmark
## [12] Germany (until 1990 former territory of the FRG)
## [13] Estonia
## [14] Ireland
## [15] Greece
## [16] Spain
## [17] France
## [18] Croatia
## [19] Italy
## [20] Cyprus
## [21] Latvia
## [22] Lithuania
## [23] Luxembourg
## [24] Hungary
## [25] Malta
## [26] Netherlands
## [27] Austria
## [28] Poland
## [29] Portugal
## [30] Romania
## [31] Slovenia
## [32] Slovakia
## [33] Finland
## [34] Sweden
## [35] Iceland
## [36] Liechtenstein
## [37] Norway
## [38] Switzerland
## [39] United Kingdom
## [40] Bosnia and Herzegovina
## 40 Levels: Austria Belgium Bosnia and Herzegovina Bulgaria Croatia ... United Kingdom
```

*Unidad de las mediciones:

```r
unique(gasto_fun$UNIT)
```

```
## [1] Million euro
## Levels: Million euro
```

*Variable que indica cómo se aplica el gasto sanitario.

```r
unique(gasto_fun$ICHA11_HC)
```

```
## [1] Current health care expenditure (CHE)
```

```
## [2] Curative care and rehabilitative care
## [3] Curative care
## [4] Inpatient curative and rehabilitative care
## [5] Inpatient curative care
## 5 Levels: Curative care ... Inpatient curative care
```

- Eliminamos la columna Fal.and.footnotes.

```
gasto_fun<-gasto_fun[,-6]
```

- Tendríamos que convertir la columna Value a numérico porque se ha cargado como factor y es erróneo. El resto de variables tienen el tipo correcto.

```
gasto_fun$Value<-as.character(gasto_fun$Value)
gasto_fun$Value<-(gsub(',','.',gasto_fun$Value) )
gasto_fun$Value<-substr(gasto_fun$Value,1,nchar(gasto_fun$Value)-3)
gasto_fun$Value<-as.numeric(gasto_fun$Value)
```

```
## Warning: NAs introducidos por coerción
```

- Comprobamos que valores tenemos en la columna **Value**:

```
table(gasto_fun$Value, useNA = "ifany")
```

```
##
##   1.003   1.004   1.007   1.029   1.038   1.042   1.045   1.047    1.05   1.069
##       2       1       1       1       1       2       1       1       1       1
##   1.077   1.089   1.092   1.093   1.098   1.108   1.109   1.116   1.134   1.136
##       1       1       1       2       1       1       1       1       1       1
##   1.137   1.142   1.156   1.192   1.194   1.198     1.2   1.211   1.227   1.232
##       1       1       1       1       2       1       1       1       1       1
##   1.234   1.247   1.249   1.263   1.265   1.274   1.277   1.289    1.29   1.302
##       1       1       1       1       1       2       1       2       1       1
##   1.305   1.318   1.322   1.325   1.326   1.327    1.35    1.36   1.361   1.364
##       1       1       1       1       1       1       2       1       1       1
##   1.369   1.374   1.388   1.406   1.407    1.41   1.415   1.426    1.43   1.432
##       1       1       1       1       1       2       1       1       1       2
##   1.438   1.441   1.448   1.449   1.454   1.463   1.475   1.476   1.493   1.503
##       1       1       1       1       1       1       1       1       1       1
##    1.51   1.519   1.521   1.522   1.529   1.531   1.534   1.555   1.556   1.557
##       1       1       1       1       1       1       2       2       1       1
##   1.568   1.569   1.572   1.607   1.608   1.609    1.61   1.623   1.636   1.638
##       1       1       2       1       1       3       2       1       1       1
##   1.642   1.654   1.666   1.667   1.675   1.681   1.708   1.715   1.716   1.717
##       1       1       1       1       1       1       1       1       1       1
##   1.726    1.73   1.734    1.74   1.742   1.752   1.767   1.772   1.775   1.781
##       1       1       1       1       1       1       1       1       2       1
##   1.804   1.806    1.81    1.82   1.834   1.835   1.842   1.855   1.862   1.871
##       1       1       1       1       1       1       1       1       2       1
##   1.879   1.891   1.909    1.91   1.919   1.936   1.942   1.946   1.959   1.962
##       1       1       1       2       1       1       1       1       1       1
##   1.981   1.987   1.996       2   2.006   2.012   2.013   2.024   2.031   2.046
##       1       1       1       1       1       1       1       1       1       1
##   2.057   2.096   2.126   2.131   2.138   2.144   2.146   2.194   2.201   2.223
##       1       1       1       1       1       1       1       1       1       1
##   2.235   2.265   2.312   2.371   2.407   2.423   2.463   2.478   2.532   2.541
##       1       1       1       1       1       1       1       1       1       1
```

```
##    2.57   2.581   2.615   2.638   2.657   2.664   2.665   2.678   2.684   2.695
##       1       1       1       1       1       1       1       1       1       1
##   2.696   2.708   2.709   2.718   2.727   2.732   2.745   2.749   2.751   2.752
##       1       2       1       1       1       1       1       1       1       1
##   2.758   2.792   2.826   2.838   2.843   2.844   2.849    2.85   2.855   2.865
##       1       1       1       2       1       1       2       1       1       1
##   2.871   2.901   2.907   2.914   2.923   2.946   2.961    2.97   2.971   2.972
##       1       1       1       1       1       1       1       1       1       1
##   2.978   2.982   2.987   3.003   3.008   3.022   3.027   3.033   3.043   3.075
##       1       2       1       1       1       1       1       1       1       1
##   3.078   3.083   3.085   3.117   3.122   3.134   3.174    3.18   3.183   3.185
##       1       1       1       1       1       1       1       1       1       1
##   3.199   3.223    3.23   3.286   3.305   3.309   3.327   3.375    3.38   3.383
##       1       1       1       1       1       1       1       1       1       1
##   3.386   3.424   3.428   3.438   3.515    3.52   3.524   3.537   3.609   3.626
##       1       1       2       1       1       1       1       1       1       1
##   3.636   3.644   3.645   3.674   3.689   3.722   3.781   3.797   3.814    3.84
##       1       1       1       1       1       1       1       1       1       1
##   3.868   3.878   3.897   3.898   3.929   3.955   3.966   3.981   4.023   4.079
##       1       1       1       1       1       1       1       1       1       1
##   4.111    4.12   4.147   4.213   4.263    4.27   4.271   4.408   4.409   4.424
##       1       1       1       1       1       1       1       1       1       1
##   4.433   4.453   4.454   4.473    4.49     4.5   4.542   4.587   4.591   4.631
##       1       1       1       1       1       1       1       1       1       1
##   4.642   4.668   4.685   4.693   4.752   4.779   4.804   4.866   4.893   4.898
##       1       1       1       1       1       1       1       1       1       1
##   4.981   5.077   5.256   5.258   5.339   5.418    5.55   5.583   5.666   5.719
##       1       1       1       1       1       1       1       1       1       1
##   5.721   5.794   5.882   5.898   5.905    5.94    5.96   5.968   5.991   5.997
##       1       1       1       1       1       1       1       1       1       1
##   6.002   6.005   6.073   6.083   6.111   6.119    6.13   6.199    6.24   6.278
##       1       1       1       1       1       1       1       1       1       1
##   6.281   6.438   6.529   6.545   6.664   6.689   6.705   6.728   6.736   6.832
##       1       1       1       1       1       1       1       1       1       1
##   7.008   7.083   7.097   7.162   7.177   7.184   7.233   7.357   7.395   7.396
##       2       1       1       2       2       2       2       1       2       1
##   7.428   7.431   7.449   7.467   7.488   7.518   7.567   7.568   7.642   7.655
##       1       1       1       1       1       2       2       1       1       2
##    7.73   7.922   7.973   7.975   8.123   8.156   8.161   8.392   8.472   8.478
##       1       1       1       1       1       1       1       1       1       1
##   8.492     8.5   8.508   8.509   8.531    8.55   8.612   8.683   8.685   8.686
##       1       1       1       1       1       1       1       1       1       2
##   8.699   8.719   8.727   8.728   8.737   8.746   8.757   8.765   8.774   8.778
##       1       1       1       1       1       1       1       1       1       1
##   8.789   8.825   8.832   8.842   8.851   8.861   8.868   8.914   8.963    9.07
##       1       1       1       1       1       1       2       1       1       1
##   9.162   9.165   9.184   9.212   9.218   9.266   9.277   9.311   9.322   9.359
##       1       1       1       1       1       1       1       1       1       1
##   9.376   9.407   9.504   9.517   9.525   9.533   9.553   9.589   9.598     9.6
##       1       1       1       1       1       1       1       2       1       1
##   9.644   9.662   9.671   9.679    9.76   9.785   9.802   9.818    9.85   9.854
##       1       1       1       1       1       1       1       1       1       1
##   9.933   9.955   9.968   9.991  10.023  10.039  10.081  10.101  10.113  10.115
##       1       1       1       1       1       1       1       1       1       1
```

```
##  10.134  10.142   10.18  10.223  10.227  10.231  10.236  10.317  10.326   10.34
##       1       1       1       1       1       1       1       1       2       1
##  10.346  10.363  10.379  10.448  10.454  10.457  10.463  10.509  10.517  10.546
##       1       1       1       1       1       1       1       1       1       1
##    10.6  10.606  10.613  10.682  10.705  10.774  10.794  10.798    10.8  10.811
##       1       1       1       1       1       1       1       1       1       1
##  10.837  10.924  10.931  11.002   11.02   11.03  11.067  11.076  11.089  11.098
##       1       1       1       1       1       1       1       1       1       1
##  11.131  11.154  11.156  11.295  11.355  11.371   11.42  11.431  11.468  11.568
##       1       1       1       1       1       1       1       1       1       1
##  11.601  11.636  11.692  11.699  11.702  11.741  11.813  11.818  11.973  11.989
##       1       1       1       1       1       1       1       1       1       1
##  12.026  12.036  12.093   12.11  12.171  12.202  12.216  12.297  12.314  12.334
##       1       1       1       1       1       1       1       1       1       1
##  12.394  12.404  12.503  12.506  12.535  12.542  12.545  12.546  12.578  12.609
##       1       1       1       1       1       1       1       1       1       1
##  12.668  12.698  12.715  12.727  12.731  12.797  12.974  12.996  13.035   13.24
##       1       1       1       1       1       1       1       1       1       1
##  13.253    13.3   13.31  13.325  13.365  13.428  13.717   13.72   13.76  13.772
##       1       1       1       1       1       1       1       1       1       1
##  13.864  13.902  13.971  14.024  14.026  14.047  14.055  14.067  14.111  14.128
##       1       1       1       1       1       1       1       1       1       1
##  14.164   14.21  14.251  14.354  14.437  14.498  14.541  14.544  14.569  14.765
##       1       1       1       1       1       1       1       1       1       1
##  14.787  14.899  14.912  14.961  15.028  15.038  15.122  15.128  15.245  15.313
##       1       1       1       1       1       1       1       1       1       1
##  15.476  15.478  15.549  15.566  15.615  15.616  15.698  15.728  15.742  15.755
##       1       1       1       1       1       1       1       1       1       1
##  15.772  15.871  15.913  16.039  16.132  16.136  16.152  16.182  16.212  16.427
##       1       1       1       1       1       1       1       1       1       1
##  16.495  16.505  16.573  16.581  16.635   16.65  16.712   16.73  16.737   16.79
##       1       1       1       1       1       1       1       1       1       1
##  16.811  16.821  16.868  16.908  16.909  16.986  17.084  17.196    17.2  17.218
##       1       1       1       1       1       1       1       1       1       1
##  17.259   17.27  17.274  17.332   17.38  17.475  17.502  17.565  17.616  17.653
##       1       1       1       1       1       1       1       1       1       1
##  17.668  17.842  17.889  17.913  17.939   17.95  17.964  17.979  18.019  18.068
##       1       1       1       1       1       1       1       1       1       1
##   18.09  18.261  18.264  18.281  18.292  18.424  18.431  18.505  18.553  18.589
##       1       1       1       1       1       1       1       1       1       1
##  18.671   18.69  18.714  18.831   18.85  18.853   18.88  19.231  19.271  19.303
##       1       1       1       1       1       1       1       1       1       1
##  19.318  19.321  19.352  19.397   19.48   19.54  19.679  19.708  20.034  20.105
##       1       1       1       1       1       1       1       1       1       1
##  20.128  20.143  20.236  20.359  20.388  20.398  20.445  20.653  20.938  20.941
##       1       1       1       1       1       1       1       1       1       1
##  21.012  21.116  21.259  21.494  21.508  21.826  22.079  22.238  22.344  22.384
##       1       1       1       1       1       1       1       2       1       1
##  22.451  22.465  22.688  22.854  22.978  23.051  23.064  23.072   23.23  23.617
##       1       1       1       1       2       2       2       2       1       1
##  23.772  23.906  24.013   24.02  24.445  24.584  24.848  24.863  24.917  25.126
##       2       1       1       1       1       2       1       2       1       1
##  25.166  25.167  25.406  25.614  25.681  25.923  26.025  26.072  26.203  26.313
##       1       1       1       1       1       2       1       1       1       1
```

```
##   26.55   26.89  27.032   27.28   27.47  27.603  27.756  27.921  28.001  28.084
##       1       2       1       1       1       1       1       1       1       1
##  28.156   28.72  29.454  29.491  29.528  29.597  29.755  29.948  30.243  30.442
##       1       1       1       1       1       1       1       1       1       1
##  30.449  30.543  30.592  30.663  31.093  31.202  31.481  31.493  31.501  31.912
##       1       1       1       1       1       1       1       1       1       1
##  31.991  32.149  32.277  32.499  33.085  33.316  33.319  34.107   34.49   34.54
##       1       1       1       1       1       1       1       1       1       1
##  34.753  34.806  34.872  34.952  35.129  35.132   35.22  35.318  35.343  35.567
##       1       1       1       1       1       1       1       1       1       1
##  35.692  35.699  35.879  36.288  36.447  36.639  36.971   37.02  37.162   37.66
##       1       1       1       1       1       1       1       1       1       1
##  38.192  38.347  38.436   38.52  39.001  39.071  39.185   39.79  39.958  40.457
##       1       1       1       1       1       1       1       1       1       1
##  40.574  40.795  40.885  41.034  41.126  41.444  41.494  42.073  42.348  43.024
##       1       1       1       1       1       1       1       1       1       1
##  43.449  44.235  45.327  46.166  46.406  46.978  47.417  47.965  48.043  48.178
##       1       1       1       1       1       1       1       1       1       1
##  48.593  48.777   49.18  49.764  50.545   50.79  51.296  51.775  51.801  51.931
##       1       1       1       1       1       1       1       1       1       1
##  52.119  52.731  52.735  53.271  53.393  53.715   53.87  54.581  55.046  55.183
##       1       1       2       1       1       2       1       2       1       1
##  55.356  55.541  55.591  55.849  56.143  56.495  56.626  57.015  58.808  59.676
##       2       2       1       2       1       1       2       2       1       2
##  61.834  62.256  62.279  62.439  63.608   64.91  64.954   66.41  66.554  67.076
##       1       1       2       1       1       1       1       1       1       1
##  68.072  68.816  69.519  69.655    69.9      70  70.207  70.275  70.902  70.964
##       1       1       1       1       1       2       1       1       1       1
##  71.046  71.128  71.236   71.64  71.857  72.475   72.51  72.629  74.256  74.268
##       1       1       1       1       1       1       1       1       1       1
##  74.687  77.115  77.202  77.889  78.223      79   79.76  79.951  80.315  80.341
##       1       1       1       1       1       4       1       1       1       1
##  80.893  81.316      82  82.352  82.356  83.192  83.278      84  85.135  86.441
##       1       1       1       1       1       1       1       1       1       1
##      88  88.527  88.615      89      90  91.297  91.745  92.518  93.239  93.824
##       1       1       1       1       1       1       1       1       1       1
##      94  94.417  95.154  95.432  97.384   97.44  97.532  97.815  98.303   98.35
##       1       1       1       1       1       1       1       1       1       1
##  99.715 100.563 101.086 103.589 103.899 106.458 107.793 108.109 110.122 112.057
##       1       1       1       1       1       1       1       1       1       1
## 114.092 114.699 115.369  117.49 121.151 124.822 126.551 128.501 132.228 132.341
##       1       1       1       1       1       1       1       1       1       1
## 132.343 134.453 135.823 136.192 137.331 137.635 139.688     140 140.782 141.526
##       1       1       1       1       1       1       1       1       1       1
## 141.807 142.099 142.676 144.317 144.966  146.15 146.613 147.533 147.963 150.499
##       1       1       1       1       1       1       1       1       1       1
## 150.588 150.697 153.085     154 154.062 156.229     157 159.571 161.807  165.64
##       1       1       1       1       1       1       1       1       1       1
##     166 168.012  171.57 172.643     174     175     177 177.997     178 178.359
##       1       1       1       1       1       2       2       1       1       1
##     179 182.998  189.13     193     197     198     199     202     207 209.392
##       1       1       1       1       1       1       1       1       2       1
##     218 218.751     220     221 224.272     225     229 229.998 230.575     232
##       1       1       1       1       1       1       1       1       1       1
```

```
## 232.178 236.311 240.259 242.123   242.3     243     245     247     248 248.958
##       1       1       1       1       1       1       1       2       1       1
##     249     252 252.075     253 256.954     257 261.567 261.667     264 265.763
##       1       2       1       1       1       1       1       1       1       1
##     269 269.405     270 271.396     273 274.841     275     276     277 277.505
##       1       1       1       1       1       1       1       1       1       1
##     279 280.956 281.576     282     283     284  284.03 284.568 287.646 288.322
##       1       1       1       1       1       1       1       1       1       1
## 290.266 290.273     291     293 294.005 294.768 295.898     296 297.784     299
##       1       1       2       1       1       1       1       2       1       1
## 299.772     300  300.54 302.723     303 306.971 307.823  309.02     310     314
##       1       1       1       1       1       1       1       1       1       1
##     316 316.338     318     320     321 322.481     324 324.206     325     327
##       1       1       1       1       1       1       1       1       3       1
##     329     331 331.406  337.29 338.267     339 339.753 348.033     349 349.351
##       1       1       1       1       1       1       1       1       2       1
##     350     352 352.045     354     355     358     361     362 363.394 364.517
##       1       1       1       1       1       1       1       1       1       1
##     365 368.911 368.917     369 369.091  369.61     373     374     376  376.35
##       1       1       1       1       1       1       1       2       1       1
##     378     379     381 383.636     385 385.288     386  386.04 387.207 387.901
##       1       1       1       1       1       1       1       1       1       1
##     391     394 394.074 394.799     397     404 404.197 404.943     406     410
##       3       1       1       1       1       1       1       1       1       1
##     414     415     417     418     426     437     442     443     444     453
##       1       1       1       1       1       2       1       1       1       1
##     457     467     473     477     481     486     498     499     508     509
##       1       1       1       1       1       1       2       2       1       1
##     511     514     519     523     525     527     529 529.351     533     534
##       1       1       1       1       1       2       1       1       1       1
##  536.67     537     544     545     549 550.826     553   557.8 558.957     560
##       1       1       1       1       1       1       1       1       1       1
##     561     562 566.919     574 574.309 575.572 581.156     582  588.92     589
##       1       1       1       1       1       1       1       2       1       1
##     590  590.29  596.14     603 604.208 605.662     610  612.78     617     618
##       1       1       1       1       1       1       1       1       1       1
##     619     620 621.568 623.211     624     629 631.857     632     633     639
##       1       1       1       1       1       1       1       1       1       1
##     640     641     650 651.214     652     654     656     664     667 668.075
##       2       2       1       1       2       1       1       1       1       1
##     670     676     679     684     685     686     689 689.118 691.676     692
##       2       2       1       2       1       1       1       1       1       1
##     694     696     699     700     702     705     709     710 710.313 717.423
##       2       1       1       1       1       1       1       2       1       1
##     722     724     726     731     739     740     741     745     746     748
##       1       1       2       1       2       3       1       2       1       1
##     749     751     752 755.408 756.784 758.408 759.413     761     762     763
##       1       1       1       1       1       1       1       1       1       1
##     764     767     770 771.537     774     779     781     782     783     786
##       1       1       1       1       1       1       1       1       1       1
## 791.717     793     795  797.03     798 798.747     801 802.492     803     804
##       1       1       1       1       1       1       2       1       1       1
## 804.267     808 819.588     820     821  821.46     829     835  844.14     845
##       1       1       1       2       1       1       1       1       1       1
```

```
##     846 846.136     851     854     857     869     879     883     887     889
##       1       1       1       1       1       1       1       1       1       1
##     898     899     901     907     909     910     916     925     931     932
##       1       1       1       1       1       1       1       1       2       2
##     939     945     955     959     960     964     968     970     978 986.082
##       1       1       1       1       1       1       1       1       1       1
##     991     995     999    <NA>
##       1       1       1     632
```

- Observamos que tenemos **632 valores perdidos**.Guardamos en la variable **idx** los índices de los registros con valores **NA** de la variable **Value**.

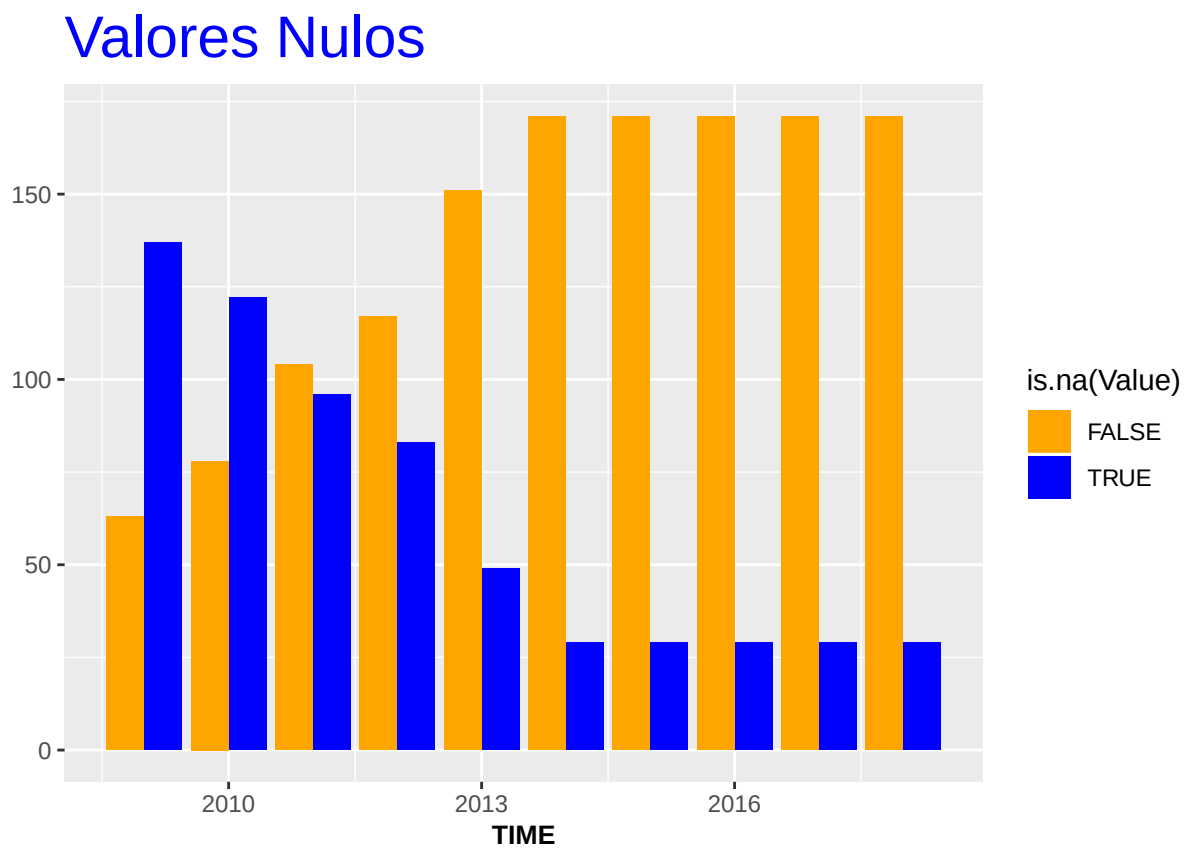
```
idx<-which(is.na(gasto_fun$Value))
length(idx)
```

```
## [1] 632
```

- Grafiquemos la información que contiene la variable **Value**

```
library(ggplot2)
library(scales)
g = ggplot(gasto_fun, aes(TIME, fill=is.na(Value)) ) +
labs(title = "Valores Nulos")+ylab("") +
theme(plot.title = element_text(size = rel(2), colour = "blue"))

g+geom_bar(position="dodge") + scale_fill_manual(values = alpha(c("orange", "blue"), 1)) +
theme(axis.title.x = element_text(face="bold", size=10))
```



- En caso de detectar algún valor anómalo (en nuestro caso los NAS) en las variables tendríamos que

realizar una imputación de esos valores o bien sustituyéndolos por la media o usando el algoritmo KNN (k-Nearest Neighbour) con los 3 vecinos más cercanos usando la distancia que consideremos, en este caso usaremos Gower(Mediana), por ser una medida más robusa frente a extremos.

```
library(VIM)
```

```
## Loading required package: colorspace
```

```
## Loading required package: grid
```

```
## VIM is ready to use.
```

```
## Suggestions and bug-reports can be submitted at: https://github.com/statistikat/VIM/issues
```

```
##
## Attaching package: 'VIM'
```

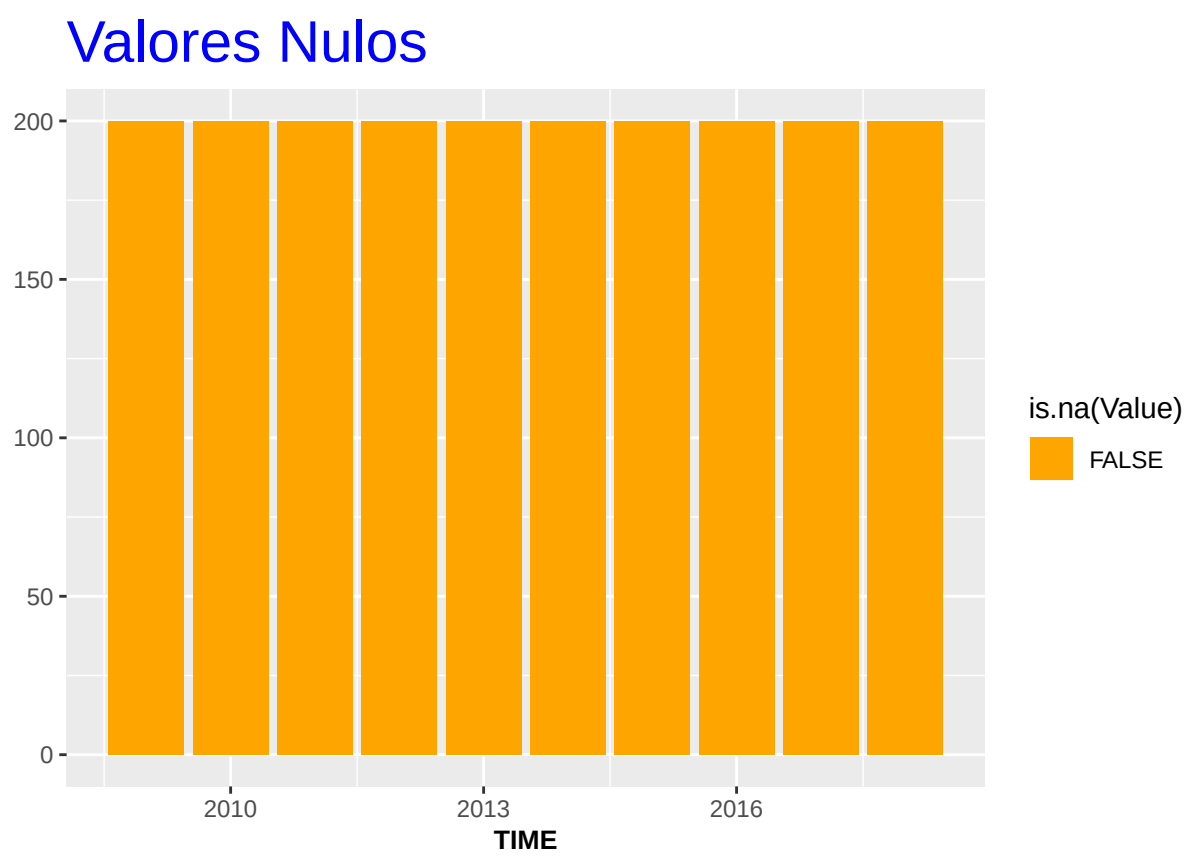
```
## The following object is masked from 'package:datasets':
##
##     sleep
```

```
output<-kNN(gasto_fun, variable=c("Value"),k=3)
gasto_fun<-output
```

- Comprobamos que no tenemos valores nulos después de la imputación

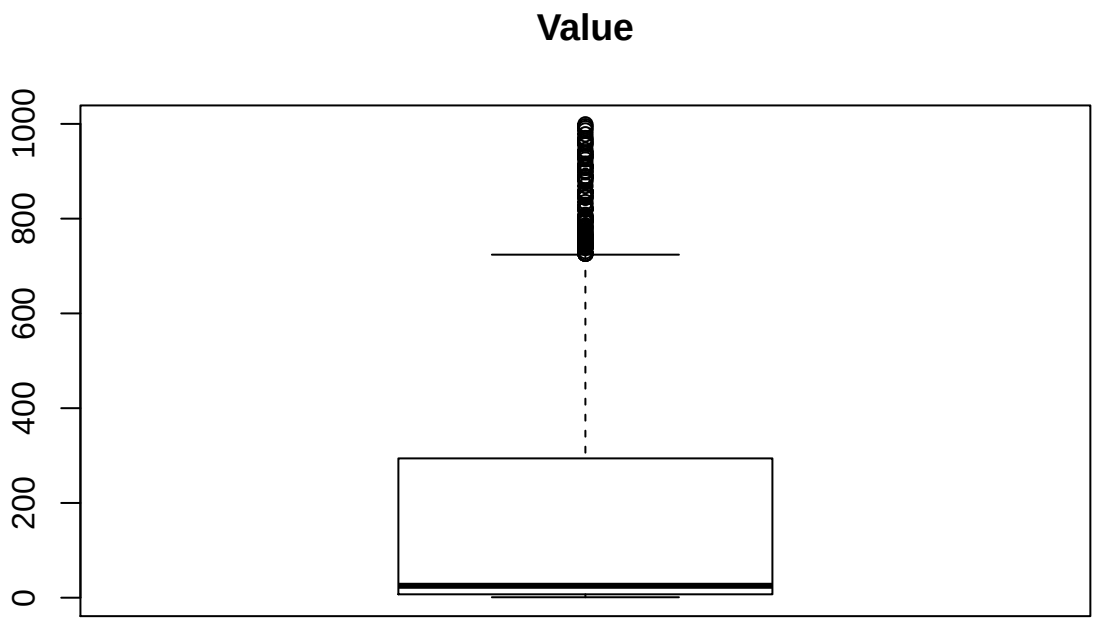
```
g = ggplot(gasto_fun, aes(TIME, fill=is.na(Value)) ) +
labs(title = "Valores Nulos")+ylab("") +
theme(plot.title = element_text(size = rel(2), colour = "blue"))

g+geom_bar(position="dodge") + scale_fill_manual(values = alpha(c("orange", "blue"), 1)) +
theme(axis.title.x = element_text(face="bold", size=10))
```



- Con el siguiente gráfico, observaremos que la variable **Value** tiene outliers o valores extremos:

```
boxplot(gasto_fun$Value, main="Value")
```



- Por otro lado, revisamos para el resto de columnas si tenemos valores NA.(desconocidos o perdidos)

```
table(gasto_fun$TIME, useNA = "ifany")
```

```
##
## 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
##  200  200  200  200  200  200  200  200  200  200
```

```
table(gasto_fun$GEO, useNA = "ifany")
```

```
##
##                                    Austria
##                                         50
##                                    Belgium
##                                         50
##                     Bosnia and Herzegovina
##                                         50
##                                   Bulgaria
##                                         50
##                                    Croatia
##                                         50
##                                     Cyprus
##                                         50
##                                    Czechia
##                                         50
##                                    Denmark
##                                         50
##                                    Estonia
```

```
##                                             50
##             Euro area - 12 countries (2001-2006)
##                                             50
##                  Euro area - 18 countries (2014)
##                                             50
##            Euro area - 19 countries  (from 2015)
##                                             50
##        European Union - 15 countries (1995-2004)
##                                             50
##        European Union - 27 countries (2007-2013)
##                                             50
##        European Union - 27 countries (from 2020)
##                                             50
##        European Union - 28 countries (2013-2020)
##                                             50
##                                        Finland
##                                             50
##                                         France
##                                             50
## Germany (until 1990 former territory of the FRG)
##                                             50
##                                         Greece
##                                             50
##                                        Hungary
##                                             50
##                                        Iceland
##                                             50
##                                        Ireland
##                                             50
##                                          Italy
##                                             50
##                                         Latvia
##                                             50
##                                  Liechtenstein
##                                             50
##                                      Lithuania
##                                             50
##                                     Luxembourg
##                                             50
##                                          Malta
##                                             50
##                                    Netherlands
##                                             50
##                                         Norway
##                                             50
##                                         Poland
##                                             50
##                                       Portugal
##                                             50
##                                        Romania
##                                             50
##                                       Slovakia
##                                             50
##                                       Slovenia
```

```
##                                          50
##                                       Spain
##                                          50
##                                      Sweden
##                                          50
##                                 Switzerland
##                                          50
##                              United Kingdom
##                                          50
```

```
table(gasto_fun$UNIT, useNA = "ifany")
```

```
##
## Million euro
##         2000
```

```
table(gasto_fun$ICHA11_HC, useNA = "ifany")
```

```
##
##                               Curative care
##                                         400
##      Curative care and rehabilitative care
##                                         400
##      Current health care expenditure (CHE)
##                                         400
## Inpatient curative and rehabilitative care
##                                         400
##                     Inpatient curative care
##                                         400
```

Observamos que no existen ahora valores perdidos después de la imputación.La suma de las cantidades de cada variable, suman el total.

- Finalmente, creamos un fichero con toda la información corregida.

```
write.csv(gasto_fun, file="GastoSanitario_Funcion_clean.csv", row.names = FALSE)
```