Master en Big Data. Fundamentos Matemáticos del Análisis de Datos (FMAD).

Tarea 1

Departamento de Matemática Aplicada

Curso 2021-22. Última actualización: 2021-09-16

Preliminares

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.4     v dplyr   1.0.7
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   2.0.1     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(ggplot2)
library(haven)
library(nycflights13)
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'

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

Instrucciones preliminares

- Empieza abriendo el proyecto de RStudio correspondiente a tu repositorio personal de la asignatura.
- En todas las tareas tendrás que repetir un proceso como el descrito en la sección *Repite los pasos Creando un fichero Rmarkdown para esta práctica* de la *Práctica00*. Puedes releer la sección *Practicando la entrega de las Tareas* de esa misma práctica para recordar el procedimiento de entrega.

Ejercicio 0

- Si no has hecho los *Ejercicios* de la *Práctica00* (págs. 12 y 13) hazlos ahora y añádelos a esta tarea. Si ya los has hecho y entregado a través de GitHub no hace falta que hagas nada.

Ejercicio 1. Análisis exploratorio de un conjunto de datos y operaciones con dplyr.

- Vamos a utilizar el conjunto de datos contenido en el fichero (es un enlace):
  cholesterol.csv
  Los datos proceden de un estudio realizado en la *University of Virginia School of Medicine* que investiga la prevalencia de la obesidad, la diabetes y otros factores de riesgo cardiovascular. Se puede encontrar más información sobre el fichero en este enlace:
  https://biostat.app.vumc.org/wiki/pub/Main/DataSets/diabetes.html
- Carga el conjunto de datos en un data.frame de R llamado `chlstrl`.

```
chlstrl=read.csv("./data/cholesterol.csv")
```

- Empezaremos por información básica sobre el conjunto de datos. Cuántas observaciones contiene, cuáles son las variables y de qué tipos,...

```
str(chlstrl)
```

```
## 'data.frame':    403 obs. of  7 variables:
##  $ chol  : int  203 165 228 78 249 248 195 227 177 263 ...
##  $ age   : int  46 29 58 67 64 34 30 37 45 55 ...
##  $ gender: chr  "female" "female" "female" "male" ...
##  $ height: int  62 64 61 67 68 71 69 59 69 63 ...
##  $ weight: int  121 218 256 119 183 190 191 170 166 202 ...
##  $ waist : int  29 46 49 33 44 36 46 34 34 45 ...
##  $ hip   : int  38 48 57 38 41 42 49 39 40 50 ...
```

- Asegúrate de comprobar si hay datos ausentes y localízalos en la tabla.

```
#Esto nos permite saber cuántos valores son NA y cuántos no lo son de la tabla completa
table(is.na(chlstrl))
```

```
##
## FALSE  TRUE
##  2810    11
```

```
#Esto nos permite saber la localización de cada valor na en la tabla (con head solo salen las 6 primera
head(is.na(chlstrl))
```

```
##       chol   age gender height weight waist   hip
## [1,] FALSE FALSE  FALSE  FALSE  FALSE FALSE FALSE
## [2,] FALSE FALSE  FALSE  FALSE  FALSE FALSE FALSE
## [3,] FALSE FALSE  FALSE  FALSE  FALSE FALSE FALSE
## [4,] FALSE FALSE  FALSE  FALSE  FALSE FALSE FALSE
## [5,] FALSE FALSE  FALSE  FALSE  FALSE FALSE FALSE
## [6,] FALSE FALSE  FALSE  FALSE  FALSE FALSE FALSE
```

```
summary(chlstrl)
```

```
##       chol            age           gender              height
##  Min.   : 78.0   Min.   :19.00   Length:403         Min.   :52.00
##  1st Qu.:179.0   1st Qu.:34.00   Class :character   1st Qu.:63.00
##  Median :204.0   Median :45.00   Mode  :character   Median :66.00
##  Mean   :207.8   Mean   :46.85                      Mean   :66.02
##  3rd Qu.:230.0   3rd Qu.:60.00                      3rd Qu.:69.00
##  Max.   :443.0   Max.   :92.00                      Max.   :76.00
##  NA's   :1                                          NA's   :5
##      weight          waist            hip
##  Min.   : 99.0   Min.   :26.0   Min.   :30.00
##  1st Qu.:151.0   1st Qu.:33.0   1st Qu.:39.00
##  Median :172.5   Median :37.0   Median :42.00
##  Mean   :177.6   Mean   :37.9   Mean   :43.04
##  3rd Qu.:200.0   3rd Qu.:41.0   3rd Qu.:46.00
##  Max.   :325.0   Max.   :56.0   Max.   :64.00
##  NA's   :1       NA's   :2      NA's   :2
```

- El análisis exploratorio (numérico y gráfico) debe cubrir todos los tipos de variable de la tabla. Es decir, que al menos debes estudiar una variable por cada tipo de variable presente en la tabla. El análisis debe contener, al menos:
  - Para las variables cuantitativas (continuas o discretas).
    Resumen numérico básico.
    Gráficas (las adecuadas, a ser posible más de un tipo de gráfico).

```
#Recorrido intercuartílico
IQR(chlstrl$chol,na.rm=TRUE)
```

```
## [1] 51
```

```
#Los valores atípicos
unname(quantile(chlstrl$chol,probs=c(1/4, 3/4), na.rm=TRUE) + c(-1,1) * 1.5 * IQR(chlstrl$chol,na.rm=TRU
```

```
## [1] 102.5 306.5
```

```
#La desviación estándar
sd(chlstrl$chol, na.rm=TRUE)
```

```
## [1] 44.44556
```

```
#La varianza
var(chlstrl$chol, na.rm=TRUE)
```

```
## [1] 1975.408
```

1)HISTOGRAMA

```r
summary(chlstrl$chol)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##    78.0   179.0   204.0   207.8   230.0   443.0       1
```

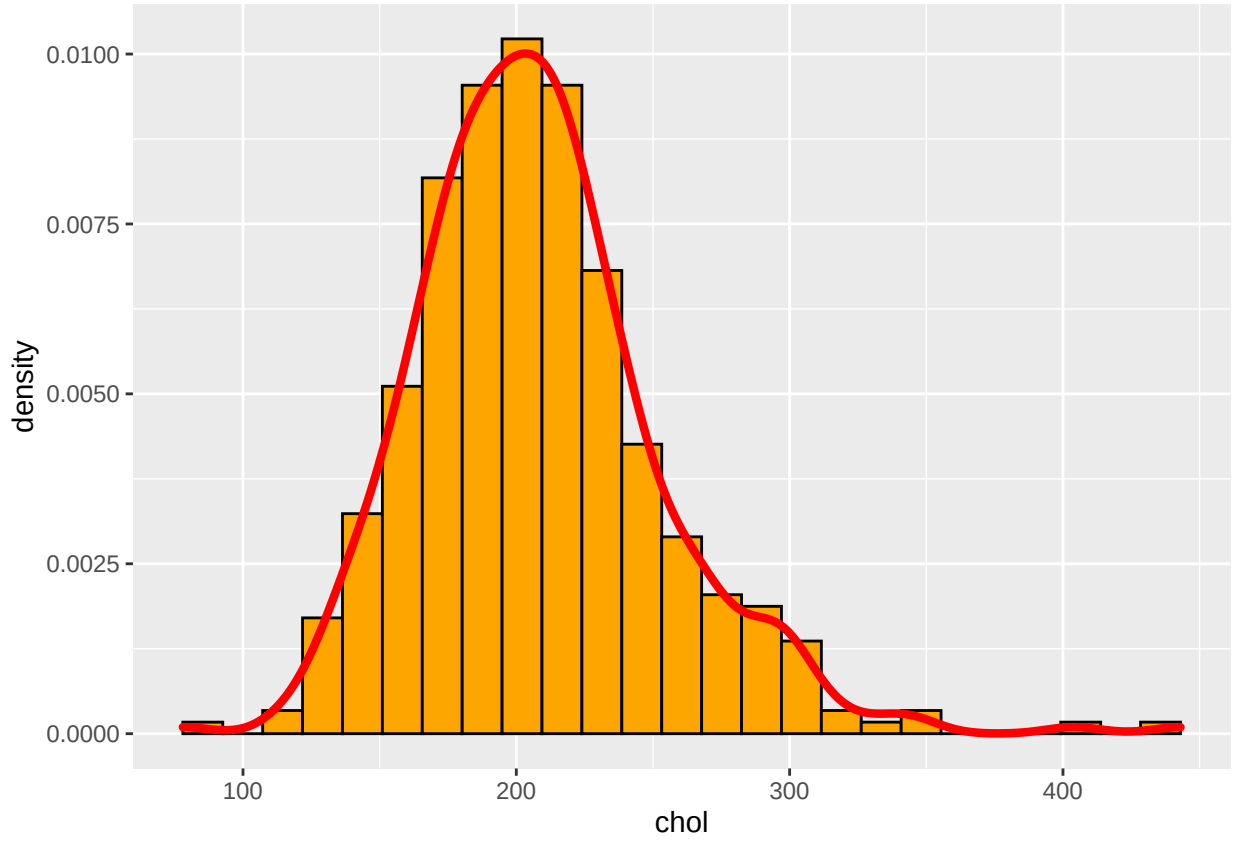
```r
#En este chunk se realiza el histograma de la variable colesterol, interpretada como continua

cortes=seq(min(chlstrl$chol, na.rm=T),max(chlstrl$chol, na.rm=T), length.out=26)

ggplot(chlstrl, aes(chol)) +
geom_histogram(aes(y=stat(density)),breaks=cortes, fill="orange", color="black") +
geom_density(color="red",size=1.5)
```

```
## Warning: Removed 1 rows containing non-finite values (stat_bin).

## Warning: Removed 1 rows containing non-finite values (stat_density).
```



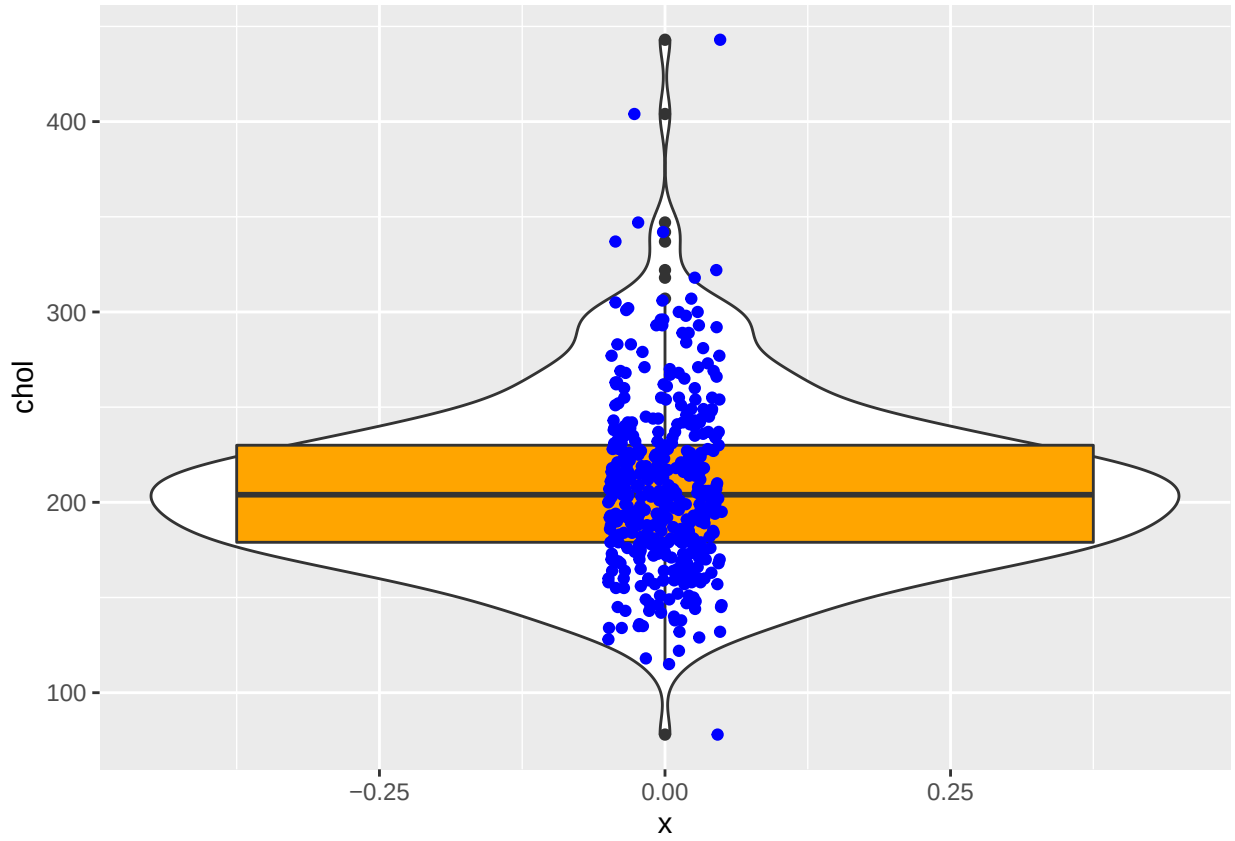
2)Violin/Boxplot

```r
#Aqui se realiza el diagrama boxplot/violín/dispersión de una variable discreta
ggplot(chlstrl)+
  geom_violin(mapping = aes(x=0, y=chol))+
  geom_boxplot(mapping = aes(y=chol),fill="orange") +
  geom_jitter(aes(x=0, y=chol),
              position=position_jitter(w=0.05, h=0), col="blue")
```

```
## Warning: Removed 1 rows containing non-finite values (stat_ydensity).

## Warning: Removed 1 rows containing non-finite values (stat_boxplot).

## Warning: Removed 1 rows containing missing values (geom_point).
```



- Variables categóricas (factores).
  Tablas de frecuencia (absolutas y relativas).
  Gráficas (diagrama de barras).

```
summary(chlstrl$gender)
```

```
##    Length     Class      Mode
##       403 character character
```

```
#table(chlstrl$gender)
#prop.table(table(chlstrl$gender))


#Tabulación de géneros según su frecuencia
chlstrl %>%
  count(gender)
```

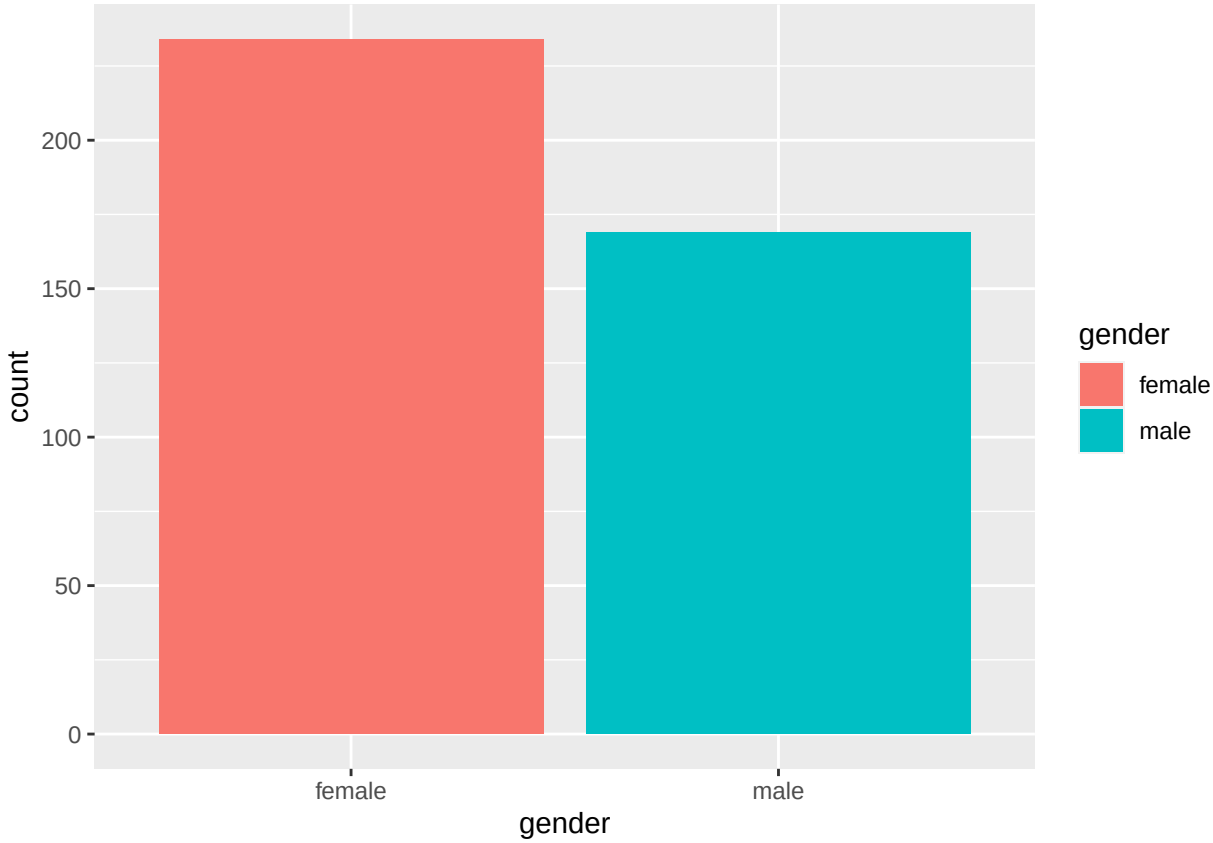
```
##   gender   n
## 1 female 234
## 2   male 169
```

```
#Tabulación de géneros según su frecuencia relativa

chlstrl %>%
  count(gender) %>%
    mutate(gender, relFreq = prop.table(n), n=NULL)
```

```
##   gender   relFreq
## 1 female 0.5806452
## 2   male 0.4193548
```

```
ggplot(chlstrl) +
  geom_bar(aes(gender, fill=gender))
```



- Los valores de `height` y `weight` están en pulgadas (inches) y libras (pounds) respectivamente. Una libra son ≈ 0.454kg y una pulgada son ≈ 0.0254m. Usa dplyr para convertir esas columnas a metros y kilogramos respectivamente. Las nuevas columnas deben llamarse igual que las originales.

```
#Sustitución de las columnas de peso y altura por sus equivalentes en el sistema métrico
chlstrl=chlstrl %>%
  mutate(height=height*0.0254, weight=weight*0.454)
```

```
(chlstrl)
```

```
##     chol age gender height  weight waist hip
## 1    203  46 female 1.5748  54.934    29  38
## 2    165  29 female 1.6256  98.972    46  48
## 3    228  58 female 1.5494 116.224    49  57
## 4     78  67   male 1.7018  54.026    33  38
## 5    249  64   male 1.7272  83.082    44  41
## 6    248  34   male 1.8034  86.260    36  42
## 7    195  30   male 1.7526  86.714    46  49
## 8    227  37   male 1.4986  77.180    34  39
## 9    177  45   male 1.7526  75.364    34  40
## 10   263  55 female 1.6002  91.708    45  50
## 11   242  60 female 1.6510  70.824    39  45
## 12   215  38 female 1.4732  88.530    42  50
## 13   238  27 female 1.5240  77.180    35  41
## 14   183  40 female 1.4986  74.910    37  43
## 15   191  36   male 1.7526  83.082    36  40
## 16   213  33 female 1.6510  71.278    37  41
## 17   255  50 female 1.6510  83.082    37  43
## 18   230  20   male 1.7018  72.186    31  39
## 19   194  36   male 1.6256  57.204    30  34
## 20   196  62 female 1.6510  88.984    46  51
## 21   186  70   male 1.7018  80.812    42  41
## 22   234  47   male 1.7018 104.420    45  46
## 23   203  38 female 1.7526 130.752    48  55
## 24   281  66 female 1.5748  83.990    48  44
## 25   228  24 female 1.5494  51.302    33  38
## 26   179  41 female 1.8288  53.572    28  36
## 27   232  37   male 1.7272 114.408    43  47
## 28    NA  48   male 1.7272  45.400    27  33
## 29   254  43 female 1.5748  65.830    31  38
## 30   215  40   male 1.7780  85.806    37  39
## 31   177  42 female 1.6510  78.996    37  40
## 32   182  52   male 1.7272  63.106    29  35
## 33   265  61   male 1.8796  86.714    39  41
## 34   182  61 female 1.7526  78.996    49  43
## 35   199  25   male 1.6764  53.572    32  34
## 36   183  47 female 1.6764  84.444    39  44
## 37   194  35   male 1.6764  72.186    31  35
## 38   190  46   male 1.8288  93.070    46  49
## 39   173  57   male 1.8034  65.830    31  36
## 40   182  70   male 1.7526  97.156    45  48
## 41   136  22 female 1.6764  72.640    35  40
## 42   218  52 female 1.5748  77.180    40  43
## 43   225  36   male 1.7018  87.168    40  42
## 44   262  43   male 1.9050 114.862    43  49
## 45   213  72 female 1.4986  62.198    40  40
## 46   243  37 female 1.6256 105.782    49  57
## 47   148  54 female 1.7018  74.910    42  42
## 48   128  60   male 1.7018  88.984    42  43
## 49   169  40 female 1.6510  81.720    40  44
## 50   157  55 female 1.6764  99.426    43  52
```

```
## 51   196  76   male 1.6510  69.916    37  41
## 52   237  43 female 1.6256  82.174    36  46
## 53   212  65 female 1.5494  84.898    43  47
## 54   233  45 female 1.6256  75.818    39  44
## 55   289  70 female 1.5240  99.880    51  54
## 56   193  20 female 1.7272 124.396    49  58
## 57   204  62   male 1.7272  81.720    38  41
## 58   165  92 female 1.5748  98.518    51  51
## 59   237  49 female 1.5748  85.806    43  47
## 60   218  44 female 1.6764  86.714    40  45
## 61   296  74 female 1.6002  83.082    42  48
## 62   178  36   male 1.7780  73.094    34  40
## 63   443  51 female 1.7780 106.690    43  48
## 64   145  38 female     NA  56.750    31  35
## 65   234  31   male 1.7780  74.910    35  39
## 66   146  28 female 1.6256  57.204    28  32
## 67   223  22 female 1.5748  62.198    28  35
## 68   213  71 female 1.6002  74.910    34  42
## 69   173  76 female 1.5494  46.308    31  33
## 70   232  91 female 1.5494  57.658    35  38
## 71   171  40   male 1.8034  97.156    41  39
## 72   164  23 female 1.7526 111.230    44  47
## 73   170  20 female 1.6256  73.094    37  40
## 74   180  40 female 1.7272 119.856    43  54
## 75   204  52   male 1.9050  64.468    31  35
## 76   209  76 female 1.5240  64.922    35  40
## 77   242  46 female 1.5748  83.082    37  45
## 78   134  48   male 1.7780  78.542    36  40
## 79   217  22 female 1.8034 101.242    46  50
## 80   251  58 female 1.6002  69.916    38  41
## 81   217  34   male 1.8542  99.426    41  42
## 82   300  61 female 1.7018  76.726    40  44
## 83   218  40   male 1.8542  90.800    38  41
## 84   189  28 female 1.6256  90.800    38  45
## 85   185  53 female 1.5494  65.830    37  40
## 86   206  67   male 1.7018  80.812    37  41
## 87   218  51 female     NA  97.610    42  53
## 88   189  49 female 1.5748  93.070    40  49
## 89   229  65 female 1.5748  68.554    37  42
## 90   228  54   male 1.6764  77.180    36  41
## 91   159  38   male 1.7272  76.726    34  40
## 92   249  64 female 1.6002  72.186    33  41
## 93   170  41 female 1.5494  49.940    29  30
## 94   174  67   male 1.7272  89.892    36  43
## 95   204  27 female 1.7018  83.990    35  44
## 96   203  21 female 1.6002  64.468    28  39
## 97   241  41 female 1.4986  63.106    29  39
## 98   245  47 female 1.6002  70.824    35  39
## 99   143  61 female 1.6510  99.880    40  50
## 100  224  65   male 1.7018  89.438    42  43
## 101  168  28 female 1.6002  90.800    42  46
## 102  184  41   male 1.7526  69.916    34  39
## 103  199  37 female 1.5494  92.162    42  51
## 104  158  50   male 1.8034  81.720    36  40
```

```
## 105  209  57 female 1.5494  68.100    36  39
## 106  214  28   male 1.7272  92.616    40  41
## 107  293  31 female 1.7018  90.800    41  42
## 108  227  83 female 1.4986  56.750    35  40
## 109  292  79   male 1.7780  74.910    39  41
## 110  218  68   male 1.7780  77.180    37  42
## 111  244  32   male 1.7780  96.248    39  44
## 112  283  26   male 1.8288 103.058    41  44
## 113  186  36   male 1.7526  68.100    31  38
## 114  273  53 female 1.6256  78.996    34  43
## 115  193  19 female 1.5494  54.026    32  38
## 116  194  63   male 1.8542  79.450    34  39
## 117  231  58 female 1.6002 104.420    39  48
## 118  217  53 female 1.6002  71.732    33  40
## 119  174  50   male 1.7780 119.402    51  64
## 120  225  41   male 1.8034  70.824    31  40
## 121  268  48   male 1.7780  54.480    32  35
## 122  195  59 female 1.7018  78.088    38  43
## 123  179  34   male 1.8288  77.180    31  39
## 124  215  63 female 1.6002  71.732    34  42
## 125  185  23   male 1.9304  74.456    32  40
## 126  132  21 female 1.6510  76.726    39  43
## 127  175  23 female 1.6510 106.690    44  50
## 128  179  36 female 1.6002  56.750    33  36
## 129  228  71 female 1.6002 110.776    48  51
## 130  181  64   male 1.8034 102.150    44  47
## 131  160  43 female 1.6256  63.560    37  40
## 132  188  31 female 1.7018 103.058    47  53
## 133  168  44 female 1.6256  72.640    40  43
## 134  318  60 female 1.6510  75.818    38  44
## 135  192  43 female 1.6256 147.550    53  62
## 136  209  48 female 1.6002  54.934    32  38
## 137  129  56   male 1.8796  68.554    34  38
## 138  160  55 female 1.7018 101.242    43  48
## 139  160  49   male 1.8034 120.764    49  45
## 140  211  58   male 1.7018  80.358    38  43
## 141  262  33 female 1.6002  77.180    33  46
## 142  201  48 female 1.7272  66.284    32  41
## 143  263  66 female 1.6764  54.934    31  33
## 144  219  59   male 1.6764  77.180    37  40
## 145  191  45 female 1.7018  68.554    33  38
## 146  171  52   male 1.8034  72.186    33  39
## 147  219  76   male 1.6256  47.670    29  33
## 148  347  36   male 1.7780 125.758    51  49
## 149  269  41 female 1.5748  72.640    39  41
## 150  164  20   male 1.8288  65.830    29  36
## 151  181  50   male 1.8034 145.280    56  49
## 152  190  43 female 1.5748  74.002    40  45
## 153  255  82   male 1.6764  74.002    37  43
## 154  218  35   male 1.7526  76.726    39  41
## 155  223  47 female 1.6510 105.328    46  54
## 156  254  75   male 1.7272  95.340    44  45
## 157  236  62   male 1.9304  72.640    35  39
## 158  176  31 female 1.5748  65.830    36  42
```

```
## 159  158  50   male 1.7780  97.610    40  45
## 160  181  39 female 1.6764 115.770    46  54
## 161  151  33   male 1.7526 139.832    52  58
## 162  115  58   male 1.7526      NA    30  37
## 163  271  81 female 1.6256  71.732    36  43
## 164  190  27 female 1.6510  95.340    39  47
## 165  118  47 female 1.6256  55.842    30  36
## 166  168  33 female 1.6764  53.572    29  35
## 167  254  67   male 1.7272  75.818    36  39
## 168  193  42 female 1.9050  84.444    37  46
## 169  187  21 female 1.6002  71.732    39  43
## 170  212  51 female 1.6510  65.830    38  42
## 171  170  27 female 1.6002  54.026    28  37
## 172  215  51 female 1.7018 128.028    52  59
## 173  199  71   male 1.7526  77.634    38  40
## 174  140  50   male 1.7526  78.088    37  41
## 175  216  54 female 1.6510  62.652    33  39
## 176  204  59   male 1.8542  84.898    38  37
## 177  193  59 female 1.6764  85.806    38  45
## 178  267  40 female 1.4986  92.616    40  47
## 179  201  58   male 1.6764  97.610    46  44
## 180  204  72   male 1.6510  75.818    45  46
## 181  246  66 female 1.6764  85.806    45  46
## 182  229  23   male 1.8288  81.720    34  41
## 183  172  42 female 1.6510  74.910    33  45
## 184  197  43   male 1.8034  81.266    37  44
## 185  205  75   male 1.7526  92.616    44  42
## 186  219  65 female 1.6002 105.782    40  53
## 187  174  34   male 1.8034  95.340    37  43
## 188  192  37   male 1.8034  88.530    36  43
## 189  206  61 female 1.6002  90.346    41  47
## 190  160  36 female 1.6256  83.990    39  45
## 191  216  45 female 1.7018  66.738    32  38
## 192  236  68 female 1.5494  54.026    29  37
## 193  205  57   male 1.6764  77.634    37  40
## 194  206  41 female 1.5748  83.536    39  44
## 195  143  68   male 1.7018  71.732    37  43
## 196  173  40 female     NA  59.020    37  38
## 197  235  79 female 1.6510  60.836    34  38
## 198  169  62   male 1.6764 113.954    50  47
## 199  283  63 female 1.5494  90.800    44  48
## 200  174  55   male 1.7780  63.560    32  33
## 201  271  55 female 1.6002  51.756    30  37
## 202  203  27 female 1.7018  94.886    34  43
## 203  188  66   male 1.7272  95.340    45  48
## 204  293  63 female 1.6256  81.266    47  45
## 205  215  78   male 1.6510  49.486    33  34
## 206  207  68   male 1.3970  59.020    29  33
## 207  179  31   male 1.6764  65.830    33  38
## 208  202  64 female 1.5748  75.818    44  47
## 209  211  40 female 1.7272  81.266    37  43
## 210  211  61 female 1.6002  65.376    40  42
## 211  151  28   male 1.7526  59.020    29  35
## 212  171  34 female 1.6002  74.456    34  43
```

```
## 213  342  63 female 1.6510  91.254    45  46
## 214  179  55   male 1.9050  84.444    38  38
## 215  155  26   male 1.8542  78.996    30  35
## 216  197  36 female 1.6256  61.744    32  37
## 217  200  40 female 1.5748  47.670    26  33
## 218  237  45   male 1.7526  59.020    33  35
## 219  198  68 female 1.6002  56.296    32  38
## 220  240  82 female 1.6002  77.180    41  46
## 221  192  60 female 1.5748  60.836    31  40
## 222  145  30 female 1.6510  74.910    33  42
## 223  269  41   male 1.7018  86.714    38  41
## 224  240  54 female 1.6510  79.450    37  43
## 225  205  72 female 1.5494  81.720    39  47
## 226  266  47   male 1.7272  64.468    35  39
## 227  188  50 female 1.5494  66.738    34  41
## 228  222  51 female 1.6764  49.940    28  37
## 229  142  45   male 1.7526  92.616    40  43
## 230  268  38 female 1.6002  82.174    38  46
## 231  174  20   male 1.7780  84.898    37  41
## 232  214  44 female     NA  86.260    38  44
## 233  194  63   male 1.7780  82.174    37  42
## 234  196  50   male 1.7018  63.560    35  37
## 235  207  44 female 1.7018  91.254    46  49
## 236  204  48   male 1.7272  88.984    38  42
## 237  189  41 female 1.6002  69.462    32  40
## 238  179  29   male 1.7272  77.180    38  39
## 239  159  76   male 1.6764  85.352    40  41
## 240  260  69 female 1.4986  81.266    45  48
## 241  228  26   male 1.8288 117.586    48  49
## 242  242  70 female 1.6764  90.800    41  47
## 243  227  25   male 1.8034  73.548    35  39
## 244  208  42 female 1.5748  64.014    33  40
## 245  208  56   male 1.7272  83.082    36  39
## 246  209  31 female 1.7018  72.640    30  44
## 247  163  31 female 1.6510  54.480    29  40
## 248  201  27 female 1.6510  65.830    32  35
## 249  237  73 female 1.6256  78.996    38  44
## 250  176  32 female 1.6002 114.408    45  58
## 251  146  19 female 1.5240  61.290    33  40
## 252  231  71 female 1.6002  70.370    33  41
## 253  241  27 female 1.6002  81.266    40  42
## 254  305  31   male 1.8034  95.794    40  45
## 255  149  20 female 1.5748  52.210    31  37
## 256  183  31 female 1.6764  86.260    41  47
## 257  235  62 female 1.6002 131.660    55  62
## 258  244  44   male 1.8034  76.272    36  39
## 259  199  36 female 1.6764 115.770    47  52
## 260  224  36   male 1.7526  93.070    37  41
## 261  173  47   male 1.8542 118.040    42  47
## 262  192  30   male 1.8288 113.500    43  51
## 263  157  63   male 1.7526  75.364    39  38
## 264  172  48 female 1.6002  77.180    35  42
## 265  170  65   male 1.7526  82.628    42  39
## 266  215  59 female 1.6002  79.904    34  44
```

```
## 267  214  37 female 1.6256  65.830    34  42
## 268  195  78   male 1.6764  78.088    40  40
## 269  230  23   male 1.8034 125.758    50  49
## 270  206  38 female 1.7526  75.818    36  47
## 271  147  38   male 1.7526  93.070    39  41
## 272  234  41   male 1.7018  83.082    38  40
## 273  135  29 female 1.6510  55.842    26  37
## 274  226  49 female 1.6002  58.112    31  36
## 275  179  23 female 1.6510  83.082    43  45
## 276  163  29 female 1.5748  44.946    30  36
## 277  191  40   male 1.8288 122.580    45  49
## 278  138  38 female 1.5240  62.652    31  39
## 279  184  40 female 1.6002 129.390    50  60
## 280  181  29   male 1.7272  81.720    38  42
## 281  224  78 female 1.6002  72.640    36  45
## 282  293  50   male 1.8034  77.180    34  39
## 283  147  23 female 1.5494  83.990    43  47
## 284  198  60   male 1.7780  74.002    36  40
## 285  152  40 female 1.3208  84.898    38  49
## 286  277  60 female 1.5494  58.112    33  39
## 287  219  40 female 1.5748  69.462    36  44
## 288  182  30 female 1.5748  56.750    31  39
## 289  135  21   male 1.7526  70.370    31  39
## 290  277  63 female 1.6256 101.242    45  54
## 291  212  63   male 1.7780  73.094    37  40
## 292  162  43   male 1.7018  98.064    41  44
## 293  207  46 female 1.6002  81.266    38  46
## 294  255  64   male 1.7272 103.058    44  47
## 295  404  56   male 1.7526  72.186    38  39
## 296  239  35   male 1.8796  77.180    32  38
## 297  220  59 female 1.6764  62.652    32  38
## 298  165  22 female 1.6002  51.756    28  35
## 299  243  43 female 1.6256 108.506    48  53
## 300  149  26 female 1.5748  78.996    38  46
## 301  178  41 female 1.6510  85.352    35  46
## 302  190  43 female 1.6510  89.892    40  49
## 303  226  20 female 1.6256  51.756    31  39
## 304  132  28 female 1.7272 102.150    41  52
## 305  160  30 female 1.6002  64.922    33  40
## 306  204  66   male 1.7018  66.284    36  48
## 307  164  20 female 1.7780  64.014    32  39
## 308  155  32 female 1.6510  68.554    33  40
## 309  251  38 female 1.6256 112.592    49  58
## 310  198  61   male 1.8796  69.008    33  38
## 311  179  26 female 1.5240  59.020    32  40
## 312  223  74 female 1.5748  74.910    41  46
## 313  207  72   male 1.7780  81.720    39  40
## 314  244  21   male 1.8034  74.002    34  39
## 315  245  36   male 1.6764  81.266    37  42
## 316  191  42 female 1.5494  70.824    36  42
## 317  221  66 female 1.6256  59.020    31  38
## 318  300  34 female     NA  72.640    40  47
## 319  173  43 female 1.7526  95.340    44  47
## 320  138  57   male 1.8542  74.456    31  37
```

```
## 321  203  45   male 1.6764  52.210    30  34
## 322  260  44 female 1.5748  72.186    36  43
## 323  166  27   male 1.8288  64.014    33  38
## 324  180  63   male 1.7526  76.726    35  39
## 325  159  65   male 1.7780  82.174    43  49
## 326  207  30   male 1.8288  81.720    35  41
## 327  298  28   male 1.6764  94.886    42  46
## 328  203  41   male 1.8034  95.340    37  42
## 329  191  31 female 1.5748 107.598    53  56
## 330  231  33   male 1.7526  74.002    35  38
## 331  184  66   male 1.8796  83.990    40  41
## 332  164  28 female 1.7018  81.720    39  43
## 333  134  25 female 1.6002 111.230    47  58
## 334  220  26   male 1.7780  68.100    33  39
## 335  180  40 female 1.6256  66.284    37  43
## 336  216  38   male 1.7272  65.830    34  37
## 337  158  30 female 1.5748  64.468    NA  NA
## 338  261  52 female 1.6256  89.892    42  49
## 339  172  22 female 1.6256  67.192    35  38
## 340  249  51 female 1.6510  90.800    43  46
## 341  189  45   male 1.7526  86.260    39  44
## 342  225  53 female 1.6002  82.628    38  46
## 343  193  21 female 1.5494  99.880    40  52
## 344  219  53 female 1.6256  81.266    39  47
## 345  156  37 female 1.7018  96.248    48  51
## 346  224  34 female 1.5240  74.910    34  46
## 347  181  30 female 1.6764 116.678    47  55
## 348  306  74   male 1.7526  83.536    39  41
## 349  122  36 female 1.8034  83.082    41  45
## 350  219  45   male 1.7018  98.972    41  45
## 351  150  35   male 1.8542  81.266    32  37
## 352  185  50 female 1.6256 103.512    42  54
## 353  226  27   male 1.7526 131.206    48  51
## 354  206  52   male 1.7526  69.462    36  40
## 355  199  42 female 1.7018 106.690    47  52
## 356  239  39   male 1.5240  65.376    33  42
## 357  235  73   male 1.6510  83.082    43  46
## 358  184  28   male 1.7018  69.916    35  38
## 359  242  53   male 1.7526  98.064    43  45
## 360  307  49   male 1.7018  82.174    41  42
## 361  204  55 female 1.6764  91.708    43  47
## 362  212  37 female 1.6256  72.640    37  45
## 363  203  60 female 1.4986  55.842    36  41
## 364  219  56 female 1.6510  89.438    41  50
## 365  226  84 female 1.5240  87.168    41  48
## 366  217  20 female 1.7018  84.898    40  45
## 367  157  80   male 1.8034  96.248    47  48
## 368  235  60   male 1.7526  84.444    40  42
## 369  252  80 female 1.5748  73.548    44  41
## 370  204  29 female 1.6256  54.480    33  38
## 371  188  43 female 1.6764  69.008    37  41
## 372  194  63 female 1.4732  95.340    44  53
## 373  215  37 female 1.4986  67.192    32  42
## 374  179  20 female 1.4732  77.180    34  46
```

```
## 375  202  44   male 1.7272  71.278    33  37
## 376  194  54   male 1.7526  58.566    30  37
## 377  227  58   male 1.7780  95.794    38  43
## 378  337  35   male 1.8288  85.806    36  44
## 379  255  52   male 1.7780  54.480    30  33
## 380  162  60 female 1.6002  54.934    32  34
## 381  322  43 female 1.4224  54.480    32  41
## 382  289  59   male 1.7272  76.726    36  38
## 383  217  33 female 1.5748  84.444    42  46
## 384  209  37   male 1.7780 118.948    42  48
## 385  214  40   male 1.8288 100.788    40  44
## 386  302  38 female 1.7018 100.788    41  51
## 387  179  32 female 1.5748  81.266    37  47
## 388  279  60 female 1.7272 101.696    48  50
## 389  144  30   male 1.8288  74.910    31  38
## 390  270  42   male 1.6764  83.990    39  41
## 391  196  52 female 1.5748  66.738    34  42
## 392  221  59 female 1.5748  80.358    39  45
## 393  210  78   male 1.6764  65.830    38  39
## 394  192  51   male 1.6510  66.284    NA  NA
## 395  169  25 female 1.5240  69.916    40  42
## 396  179  37   male 1.6764  61.744    33  39
## 397  216  54 female 1.6764  76.272    38  42
## 398  301  89 female 1.5494  52.210    31  41
## 399  296  53   male 1.7526  78.542    35  39
## 400  284  51 female 1.6002  69.916    32  43
## 401  194  29 female 1.7526  75.818    33  40
## 402  199  41 female 1.6002  89.438    41  48
## 403  159  68 female 1.6256  99.880    49  58
```

- Ahora usa esos valores de `height` y `weight` para añadir una nueva columna llamada BMI, definida mediante:

$$BMI = \frac{weight}{height^2}$$

  (se divide por el cuadrado de la altura).

```
#Creación de la columna BMI a partir de peso y altura

chlstrl=chlstrl %>%
  mutate(BMI=weight/(height^2))

(chlstrl)
```

```
##     chol age gender height  weight waist hip      BMI
## 1    203  46 female 1.5748  54.934    29  38 22.15085
## 2    165  29 female 1.6256  98.972    46  48 37.45286
## 3    228  58 female 1.5494 116.224    49  57 48.41375
## 4     78  67   male 1.7018  54.026    33  38 18.65459
## 5    249  64   male 1.7272  83.082    44  41 27.84977
## 6    248  34   male 1.8034  86.260    36  42 26.52316
## 7    195  30   male 1.7526  86.714    46  49 28.23083
## 8    227  37   male 1.4986  77.180    34  39 34.36634
## 9    177  45   male 1.7526  75.364    34  40 24.53569
```

```
## 10   263  55 female 1.6002  91.708    45  50 35.81448
## 11   242  60 female 1.6510  70.824    39  45 25.98282
## 12   215  38 female 1.4732  88.530    42  50 40.79125
## 13   238  27 female 1.5240  77.180    35  41 33.23034
## 14   183  40 female 1.4986  74.910    37  43 33.35557
## 15   191  36   male 1.7526  83.082    36  40 27.04838
## 16   213  33 female 1.6510  71.278    37  41 26.14938
## 17   255  50 female 1.6510  83.082    37  43 30.47985
## 18   230  20   male 1.7018  72.186    31  39 24.92504
## 19   194  36   male 1.6256  57.204    30  34 21.64706
## 20   196  62 female 1.6510  88.984    46  51 32.64508
## 21   186  70   male 1.7018  80.812    42  41 27.90351
## 22   234  47   male 1.7018 104.420    45  46 36.05510
## 23   203  38 female 1.7526 130.752    48  55 42.56795
## 24   281  66 female 1.5748  83.990    48  44 33.86700
## 25   228  24 female 1.5494  51.302    33  38 21.37013
## 26   179  41 female 1.8288  53.572    28  36 16.01789
## 27   232  37   male 1.7272 114.408    43  47 38.35051
## 28    NA  48   male 1.7272  45.400    27  33 15.21846
## 29   254  43 female 1.5748  65.830    31  38 26.54441
## 30   215  40   male 1.7780  85.806    37  39 27.14277
## 31   177  42 female 1.6510  78.996    37  40 28.98084
## 32   182  52   male 1.7272  63.106    29  35 21.15365
## 33   265  61   male 1.8796  86.714    39  41 24.54473
## 34   182  61 female 1.7526  78.996    49  43 25.71814
## 35   199  25   male 1.6764  53.572    32  34 19.06262
## 36   183  47 female 1.6764  84.444    39  44 30.04786
## 37   194  35   male 1.6764  72.186    31  35 25.68607
## 38   190  46   male 1.8288  93.070    46  49 27.82770
## 39   173  57   male 1.8034  65.830    31  36 20.24136
## 40   182  70   male 1.7526  97.156    45  48 31.63035
## 41   136  22 female 1.6764  72.640    35  40 25.84762
## 42   218  52 female 1.5748  77.180    40  43 31.12103
## 43   225  36   male 1.7018  87.168    40  42 30.09817
## 44   262  43   male 1.9050 114.862    43  49 31.65093
## 45   213  72 female 1.4986  62.198    40  40 27.69523
## 46   243  37 female 1.6256 105.782    49  57 40.02989
## 47   148  54 female 1.7018  74.910    42  42 25.86561
## 48   128  60   male 1.7018  88.984    42  43 30.72521
## 49   169  40 female 1.6510  81.720    40  44 29.98018
## 50   157  55 female 1.6764  99.426    43  52 35.37893
## 51   196  76   male 1.6510  69.916    37  41 25.64971
## 52   237  43 female 1.6256  82.174    36  46 31.09618
## 53   212  65 female 1.5494  84.898    43  47 35.36473
## 54   233  45 female 1.6256  75.818    39  44 28.69095
## 55   289  70 female 1.5240  99.880    51  54 43.00397
## 56   193  20 female 1.7272 124.396    49  58 41.69857
## 57   204  62   male 1.7272  81.720    38  41 27.39322
## 58   165  92 female 1.5748  98.518    51  51 39.72508
## 59   237  49 female 1.5748  85.806    43  47 34.59926
## 60   218  44 female 1.6764  86.714    40  45 30.85559
## 61   296  74 female 1.6002  83.082    42  48 32.44579
## 62   178  36   male 1.7780  73.094    34  40 23.12162
## 63   443  51 female 1.7780 106.690    43  48 33.74895
```

```
## 64   145  38 female     NA  56.750    31  35       NA
## 65   234  31   male 1.7780  74.910    35  39 23.69607
## 66   146  28 female 1.6256  57.204    28  32 21.64706
## 67   223  22 female 1.5748  62.198    28  35 25.07989
## 68   213  71 female 1.6002  74.910    34  42 29.25440
## 69   173  76 female 1.5494  46.308    31  33 19.28985
## 70   232  91 female 1.5494  57.658    35  38 24.01776
## 71   171  40   male 1.8034  97.156    41  39 29.87346
## 72   164  23 female 1.7526 111.230    44  47 36.21232
## 73   170  20 female 1.6256  73.094    37  40 27.66014
## 74   180  40 female 1.7272 119.856    43  54 40.17672
## 75   204  52   male 1.9050  64.468    31  35 17.76455
## 76   209  76 female 1.5240  64.922    35  40 27.95258
## 77   242  46 female 1.5748  83.082    37  45 33.50087
## 78   134  48   male 1.7780  78.542    36  40 24.84497
## 79   217  22 female 1.8034 101.242    46  50 31.12982
## 80   251  58 female 1.6002  69.916    38  41 27.30411
## 81   217  34   male 1.8542  99.426    41  42 28.91924
## 82   300  61 female 1.7018  76.726    40  44 26.49266
## 83   218  40   male 1.8542  90.800    38  41 26.41026
## 84   189  28 female 1.6256  90.800    38  45 34.36042
## 85   185  53 female 1.5494  65.830    37  40 27.42185
## 86   206  67   male 1.7018  80.812    37  41 27.90351
## 87   218  51 female     NA  97.610    42  53       NA
## 88   189  49 female 1.5748  93.070    40  49 37.52830
## 89   229  65 female 1.5748  68.554    37  42 27.64280
## 90   228  54   male 1.6764  77.180    36  41 27.46309
## 91   159  38   male 1.7272  76.726    34  40 25.71919
## 92   249  64 female 1.6002  72.186    33  41 28.19061
## 93   170  41 female 1.5494  49.940    29  30 20.80278
## 94   174  67   male 1.7272  89.892    36  43 30.13254
## 95   204  27 female 1.7018  83.990    35  44 29.00084
## 96   203  21 female 1.6002  64.468    28  39 25.17652
## 97   241  41 female 1.4986  63.106    29  39 28.09954
## 98   245  47 female 1.6002  70.824    35  39 27.65871
## 99   143  61 female 1.6510  99.880    40  50 36.64244
## 100  224  65   male 1.7018  89.438    42  43 30.88197
## 101  168  28 female 1.6002  90.800    42  46 35.45988
## 102  184  41   male 1.7526  69.916    34  39 22.76203
## 103  199  37 female 1.5494  92.162    42  51 38.39059
## 104  158  50   male 1.8034  81.720    36  40 25.12721
## 105  209  57 female 1.5494  68.100    36  39 28.36743
## 106  214  28   male 1.7272  92.616    40  41 31.04565
## 107  293  31 female 1.7018  90.800    41  42 31.35226
## 108  227  83 female 1.4986  56.750    35  40 25.26937
## 109  292  79   male 1.7780  74.910    39  41 23.69607
## 110  218  68   male 1.7780  77.180    37  42 24.41413
## 111  244  32   male 1.7780  96.248    39  44 30.44586
## 112  283  26   male 1.8288 103.058    41  44 30.81409
## 113  186  36   male 1.7526  68.100    31  38 22.17081
## 114  273  53 female 1.6256  78.996    34  43 29.89357
## 115  193  19 female 1.5494  54.026    32  38 22.50483
## 116  194  63   male 1.8542  79.450    34  39 23.10898
## 117  231  58 female 1.6002 104.420    39  48 40.77887
```

```
## 118  217  53 female 1.6002  71.732    33  40 28.01331
## 119  174  50   male 1.7780 119.402    51  64 37.77010
## 120  225  41   male 1.8034  70.824    31  40 21.77691
## 121  268  48   male 1.7780  54.480    32  35 17.23350
## 122  195  59 female 1.7018  78.088    38  43 26.96294
## 123  179  34   male 1.8288  77.180    31  39 23.07663
## 124  215  63 female 1.6002  71.732    34  42 28.01331
## 125  185  23   male 1.9304  74.456    32  40 19.98044
## 126  132  21 female 1.6510  76.726    39  43 28.14806
## 127  175  23 female 1.6510 106.690    44  50 39.14079
## 128  179  36 female 1.6002  56.750    33  36 22.16243
## 129  228  71 female 1.6002 110.776    48  51 43.26106
## 130  181  64   male 1.8034 102.150    44  47 31.40901
## 131  160  43 female 1.6256  63.560    37  40 24.05229
## 132  188  31 female 1.7018 103.058    47  53 35.58481
## 133  168  44 female 1.6256  72.640    40  43 27.48834
## 134  318  60 female 1.6510  75.818    38  44 27.81494
## 135  192  43 female 1.6256 147.550    53  62 55.83568
## 136  209  48 female 1.6002  54.934    32  38 21.45323
## 137  129  56   male 1.8796  68.554    34  38 19.40448
## 138  160  55 female 1.7018 101.242    43  48 34.95777
## 139  160  49   male 1.8034 120.764    49  45 37.13243
## 140  211  58   male 1.7018  80.358    38  43 27.74675
## 141  262  33 female 1.6002  77.180    33  46 30.14090
## 142  201  48 female 1.7272  66.284    32  41 22.21895
## 143  263  66 female 1.6764  54.934    31  33 19.54726
## 144  219  59   male 1.6764  77.180    37  40 27.46309
## 145  191  45 female 1.7018  68.554    33  38 23.67095
## 146  171  52   male 1.8034  72.186    33  39 22.19570
## 147  219  76   male 1.6256  47.670    29  33 18.03922
## 148  347  36   male 1.7780 125.758    51  49 39.78067
## 149  269  41 female 1.5748  72.640    39  41 29.29038
## 150  164  20   male 1.8288  65.830    29  36 19.68301
## 151  181  50   male 1.8034 145.280    56  49 44.67059
## 152  190  43 female 1.5748  74.002    40  45 29.83958
## 153  255  82   male 1.6764  74.002    37  43 26.33226
## 154  218  35   male 1.7526  76.726    39  41 24.97911
## 155  223  47 female 1.6510 105.328    46  54 38.64112
## 156  254  75   male 1.7272  95.340    44  45 31.95876
## 157  236  62   male 1.9304  72.640    35  39 19.49311
## 158  176  31 female 1.5748  65.830    36  42 26.54441
## 159  158  50   male 1.7780  97.610    40  45 30.87669
## 160  181  39 female 1.6764 115.770    46  54 41.19464
## 161  151  33   male 1.7526 139.832    52  58 45.52406
## 162  115  58   male 1.7526      NA    30  37       NA
## 163  271  81 female 1.6256  71.732    36  43 27.14473
## 164  190  27 female 1.6510  95.340    39  47 34.97687
## 165  118  47 female 1.6256  55.842    30  36 21.13166
## 166  168  33 female 1.6764  53.572    29  35 19.06262
## 167  254  67   male 1.7272  75.818    36  39 25.41482
## 168  193  42 female 1.9050  84.444    37  46 23.26906
## 169  187  21 female 1.6002  71.732    39  43 28.01331
## 170  212  51 female 1.6510  65.830    38  42 24.15070
## 171  170  27 female 1.6002  54.026    28  37 21.09863
```

```
## 172  215  51 female 1.7018 128.028    52  59 44.20668
## 173  199  71   male 1.7526  77.634    38  40 25.27472
## 174  140  50   male 1.7526  78.088    37  41 25.42253
## 175  216  54 female 1.6510  62.652    33  39 22.98480
## 176  204  59   male 1.8542  84.898    38  37 24.69359
## 177  193  59 female 1.6764  85.806    38  45 30.53250
## 178  267  40 female 1.4986  92.616    40  47 41.23961
## 179  201  58   male 1.6764  97.610    46  44 34.73274
## 180  204  72   male 1.6510  75.818    45  46 27.81494
## 181  246  66 female 1.6764  85.806    45  46 30.53250
## 182  229  23   male 1.8288  81.720    34  41 24.43408
## 183  172  42 female 1.6510  74.910    33  45 27.48183
## 184  197  43   male 1.8034  81.266    37  44 24.98761
## 185  205  75   male 1.7526  92.616    44  42 30.15230
## 186  219  65 female 1.6002 105.782    40  53 41.31077
## 187  174  34   male 1.8034  95.340    37  43 29.31508
## 188  192  37   male 1.8034  88.530    36  43 27.22114
## 189  206  61 female 1.6002  90.346    41  47 35.28259
## 190  160  36 female 1.6256  83.990    39  45 31.78339
## 191  216  45 female 1.7018  66.738    32  38 23.04391
## 192  236  68 female 1.5494  54.026    29  37 22.50483
## 193  205  57   male 1.6764  77.634    37  40 27.62464
## 194  206  41 female 1.5748  83.536    39  44 33.68394
## 195  143  68   male 1.7018  71.732    37  43 24.76828
## 196  173  40 female     NA  59.020    37  38       NA
## 197  235  79 female 1.6510  60.836    34  38 22.31858
## 198  169  62   male 1.6764 113.954    50  47 40.54845
## 199  283  63 female 1.5494  90.800    44  48 37.82324
## 200  174  55   male 1.7780  63.560    32  33 20.10575
## 201  271  55 female 1.6002  51.756    30  37 20.21213
## 202  203  27 female 1.7018  94.886    34  43 32.76311
## 203  188  66   male 1.7272  95.340    45  48 31.95876
## 204  293  63 female 1.6256  81.266    47  45 30.75258
## 205  215  78   male 1.6510  49.486    33  34 18.15466
## 206  207  68   male 1.3970  59.020    29  33 30.24171
## 207  179  31   male 1.6764  65.830    33  38 23.42440
## 208  202  64 female 1.5748  75.818    44  47 30.57184
## 209  211  40 female 1.7272  81.266    37  43 27.24104
## 210  211  61 female 1.6002  65.376    40  42 25.53112
## 211  151  28   male 1.7526  59.020    29  35 19.21470
## 212  171  34 female 1.6002  74.456    34  43 29.07711
## 213  342  63 female 1.6510  91.254    45  46 33.47787
## 214  179  55   male 1.9050  84.444    38  38 23.26906
## 215  155  26   male 1.8542  78.996    30  35 22.97693
## 216  197  36 female 1.6256  61.744    32  37 23.36509
## 217  200  40 female 1.5748  47.670    26  33 19.22181
## 218  237  45   male 1.7526  59.020    33  35 19.21470
## 219  198  68 female 1.6002  56.296    32  38 21.98513
## 220  240  82 female 1.6002  77.180    41  46 30.14090
## 221  192  60 female 1.5748  60.836    31  40 24.53069
## 222  145  30 female 1.6510  74.910    33  42 27.48183
## 223  269  41   male 1.7018  86.714    38  41 29.94141
## 224  240  54 female 1.6510  79.450    37  43 29.14740
## 225  205  72 female 1.5494  81.720    39  47 34.04092
```

```
## 226  266  47   male 1.7272  64.468    35  39 21.61021
## 227  188  50 female 1.5494  66.738    34  41 27.80008
## 228  222  51 female 1.6764  49.940    28  37 17.77024
## 229  142  45   male 1.7526  92.616    40  43 30.15230
## 230  268  38 female 1.6002  82.174    38  46 32.09120
## 231  174  20   male 1.7780  84.898    37  41 26.85554
## 232  214  44 female     NA  86.260    38  44       NA
## 233  194  63   male 1.7780  82.174    37  42 25.99387
## 234  196  50   male 1.7018  63.560    35  37 21.94658
## 235  207  44 female 1.7018  91.254    46  49 31.50902
## 236  204  48   male 1.7272  88.984    38  42 29.82817
## 237  189  41 female 1.6002  69.462    32  40 27.12681
## 238  179  29   male 1.7272  77.180    38  39 25.87138
## 239  159  76   male 1.6764  85.352    40  41 30.37095
## 240  260  69 female 1.4986  81.266    45  48 36.18574
## 241  228  26   male 1.8288 117.586    48  49 35.15792
## 242  242  70 female 1.6764  90.800    41  47 32.30952
## 243  227  25   male 1.8034  73.548    35  39 22.61449
## 244  208  42 female 1.5748  64.014    33  40 25.81215
## 245  208  56   male 1.7272  83.082    36  39 27.84977
## 246  209  31 female 1.7018  72.640    30  44 25.08181
## 247  163  31 female 1.6510  54.480    29  40 19.98679
## 248  201  27 female 1.6510  65.830    32  35 24.15070
## 249  237  73 female 1.6256  78.996    38  44 29.89357
## 250  176  32 female 1.6002 114.408    45  58 44.67945
## 251  146  19 female 1.5240  61.290    33  40 26.38880
## 252  231  71 female 1.6002  70.370    33  41 27.48141
## 253  241  27 female 1.6002  81.266    40  42 31.73660
## 254  305  31   male 1.8034  95.794    40  45 29.45467
## 255  149  20 female 1.5748  52.210    31  37 21.05246
## 256  183  31 female 1.6764  86.260    41  47 30.69405
## 257  235  62 female 1.6002 131.660    55  62 51.41683
## 258  244  44   male 1.8034  76.272    36  39 23.45206
## 259  199  36 female 1.6764 115.770    47  52 41.19464
## 260  224  36   male 1.7526  93.070    37  41 30.30010
## 261  173  47   male 1.8542 118.040    42  47 34.33334
## 262  192  30   male 1.8288 113.500    43  51 33.93622
## 263  157  63   male 1.7526  75.364    39  38 24.53569
## 264  172  48 female 1.6002  77.180    35  42 30.14090
## 265  170  65   male 1.7526  82.628    42  39 26.90058
## 266  215  59 female 1.6002  79.904    34  44 31.20470
## 267  214  37 female 1.6256  65.830    34  42 24.91130
## 268  195  78   male 1.6764  78.088    40  40 27.78619
## 269  230  23   male 1.8034 125.758    50  49 38.66798
## 270  206  38 female 1.7526  75.818    36  47 24.68350
## 271  147  38   male 1.7526  93.070    39  41 30.30010
## 272  234  41   male 1.7018  83.082    38  40 28.68732
## 273  135  29 female 1.6510  55.842    26  37 20.48646
## 274  226  49 female 1.6002  58.112    31  36 22.69433
## 275  179  23 female 1.6510  83.082    43  45 30.47985
## 276  163  29 female 1.5748  44.946    30  36 18.12342
## 277  191  40   male 1.8288 122.580    45  49 36.65111
## 278  138  38 female 1.5240  62.652    31  39 26.97522
## 279  184  40 female 1.6002 129.390    50  60 50.53034
```

```
## 280  181  29   male 1.7272  81.720    38  42 27.39322
## 281  224  78 female 1.6002  72.640    36  45 28.36791
## 282  293  50   male 1.8034  77.180    34  39 23.73125
## 283  147  23 female 1.5494  83.990    43  47 34.98650
## 284  198  60   male 1.7780  74.002    36  40 23.40884
## 285  152  40 female 1.3208  84.898    38  49 48.66574
## 286  277  60 female 1.5494  58.112    33  39 24.20687
## 287  219  40 female 1.5748  69.462    36  44 28.00893
## 288  182  30 female 1.5748  56.750    31  39 22.88311
## 289  135  21   male 1.7526  70.370    31  39 22.90983
## 290  277  63 female 1.6256 101.242    45  54 38.31187
## 291  212  63   male 1.7780  73.094    37  40 23.12162
## 292  162  43   male 1.7018  98.064    41  44 33.86044
## 293  207  46 female 1.6002  81.266    38  46 31.73660
## 294  255  64   male 1.7272 103.058    44  47 34.54590
## 295  404  56   male 1.7526  72.186    38  39 23.50106
## 296  239  35   male 1.8796  77.180    32  38 21.84610
## 297  220  59 female 1.6764  62.652    32  38 22.29357
## 298  165  22 female 1.6002  51.756    28  35 20.21213
## 299  243  43 female 1.6256 108.506    48  53 41.06070
## 300  149  26 female 1.5748  78.996    38  46 31.85329
## 301  178  41 female 1.6510  85.352    35  46 31.31263
## 302  190  43 female 1.6510  89.892    40  49 32.97820
## 303  226  20 female 1.6256  51.756    31  39 19.58544
## 304  132  28 female 1.7272 102.150    41  52 34.24153
## 305  160  30 female 1.6002  64.922    33  40 25.35382
## 306  204  66   male 1.7018  66.284    36  48 22.88715
## 307  164  20 female 1.7780  64.014    32  39 20.24937
## 308  155  32 female 1.6510  68.554    33  40 25.15004
## 309  251  38 female 1.6256 112.592    49  58 42.60692
## 310  198  61   male 1.8796  69.008    33  38 19.53298
## 311  179  26 female 1.5240  59.020    32  40 25.41144
## 312  223  74 female 1.5748  74.910    41  46 30.20571
## 313  207  72   male 1.7780  81.720    39  40 25.85026
## 314  244  21   male 1.8034  74.002    34  39 22.75408
## 315  245  36   male 1.6764  81.266    37  42 28.91702
## 316  191  42 female 1.5494  70.824    36  42 29.50213
## 317  221  66 female 1.6256  59.020    31  38 22.33427
## 318  300  34 female     NA  72.640    40  47       NA
## 319  173  43 female 1.7526  95.340    44  47 31.03913
## 320  138  57   male 1.8542  74.456    31  37 21.65641
## 321  203  45   male 1.6764  52.210    30  34 18.57798
## 322  260  44 female 1.5748  72.186    36  43 29.10732
## 323  166  27   male 1.8288  64.014    33  38 19.14003
## 324  180  63   male 1.7526  76.726    35  39 24.97911
## 325  159  65   male 1.7780  82.174    43  49 25.99387
## 326  207  30   male 1.8288  81.720    35  41 24.43408
## 327  298  28   male 1.6764  94.886    42  46 33.76345
## 328  203  41   male 1.8034  95.340    37  42 29.31508
## 329  191  31 female 1.5748 107.598    53  56 43.38638
## 330  231  33   male 1.7526  74.002    35  38 24.09228
## 331  184  66   male 1.8796  83.990    40  41 23.77370
## 332  164  28 female 1.7018  81.720    39  43 28.21703
## 333  134  25 female 1.6002 111.230    47  58 43.43836
```

```
## 334  220  26   male 1.7780  68.100    33  39 21.54188
## 335  180  40 female 1.6256  66.284    37  43 25.08311
## 336  216  38   male 1.7272  65.830    34  37 22.06676
## 337  158  30 female 1.5748  64.468    NA  NA 25.99521
## 338  261  52 female 1.6256  89.892    42  49 34.01682
## 339  172  22 female 1.6256  67.192    35  38 25.42671
## 340  249  51 female 1.6510  90.800    43  46 33.31131
## 341  189  45   male 1.7526  86.260    39  44 28.08302
## 342  225  53 female 1.6002  82.628    38  46 32.26849
## 343  193  21 female 1.5494  99.880    40  52 41.60557
## 344  219  53 female 1.6256  81.266    39  47 30.75258
## 345  156  37 female 1.7018  96.248    48  51 33.23339
## 346  224  34 female 1.5240  74.910    34  46 32.25298
## 347  181  30 female 1.6764 116.678    47  55 41.51774
## 348  306  74   male 1.7526  83.536    39  41 27.19619
## 349  122  36 female 1.8034  83.082    41  45 25.54599
## 350  219  45   male 1.7018  98.972    41  45 34.17396
## 351  150  35   male 1.8542  81.266    32  37 23.63718
## 352  185  50 female 1.6256 103.512    42  54 39.17088
## 353  226  27   male 1.7526 131.206    48  51 42.71575
## 354  206  52   male 1.7526  69.462    36  40 22.61422
## 355  199  42 female 1.7018 106.690    47  52 36.83890
## 356  239  39   male 1.5240  65.376    33  42 28.14806
## 357  235  73   male 1.6510  83.082    43  46 30.47985
## 358  184  28   male 1.7018  69.916    35  38 24.14124
## 359  242  53   male 1.7526  98.064    43  45 31.92596
## 360  307  49   male 1.7018  82.174    41  42 28.37379
## 361  204  55 female 1.6764  91.708    43  47 32.63262
## 362  212  37 female 1.6256  72.640    37  45 27.48834
## 363  203  60 female 1.4986  55.842    36  41 24.86506
## 364  219  56 female 1.6510  89.438    41  50 32.81164
## 365  226  84 female 1.5240  87.168    41  48 37.53074
## 366  217  20 female 1.7018  84.898    40  45 29.31436
## 367  157  80   male 1.8034  96.248    47  48 29.59427
## 368  235  60   male 1.7526  84.444    40  42 27.49180
## 369  252  80 female 1.5748  73.548    44  41 29.65651
## 370  204  29 female 1.6256  54.480    33  38 20.61625
## 371  188  43 female 1.6764  69.008    37  41 24.55524
## 372  194  63 female 1.4732  95.340    44  53 43.92904
## 373  215  37 female 1.4986  67.192    32  42 29.91893
## 374  179  20 female 1.4732  77.180    34  46 35.56161
## 375  202  44   male 1.7272  71.278    33  37 23.89298
## 376  194  54   male 1.7526  58.566    30  37 19.06689
## 377  227  58   male 1.7780  95.794    38  43 30.30224
## 378  337  35   male 1.8288  85.806    36  44 25.65578
## 379  255  52   male 1.7780  54.480    30  33 17.23350
## 380  162  60 female 1.6002  54.934    32  34 21.45323
## 381  322  43 female 1.4224  54.480    32  41 26.92735
## 382  289  59   male 1.7272  76.726    36  38 25.71919
## 383  217  33 female 1.5748  84.444    42  46 34.05007
## 384  209  37   male 1.7780 118.948    42  48 37.62648
## 385  214  40   male 1.8288 100.788    40  44 30.13536
## 386  302  38 female 1.7018 100.788    41  51 34.80101
## 387  179  32 female 1.5748  81.266    37  47 32.76861
```

```
## 388  279  60 female 1.7272 101.696    48  50 34.08934
## 389  144  30   male 1.8288  74.910    31  38 22.39790
## 390  270  42   male 1.6764  83.990    39  41 29.88631
## 391  196  52 female 1.5748  66.738    34  42 26.91054
## 392  221  59 female 1.5748  80.358    39  45 32.40248
## 393  210  78   male 1.6764  65.830    38  39 23.42440
## 394  192  51   male 1.6510  66.284    NA  NA 24.31726
## 395  169  25 female 1.5240  69.916    40  42 30.10278
## 396  179  37   male 1.6764  61.744    33  39 21.97048
## 397  216  54 female 1.6764  76.272    38  42 27.14000
## 398  301  89 female 1.5494  52.210    31  41 21.74836
## 399  296  53   male 1.7526  78.542    35  39 25.57033
## 400  284  51 female 1.6002  69.916    32  43 27.30411
## 401  194  29 female 1.7526  75.818    33  40 24.68350
## 402  199  41 female 1.6002  89.438    41  48 34.92799
## 403  159  68 female 1.6256  99.880    49  58 37.79646
```

- Crea una nueva columna llamada `ageGroup` dividiendo la edad en los siguientes tres niveles:

  `(10,40], (40,70], (70,100]`

```
#Clasificación de todas las filas como parte de un grupo de edad determinado en forma de nueva columna

(chlstrl=chlstrl %>%
  mutate(ageGroup=cut(age,breaks=c(10,40,70,100))))
```

```
##     chol age gender height  weight waist hip      BMI ageGroup
## 1    203  46 female 1.5748  54.934    29  38 22.15085  (40,70]
## 2    165  29 female 1.6256  98.972    46  48 37.45286  (10,40]
## 3    228  58 female 1.5494 116.224    49  57 48.41375  (40,70]
## 4     78  67   male 1.7018  54.026    33  38 18.65459  (40,70]
## 5    249  64   male 1.7272  83.082    44  41 27.84977  (40,70]
## 6    248  34   male 1.8034  86.260    36  42 26.52316  (10,40]
## 7    195  30   male 1.7526  86.714    46  49 28.23083  (10,40]
## 8    227  37   male 1.4986  77.180    34  39 34.36634  (10,40]
## 9    177  45   male 1.7526  75.364    34  40 24.53569  (40,70]
## 10   263  55 female 1.6002  91.708    45  50 35.81448  (40,70]
## 11   242  60 female 1.6510  70.824    39  45 25.98282  (40,70]
## 12   215  38 female 1.4732  88.530    42  50 40.79125  (10,40]
## 13   238  27 female 1.5240  77.180    35  41 33.23034  (10,40]
## 14   183  40 female 1.4986  74.910    37  43 33.35557  (10,40]
## 15   191  36   male 1.7526  83.082    36  40 27.04838  (10,40]
## 16   213  33 female 1.6510  71.278    37  41 26.14938  (10,40]
## 17   255  50 female 1.6510  83.082    37  43 30.47985  (40,70]
## 18   230  20   male 1.7018  72.186    31  39 24.92504  (10,40]
## 19   194  36   male 1.6256  57.204    30  34 21.64706  (10,40]
## 20   196  62 female 1.6510  88.984    46  51 32.64508  (40,70]
## 21   186  70   male 1.7018  80.812    42  41 27.90351  (40,70]
## 22   234  47   male 1.7018 104.420    45  46 36.05510  (40,70]
## 23   203  38 female 1.7526 130.752    48  55 42.56795  (10,40]
## 24   281  66 female 1.5748  83.990    48  44 33.86700  (40,70]
## 25   228  24 female 1.5494  51.302    33  38 21.37013  (10,40]
## 26   179  41 female 1.8288  53.572    28  36 16.01789  (40,70]
```

```
## 27   232  37   male 1.7272 114.408    43  47 38.35051  (10,40]
## 28    NA  48   male 1.7272  45.400    27  33 15.21846  (40,70]
## 29   254  43 female 1.5748  65.830    31  38 26.54441  (40,70]
## 30   215  40   male 1.7780  85.806    37  39 27.14277  (10,40]
## 31   177  42 female 1.6510  78.996    37  40 28.98084  (40,70]
## 32   182  52   male 1.7272  63.106    29  35 21.15365  (40,70]
## 33   265  61   male 1.8796  86.714    39  41 24.54473  (40,70]
## 34   182  61 female 1.7526  78.996    49  43 25.71814  (40,70]
## 35   199  25   male 1.6764  53.572    32  34 19.06262  (10,40]
## 36   183  47 female 1.6764  84.444    39  44 30.04786  (40,70]
## 37   194  35   male 1.6764  72.186    31  35 25.68607  (10,40]
## 38   190  46   male 1.8288  93.070    46  49 27.82770  (40,70]
## 39   173  57   male 1.8034  65.830    31  36 20.24136  (40,70]
## 40   182  70   male 1.7526  97.156    45  48 31.63035  (40,70]
## 41   136  22 female 1.6764  72.640    35  40 25.84762  (10,40]
## 42   218  52 female 1.5748  77.180    40  43 31.12103  (40,70]
## 43   225  36   male 1.7018  87.168    40  42 30.09817  (10,40]
## 44   262  43   male 1.9050 114.862    43  49 31.65093  (40,70]
## 45   213  72 female 1.4986  62.198    40  40 27.69523 (70,100]
## 46   243  37 female 1.6256 105.782    49  57 40.02989  (10,40]
## 47   148  54 female 1.7018  74.910    42  42 25.86561  (40,70]
## 48   128  60   male 1.7018  88.984    42  43 30.72521  (40,70]
## 49   169  40 female 1.6510  81.720    40  44 29.98018  (10,40]
## 50   157  55 female 1.6764  99.426    43  52 35.37893  (40,70]
## 51   196  76   male 1.6510  69.916    37  41 25.64971 (70,100]
## 52   237  43 female 1.6256  82.174    36  46 31.09618  (40,70]
## 53   212  65 female 1.5494  84.898    43  47 35.36473  (40,70]
## 54   233  45 female 1.6256  75.818    39  44 28.69095  (40,70]
## 55   289  70 female 1.5240  99.880    51  54 43.00397  (40,70]
## 56   193  20 female 1.7272 124.396    49  58 41.69857  (10,40]
## 57   204  62   male 1.7272  81.720    38  41 27.39322  (40,70]
## 58   165  92 female 1.5748  98.518    51  51 39.72508 (70,100]
## 59   237  49 female 1.5748  85.806    43  47 34.59926  (40,70]
## 60   218  44 female 1.6764  86.714    40  45 30.85559  (40,70]
## 61   296  74 female 1.6002  83.082    42  48 32.44579 (70,100]
## 62   178  36   male 1.7780  73.094    34  40 23.12162  (10,40]
## 63   443  51 female 1.7780 106.690    43  48 33.74895  (40,70]
## 64   145  38 female     NA  56.750    31  35       NA  (10,40]
## 65   234  31   male 1.7780  74.910    35  39 23.69607  (10,40]
## 66   146  28 female 1.6256  57.204    28  32 21.64706  (10,40]
## 67   223  22 female 1.5748  62.198    28  35 25.07989  (10,40]
## 68   213  71 female 1.6002  74.910    34  42 29.25440 (70,100]
## 69   173  76 female 1.5494  46.308    31  33 19.28985 (70,100]
## 70   232  91 female 1.5494  57.658    35  38 24.01776 (70,100]
## 71   171  40   male 1.8034  97.156    41  39 29.87346  (10,40]
## 72   164  23 female 1.7526 111.230    44  47 36.21232  (10,40]
## 73   170  20 female 1.6256  73.094    37  40 27.66014  (10,40]
## 74   180  40 female 1.7272 119.856    43  54 40.17672  (10,40]
## 75   204  52   male 1.9050  64.468    31  35 17.76455  (40,70]
## 76   209  76 female 1.5240  64.922    35  40 27.95258 (70,100]
## 77   242  46 female 1.5748  83.082    37  45 33.50087  (40,70]
## 78   134  48   male 1.7780  78.542    36  40 24.84497  (40,70]
## 79   217  22 female 1.8034 101.242    46  50 31.12982  (10,40]
## 80   251  58 female 1.6002  69.916    38  41 27.30411  (40,70]
```

```
## 81   217  34   male 1.8542  99.426    41  42 28.91924  (10,40]
## 82   300  61 female 1.7018  76.726    40  44 26.49266  (40,70]
## 83   218  40   male 1.8542  90.800    38  41 26.41026  (10,40]
## 84   189  28 female 1.6256  90.800    38  45 34.36042  (10,40]
## 85   185  53 female 1.5494  65.830    37  40 27.42185  (40,70]
## 86   206  67   male 1.7018  80.812    37  41 27.90351  (40,70]
## 87   218  51 female     NA  97.610    42  53       NA  (40,70]
## 88   189  49 female 1.5748  93.070    40  49 37.52830  (40,70]
## 89   229  65 female 1.5748  68.554    37  42 27.64280  (40,70]
## 90   228  54   male 1.6764  77.180    36  41 27.46309  (40,70]
## 91   159  38   male 1.7272  76.726    34  40 25.71919  (10,40]
## 92   249  64 female 1.6002  72.186    33  41 28.19061  (40,70]
## 93   170  41 female 1.5494  49.940    29  30 20.80278  (40,70]
## 94   174  67   male 1.7272  89.892    36  43 30.13254  (40,70]
## 95   204  27 female 1.7018  83.990    35  44 29.00084  (10,40]
## 96   203  21 female 1.6002  64.468    28  39 25.17652  (10,40]
## 97   241  41 female 1.4986  63.106    29  39 28.09954  (40,70]
## 98   245  47 female 1.6002  70.824    35  39 27.65871  (40,70]
## 99   143  61 female 1.6510  99.880    40  50 36.64244  (40,70]
## 100  224  65   male 1.7018  89.438    42  43 30.88197  (40,70]
## 101  168  28 female 1.6002  90.800    42  46 35.45988  (10,40]
## 102  184  41   male 1.7526  69.916    34  39 22.76203  (40,70]
## 103  199  37 female 1.5494  92.162    42  51 38.39059  (10,40]
## 104  158  50   male 1.8034  81.720    36  40 25.12721  (40,70]
## 105  209  57 female 1.5494  68.100    36  39 28.36743  (40,70]
## 106  214  28   male 1.7272  92.616    40  41 31.04565  (10,40]
## 107  293  31 female 1.7018  90.800    41  42 31.35226  (10,40]
## 108  227  83 female 1.4986  56.750    35  40 25.26937 (70,100]
## 109  292  79   male 1.7780  74.910    39  41 23.69607 (70,100]
## 110  218  68   male 1.7780  77.180    37  42 24.41413  (40,70]
## 111  244  32   male 1.7780  96.248    39  44 30.44586  (10,40]
## 112  283  26   male 1.8288 103.058    41  44 30.81409  (10,40]
## 113  186  36   male 1.7526  68.100    31  38 22.17081  (10,40]
## 114  273  53 female 1.6256  78.996    34  43 29.89357  (40,70]
## 115  193  19 female 1.5494  54.026    32  38 22.50483  (10,40]
## 116  194  63   male 1.8542  79.450    34  39 23.10898  (40,70]
## 117  231  58 female 1.6002 104.420    39  48 40.77887  (40,70]
## 118  217  53 female 1.6002  71.732    33  40 28.01331  (40,70]
## 119  174  50   male 1.7780 119.402    51  64 37.77010  (40,70]
## 120  225  41   male 1.8034  70.824    31  40 21.77691  (40,70]
## 121  268  48   male 1.7780  54.480    32  35 17.23350  (40,70]
## 122  195  59 female 1.7018  78.088    38  43 26.96294  (40,70]
## 123  179  34   male 1.8288  77.180    31  39 23.07663  (10,40]
## 124  215  63 female 1.6002  71.732    34  42 28.01331  (40,70]
## 125  185  23   male 1.9304  74.456    32  40 19.98044  (10,40]
## 126  132  21 female 1.6510  76.726    39  43 28.14806  (10,40]
## 127  175  23 female 1.6510 106.690    44  50 39.14079  (10,40]
## 128  179  36 female 1.6002  56.750    33  36 22.16243  (10,40]
## 129  228  71 female 1.6002 110.776    48  51 43.26106 (70,100]
## 130  181  64   male 1.8034 102.150    44  47 31.40901  (40,70]
## 131  160  43 female 1.6256  63.560    37  40 24.05229  (40,70]
## 132  188  31 female 1.7018 103.058    47  53 35.58481  (10,40]
## 133  168  44 female 1.6256  72.640    40  43 27.48834  (40,70]
## 134  318  60 female 1.6510  75.818    38  44 27.81494  (40,70]
```

```
## 135  192  43 female 1.6256 147.550    53  62 55.83568  (40,70]
## 136  209  48 female 1.6002  54.934    32  38 21.45323  (40,70]
## 137  129  56   male 1.8796  68.554    34  38 19.40448  (40,70]
## 138  160  55 female 1.7018 101.242    43  48 34.95777  (40,70]
## 139  160  49   male 1.8034 120.764    49  45 37.13243  (40,70]
## 140  211  58   male 1.7018  80.358    38  43 27.74675  (40,70]
## 141  262  33 female 1.6002  77.180    33  46 30.14090  (10,40]
## 142  201  48 female 1.7272  66.284    32  41 22.21895  (40,70]
## 143  263  66 female 1.6764  54.934    31  33 19.54726  (40,70]
## 144  219  59   male 1.6764  77.180    37  40 27.46309  (40,70]
## 145  191  45 female 1.7018  68.554    33  38 23.67095  (40,70]
## 146  171  52   male 1.8034  72.186    33  39 22.19570  (40,70]
## 147  219  76   male 1.6256  47.670    29  33 18.03922 (70,100]
## 148  347  36   male 1.7780 125.758    51  49 39.78067  (10,40]
## 149  269  41 female 1.5748  72.640    39  41 29.29038  (40,70]
## 150  164  20   male 1.8288  65.830    29  36 19.68301  (10,40]
## 151  181  50   male 1.8034 145.280    56  49 44.67059  (40,70]
## 152  190  43 female 1.5748  74.002    40  45 29.83958  (40,70]
## 153  255  82   male 1.6764  74.002    37  43 26.33226 (70,100]
## 154  218  35   male 1.7526  76.726    39  41 24.97911  (10,40]
## 155  223  47 female 1.6510 105.328    46  54 38.64112  (40,70]
## 156  254  75   male 1.7272  95.340    44  45 31.95876 (70,100]
## 157  236  62   male 1.9304  72.640    35  39 19.49311  (40,70]
## 158  176  31 female 1.5748  65.830    36  42 26.54441  (10,40]
## 159  158  50   male 1.7780  97.610    40  45 30.87669  (40,70]
## 160  181  39 female 1.6764 115.770    46  54 41.19464  (10,40]
## 161  151  33   male 1.7526 139.832    52  58 45.52406  (10,40]
## 162  115  58   male 1.7526      NA    30  37       NA  (40,70]
## 163  271  81 female 1.6256  71.732    36  43 27.14473 (70,100]
## 164  190  27 female 1.6510  95.340    39  47 34.97687  (10,40]
## 165  118  47 female 1.6256  55.842    30  36 21.13166  (40,70]
## 166  168  33 female 1.6764  53.572    29  35 19.06262  (10,40]
## 167  254  67   male 1.7272  75.818    36  39 25.41482  (40,70]
## 168  193  42 female 1.9050  84.444    37  46 23.26906  (40,70]
## 169  187  21 female 1.6002  71.732    39  43 28.01331  (10,40]
## 170  212  51 female 1.6510  65.830    38  42 24.15070  (40,70]
## 171  170  27 female 1.6002  54.026    28  37 21.09863  (10,40]
## 172  215  51 female 1.7018 128.028    52  59 44.20668  (40,70]
## 173  199  71   male 1.7526  77.634    38  40 25.27472 (70,100]
## 174  140  50   male 1.7526  78.088    37  41 25.42253  (40,70]
## 175  216  54 female 1.6510  62.652    33  39 22.98480  (40,70]
## 176  204  59   male 1.8542  84.898    38  37 24.69359  (40,70]
## 177  193  59 female 1.6764  85.806    38  45 30.53250  (40,70]
## 178  267  40 female 1.4986  92.616    40  47 41.23961  (10,40]
## 179  201  58   male 1.6764  97.610    46  44 34.73274  (40,70]
## 180  204  72   male 1.6510  75.818    45  46 27.81494 (70,100]
## 181  246  66 female 1.6764  85.806    45  46 30.53250  (40,70]
## 182  229  23   male 1.8288  81.720    34  41 24.43408  (10,40]
## 183  172  42 female 1.6510  74.910    33  45 27.48183  (40,70]
## 184  197  43   male 1.8034  81.266    37  44 24.98761  (40,70]
## 185  205  75   male 1.7526  92.616    44  42 30.15230 (70,100]
## 186  219  65 female 1.6002 105.782    40  53 41.31077  (40,70]
## 187  174  34   male 1.8034  95.340    37  43 29.31508  (10,40]
## 188  192  37   male 1.8034  88.530    36  43 27.22114  (10,40]
```

```
## 189  206  61 female 1.6002  90.346    41  47 35.28259  (40,70]
## 190  160  36 female 1.6256  83.990    39  45 31.78339  (10,40]
## 191  216  45 female 1.7018  66.738    32  38 23.04391  (40,70]
## 192  236  68 female 1.5494  54.026    29  37 22.50483  (40,70]
## 193  205  57   male 1.6764  77.634    37  40 27.62464  (40,70]
## 194  206  41 female 1.5748  83.536    39  44 33.68394  (40,70]
## 195  143  68   male 1.7018  71.732    37  43 24.76828  (40,70]
## 196  173  40 female     NA  59.020    37  38       NA  (10,40]
## 197  235  79 female 1.6510  60.836    34  38 22.31858 (70,100]
## 198  169  62   male 1.6764 113.954    50  47 40.54845  (40,70]
## 199  283  63 female 1.5494  90.800    44  48 37.82324  (40,70]
## 200  174  55   male 1.7780  63.560    32  33 20.10575  (40,70]
## 201  271  55 female 1.6002  51.756    30  37 20.21213  (40,70]
## 202  203  27 female 1.7018  94.886    34  43 32.76311  (10,40]
## 203  188  66   male 1.7272  95.340    45  48 31.95876  (40,70]
## 204  293  63 female 1.6256  81.266    47  45 30.75258  (40,70]
## 205  215  78   male 1.6510  49.486    33  34 18.15466 (70,100]
## 206  207  68   male 1.3970  59.020    29  33 30.24171  (40,70]
## 207  179  31   male 1.6764  65.830    33  38 23.42440  (10,40]
## 208  202  64 female 1.5748  75.818    44  47 30.57184  (40,70]
## 209  211  40 female 1.7272  81.266    37  43 27.24104  (10,40]
## 210  211  61 female 1.6002  65.376    40  42 25.53112  (40,70]
## 211  151  28   male 1.7526  59.020    29  35 19.21470  (10,40]
## 212  171  34 female 1.6002  74.456    34  43 29.07711  (10,40]
## 213  342  63 female 1.6510  91.254    45  46 33.47787  (40,70]
## 214  179  55   male 1.9050  84.444    38  38 23.26906  (40,70]
## 215  155  26   male 1.8542  78.996    30  35 22.97693  (10,40]
## 216  197  36 female 1.6256  61.744    32  37 23.36509  (10,40]
## 217  200  40 female 1.5748  47.670    26  33 19.22181  (10,40]
## 218  237  45   male 1.7526  59.020    33  35 19.21470  (40,70]
## 219  198  68 female 1.6002  56.296    32  38 21.98513  (40,70]
## 220  240  82 female 1.6002  77.180    41  46 30.14090 (70,100]
## 221  192  60 female 1.5748  60.836    31  40 24.53069  (40,70]
## 222  145  30 female 1.6510  74.910    33  42 27.48183  (10,40]
## 223  269  41   male 1.7018  86.714    38  41 29.94141  (40,70]
## 224  240  54 female 1.6510  79.450    37  43 29.14740  (40,70]
## 225  205  72 female 1.5494  81.720    39  47 34.04092 (70,100]
## 226  266  47   male 1.7272  64.468    35  39 21.61021  (40,70]
## 227  188  50 female 1.5494  66.738    34  41 27.80008  (40,70]
## 228  222  51 female 1.6764  49.940    28  37 17.77024  (40,70]
## 229  142  45   male 1.7526  92.616    40  43 30.15230  (40,70]
## 230  268  38 female 1.6002  82.174    38  46 32.09120  (10,40]
## 231  174  20   male 1.7780  84.898    37  41 26.85554  (10,40]
## 232  214  44 female     NA  86.260    38  44       NA  (40,70]
## 233  194  63   male 1.7780  82.174    37  42 25.99387  (40,70]
## 234  196  50   male 1.7018  63.560    35  37 21.94658  (40,70]
## 235  207  44 female 1.7018  91.254    46  49 31.50902  (40,70]
## 236  204  48   male 1.7272  88.984    38  42 29.82817  (40,70]
## 237  189  41 female 1.6002  69.462    32  40 27.12681  (40,70]
## 238  179  29   male 1.7272  77.180    38  39 25.87138  (10,40]
## 239  159  76   male 1.6764  85.352    40  41 30.37095 (70,100]
## 240  260  69 female 1.4986  81.266    45  48 36.18574  (40,70]
## 241  228  26   male 1.8288 117.586    48  49 35.15792  (10,40]
## 242  242  70 female 1.6764  90.800    41  47 32.30952  (40,70]
```

```
## 243  227  25   male 1.8034  73.548    35  39 22.61449  (10,40]
## 244  208  42 female 1.5748  64.014    33  40 25.81215  (40,70]
## 245  208  56   male 1.7272  83.082    36  39 27.84977  (40,70]
## 246  209  31 female 1.7018  72.640    30  44 25.08181  (10,40]
## 247  163  31 female 1.6510  54.480    29  40 19.98679  (10,40]
## 248  201  27 female 1.6510  65.830    32  35 24.15070  (10,40]
## 249  237  73 female 1.6256  78.996    38  44 29.89357 (70,100]
## 250  176  32 female 1.6002 114.408    45  58 44.67945  (10,40]
## 251  146  19 female 1.5240  61.290    33  40 26.38880  (10,40]
## 252  231  71 female 1.6002  70.370    33  41 27.48141 (70,100]
## 253  241  27 female 1.6002  81.266    40  42 31.73660  (10,40]
## 254  305  31   male 1.8034  95.794    40  45 29.45467  (10,40]
## 255  149  20 female 1.5748  52.210    31  37 21.05246  (10,40]
## 256  183  31 female 1.6764  86.260    41  47 30.69405  (10,40]
## 257  235  62 female 1.6002 131.660    55  62 51.41683  (40,70]
## 258  244  44   male 1.8034  76.272    36  39 23.45206  (40,70]
## 259  199  36 female 1.6764 115.770    47  52 41.19464  (10,40]
## 260  224  36   male 1.7526  93.070    37  41 30.30010  (10,40]
## 261  173  47   male 1.8542 118.040    42  47 34.33334  (40,70]
## 262  192  30   male 1.8288 113.500    43  51 33.93622  (10,40]
## 263  157  63   male 1.7526  75.364    39  38 24.53569  (40,70]
## 264  172  48 female 1.6002  77.180    35  42 30.14090  (40,70]
## 265  170  65   male 1.7526  82.628    42  39 26.90058  (40,70]
## 266  215  59 female 1.6002  79.904    34  44 31.20470  (40,70]
## 267  214  37 female 1.6256  65.830    34  42 24.91130  (10,40]
## 268  195  78   male 1.6764  78.088    40  40 27.78619 (70,100]
## 269  230  23   male 1.8034 125.758    50  49 38.66798  (10,40]
## 270  206  38 female 1.7526  75.818    36  47 24.68350  (10,40]
## 271  147  38   male 1.7526  93.070    39  41 30.30010  (10,40]
## 272  234  41   male 1.7018  83.082    38  40 28.68732  (40,70]
## 273  135  29 female 1.6510  55.842    26  37 20.48646  (10,40]
## 274  226  49 female 1.6002  58.112    31  36 22.69433  (40,70]
## 275  179  23 female 1.6510  83.082    43  45 30.47985  (10,40]
## 276  163  29 female 1.5748  44.946    30  36 18.12342  (10,40]
## 277  191  40   male 1.8288 122.580    45  49 36.65111  (10,40]
## 278  138  38 female 1.5240  62.652    31  39 26.97522  (10,40]
## 279  184  40 female 1.6002 129.390    50  60 50.53034  (10,40]
## 280  181  29   male 1.7272  81.720    38  42 27.39322  (10,40]
## 281  224  78 female 1.6002  72.640    36  45 28.36791 (70,100]
## 282  293  50   male 1.8034  77.180    34  39 23.73125  (40,70]
## 283  147  23 female 1.5494  83.990    43  47 34.98650  (10,40]
## 284  198  60   male 1.7780  74.002    36  40 23.40884  (40,70]
## 285  152  40 female 1.3208  84.898    38  49 48.66574  (10,40]
## 286  277  60 female 1.5494  58.112    33  39 24.20687  (40,70]
## 287  219  40 female 1.5748  69.462    36  44 28.00893  (10,40]
## 288  182  30 female 1.5748  56.750    31  39 22.88311  (10,40]
## 289  135  21   male 1.7526  70.370    31  39 22.90983  (10,40]
## 290  277  63 female 1.6256 101.242    45  54 38.31187  (40,70]
## 291  212  63   male 1.7780  73.094    37  40 23.12162  (40,70]
## 292  162  43   male 1.7018  98.064    41  44 33.86044  (40,70]
## 293  207  46 female 1.6002  81.266    38  46 31.73660  (40,70]
## 294  255  64   male 1.7272 103.058    44  47 34.54590  (40,70]
## 295  404  56   male 1.7526  72.186    38  39 23.50106  (40,70]
## 296  239  35   male 1.8796  77.180    32  38 21.84610  (10,40]
```

```
## 297  220  59 female 1.6764  62.652    32  38 22.29357  (40,70]
## 298  165  22 female 1.6002  51.756    28  35 20.21213  (10,40]
## 299  243  43 female 1.6256 108.506    48  53 41.06070  (40,70]
## 300  149  26 female 1.5748  78.996    38  46 31.85329  (10,40]
## 301  178  41 female 1.6510  85.352    35  46 31.31263  (40,70]
## 302  190  43 female 1.6510  89.892    40  49 32.97820  (40,70]
## 303  226  20 female 1.6256  51.756    31  39 19.58544  (10,40]
## 304  132  28 female 1.7272 102.150    41  52 34.24153  (10,40]
## 305  160  30 female 1.6002  64.922    33  40 25.35382  (10,40]
## 306  204  66   male 1.7018  66.284    36  48 22.88715  (40,70]
## 307  164  20 female 1.7780  64.014    32  39 20.24937  (10,40]
## 308  155  32 female 1.6510  68.554    33  40 25.15004  (10,40]
## 309  251  38 female 1.6256 112.592    49  58 42.60692  (10,40]
## 310  198  61   male 1.8796  69.008    33  38 19.53298  (40,70]
## 311  179  26 female 1.5240  59.020    32  40 25.41144  (10,40]
## 312  223  74 female 1.5748  74.910    41  46 30.20571 (70,100]
## 313  207  72   male 1.7780  81.720    39  40 25.85026 (70,100]
## 314  244  21   male 1.8034  74.002    34  39 22.75408  (10,40]
## 315  245  36   male 1.6764  81.266    37  42 28.91702  (10,40]
## 316  191  42 female 1.5494  70.824    36  42 29.50213  (40,70]
## 317  221  66 female 1.6256  59.020    31  38 22.33427  (40,70]
## 318  300  34 female     NA  72.640    40  47       NA  (10,40]
## 319  173  43 female 1.7526  95.340    44  47 31.03913  (40,70]
## 320  138  57   male 1.8542  74.456    31  37 21.65641  (40,70]
## 321  203  45   male 1.6764  52.210    30  34 18.57798  (40,70]
## 322  260  44 female 1.5748  72.186    36  43 29.10732  (40,70]
## 323  166  27   male 1.8288  64.014    33  38 19.14003  (10,40]
## 324  180  63   male 1.7526  76.726    35  39 24.97911  (40,70]
## 325  159  65   male 1.7780  82.174    43  49 25.99387  (40,70]
## 326  207  30   male 1.8288  81.720    35  41 24.43408  (10,40]
## 327  298  28   male 1.6764  94.886    42  46 33.76345  (10,40]
## 328  203  41   male 1.8034  95.340    37  42 29.31508  (40,70]
## 329  191  31 female 1.5748 107.598    53  56 43.38638  (10,40]
## 330  231  33   male 1.7526  74.002    35  38 24.09228  (10,40]
## 331  184  66   male 1.8796  83.990    40  41 23.77370  (40,70]
## 332  164  28 female 1.7018  81.720    39  43 28.21703  (10,40]
## 333  134  25 female 1.6002 111.230    47  58 43.43836  (10,40]
## 334  220  26   male 1.7780  68.100    33  39 21.54188  (10,40]
## 335  180  40 female 1.6256  66.284    37  43 25.08311  (10,40]
## 336  216  38   male 1.7272  65.830    34  37 22.06676  (10,40]
## 337  158  30 female 1.5748  64.468    NA  NA 25.99521  (10,40]
## 338  261  52 female 1.6256  89.892    42  49 34.01682  (40,70]
## 339  172  22 female 1.6256  67.192    35  38 25.42671  (10,40]
## 340  249  51 female 1.6510  90.800    43  46 33.31131  (40,70]
## 341  189  45   male 1.7526  86.260    39  44 28.08302  (40,70]
## 342  225  53 female 1.6002  82.628    38  46 32.26849  (40,70]
## 343  193  21 female 1.5494  99.880    40  52 41.60557  (10,40]
## 344  219  53 female 1.6256  81.266    39  47 30.75258  (40,70]
## 345  156  37 female 1.7018  96.248    48  51 33.23339  (10,40]
## 346  224  34 female 1.5240  74.910    34  46 32.25298  (10,40]
## 347  181  30 female 1.6764 116.678    47  55 41.51774  (10,40]
## 348  306  74   male 1.7526  83.536    39  41 27.19619 (70,100]
## 349  122  36 female 1.8034  83.082    41  45 25.54599  (10,40]
## 350  219  45   male 1.7018  98.972    41  45 34.17396  (40,70]
```

```
## 351  150  35   male 1.8542  81.266    32  37 23.63718  (10,40]
## 352  185  50 female 1.6256 103.512    42  54 39.17088  (40,70]
## 353  226  27   male 1.7526 131.206    48  51 42.71575  (10,40]
## 354  206  52   male 1.7526  69.462    36  40 22.61422  (40,70]
## 355  199  42 female 1.7018 106.690    47  52 36.83890  (40,70]
## 356  239  39   male 1.5240  65.376    33  42 28.14806  (10,40]
## 357  235  73   male 1.6510  83.082    43  46 30.47985 (70,100]
## 358  184  28   male 1.7018  69.916    35  38 24.14124  (10,40]
## 359  242  53   male 1.7526  98.064    43  45 31.92596  (40,70]
## 360  307  49   male 1.7018  82.174    41  42 28.37379  (40,70]
## 361  204  55 female 1.6764  91.708    43  47 32.63262  (40,70]
## 362  212  37 female 1.6256  72.640    37  45 27.48834  (10,40]
## 363  203  60 female 1.4986  55.842    36  41 24.86506  (40,70]
## 364  219  56 female 1.6510  89.438    41  50 32.81164  (40,70]
## 365  226  84 female 1.5240  87.168    41  48 37.53074 (70,100]
## 366  217  20 female 1.7018  84.898    40  45 29.31436  (10,40]
## 367  157  80   male 1.8034  96.248    47  48 29.59427 (70,100]
## 368  235  60   male 1.7526  84.444    40  42 27.49180  (40,70]
## 369  252  80 female 1.5748  73.548    44  41 29.65651 (70,100]
## 370  204  29 female 1.6256  54.480    33  38 20.61625  (10,40]
## 371  188  43 female 1.6764  69.008    37  41 24.55524  (40,70]
## 372  194  63 female 1.4732  95.340    44  53 43.92904  (40,70]
## 373  215  37 female 1.4986  67.192    32  42 29.91893  (10,40]
## 374  179  20 female 1.4732  77.180    34  46 35.56161  (10,40]
## 375  202  44   male 1.7272  71.278    33  37 23.89298  (40,70]
## 376  194  54   male 1.7526  58.566    30  37 19.06689  (40,70]
## 377  227  58   male 1.7780  95.794    38  43 30.30224  (40,70]
## 378  337  35   male 1.8288  85.806    36  44 25.65578  (10,40]
## 379  255  52   male 1.7780  54.480    30  33 17.23350  (40,70]
## 380  162  60 female 1.6002  54.934    32  34 21.45323  (40,70]
## 381  322  43 female 1.4224  54.480    32  41 26.92735  (40,70]
## 382  289  59   male 1.7272  76.726    36  38 25.71919  (40,70]
## 383  217  33 female 1.5748  84.444    42  46 34.05007  (10,40]
## 384  209  37   male 1.7780 118.948    42  48 37.62648  (10,40]
## 385  214  40   male 1.8288 100.788    40  44 30.13536  (10,40]
## 386  302  38 female 1.7018 100.788    41  51 34.80101  (10,40]
## 387  179  32 female 1.5748  81.266    37  47 32.76861  (10,40]
## 388  279  60 female 1.7272 101.696    48  50 34.08934  (40,70]
## 389  144  30   male 1.8288  74.910    31  38 22.39790  (10,40]
## 390  270  42   male 1.6764  83.990    39  41 29.88631  (40,70]
## 391  196  52 female 1.5748  66.738    34  42 26.91054  (40,70]
## 392  221  59 female 1.5748  80.358    39  45 32.40248  (40,70]
## 393  210  78   male 1.6764  65.830    38  39 23.42440 (70,100]
## 394  192  51   male 1.6510  66.284    NA  NA 24.31726  (40,70]
## 395  169  25 female 1.5240  69.916    40  42 30.10278  (10,40]
## 396  179  37   male 1.6764  61.744    33  39 21.97048  (10,40]
## 397  216  54 female 1.6764  76.272    38  42 27.14000  (40,70]
## 398  301  89 female 1.5494  52.210    31  41 21.74836 (70,100]
## 399  296  53   male 1.7526  78.542    35  39 25.57033  (40,70]
## 400  284  51 female 1.6002  69.916    32  43 27.30411  (40,70]
## 401  194  29 female 1.7526  75.818    33  40 24.68350  (10,40]
## 402  199  41 female 1.6002  89.438    41  48 34.92799  (40,70]
## 403  159  68 female 1.6256  99.880    49  58 37.79646  (40,70]
```

- Usando `dplyr` calcula cuántas observaciones hay en cada nivel de `ageGroup` (indicación: usa `group_by`). Ahora, usando aquellas observaciones que corresponden a mujeres, ¿cuál es la media del nivel de colesterol y de BMI en cada uno de esos grupos de edad?

```
#Frecuencia de cada grupo de edad

(chlstrl %>%
  count(ageGroup))
```

```
##   ageGroup   n
## 1  (10,40] 160
## 2  (40,70] 207
## 3 (70,100]  36
```

```
#Cálculo de la media del colesterol y BMI por grupos de edad

(chlstrl %>%
  filter(gender=='female') %>%
    group_by(ageGroup) %>%
    summarise(MedChol=mean(chol, na.rm = TRUE), MedBMI=mean(BMI, na.rm=TRUE)))
```

```
## # A tibble: 3 x 3
##   ageGroup MedChol MedBMI
##   <fct>      <dbl>  <dbl>
## 1 (10,40]     189.   30.5
## 2 (40,70]     221.   30.3
## 3 (70,100]    230.   29.4
```

Ejercicio 2: Funciones de R.

- Crea una función de R llamada `cambiosSigno` que dado un vector `x` de números enteros no nulos, como

  `-12, -19, 9, -13, -14, -17, 8, -19, -14,`

  calcule cuántos cambios de signo ha habido. Es decir, cuántas veces el signo de un elemento es distinto del signo del elemento previo. Por ejemplo, en el vector anterior hay 4 cambios de signo (en las posiciones 3, 4, 7 y 8).

```
cambiossigno=function(x=sample(c(-1,1), 9, replace = TRUE) * sample(1:20, 9, replace = TRUE)){
  sol=list()
  a=length(x)
  cs=0
  for(y in 1:(a-1)){
    if ((x[y]>0)==TRUE && (x[y+1]<0)==TRUE){
      cs=cs+1

    }else if ((x[y]<0)==TRUE && (x[y+1]>0)==TRUE){
      cs=cs+1
    }
```

```
  }
  sol$vector=x
  sol$cambSigno=cs
  returnValue(sol)
}
cambiossigno(x)
```

```
## $vector
## [1] -12 -19   9 -13 -14 -17   8 -19 -14
##
## $cambSigno
## [1] 4
```

```
cambiossigno()
```

```
## $vector
## [1]   5  -1  14  -7   6  -6 -17 -16   6
##
## $cambSigno
## [1] 6
```

- Modifica la función para que devuelva como resultado las posiciones donde hay cambios de signo. Llama `cambiosSignoPos(x)` a esa otra función. Por ejemplo, para el vector anterior el resultado de esta función sería [1] 3 4 7 8

```
cambiossignopos=function(x=sample(c(-1,1), 9, replace = TRUE) * sample(1:20, 9, replace = TRUE)){
  sol=list()
  a=length(x)
  pos=c()
  for(y in 1:(a-1)){
    if ((x[y]>0)==TRUE && (x[y+1]<0)==TRUE){
      pos=append(pos,y+1)
    }else if ((x[y]<0)==TRUE && (x[y+1]>0)==TRUE){
      pos=append(pos,y+1)
    }
  }
  sol$vector=x
  sol$posiciones=pos
  returnValue(sol)
}
cambiossignopos(x)
```

```
## $vector
## [1] -12 -19   9 -13 -14 -17   8 -19 -14
##
## $posiciones
## [1] 3 4 7 8
```

También se valorará que incluyas en el código como usar ‘sample‘ para generar vectores aleatorios de 20

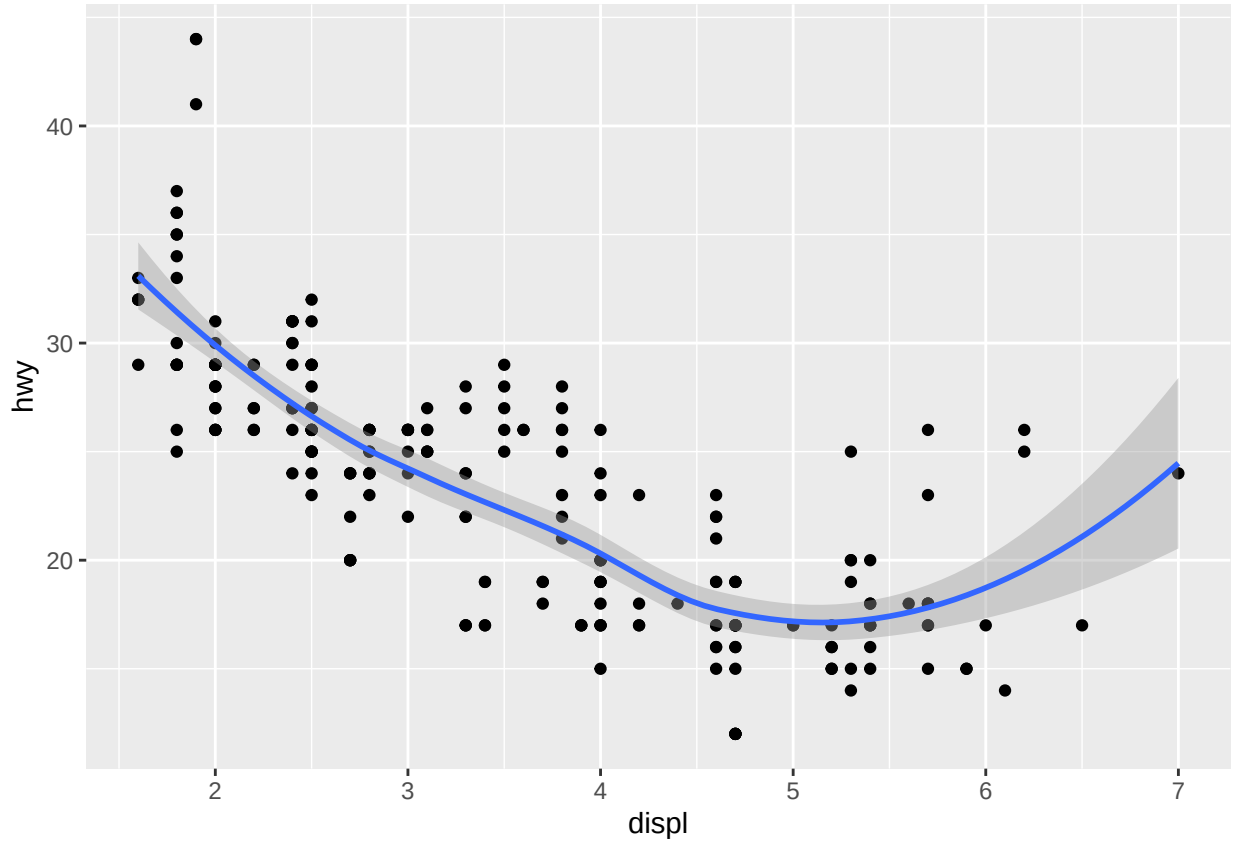
Ejercicio 3. R4DS.

Es recomendable que esta semana del curso hagas al menos una lectura somera de los Capítulos 1 a 5 de R for Data Science (R4DS), de H. Wickham, con énfasis especial en los Capítulos 3 y 5 (los capítulos 1, 2 y 4 son muy breves). Los siguientes apartados pretenden motivar esa lectura y por eso mismo pueden resultar un poco más laboriosos.

- Haz el ejercicio 6 de la Sección 3.6.1 de R4DS.

```
ggplot(data = mpg, mapping = aes(x = displ, y = hwy)) +
  geom_point() +
  geom_smooth()
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```




```
g1=ggplot() +
  geom_point(data = mpg, mapping = aes(x = displ, y = hwy)) +
  geom_smooth(data = mpg, mapping = aes(x = displ, y = hwy), se=FALSE)
```

```
g2=ggplot() +
  geom_point(data = mpg, mapping = aes(x = displ, y = hwy)) +
  geom_smooth(data = mpg, mapping = aes(x = displ, y = hwy,group=drv), se=FALSE)
```

```
g3=ggplot() +
  geom_point(data = mpg, mapping = aes(x = displ, y = hwy, color=drv)) +
  geom_smooth(data = mpg, mapping = aes(x = displ, y = hwy, color=drv), se=FALSE)
```

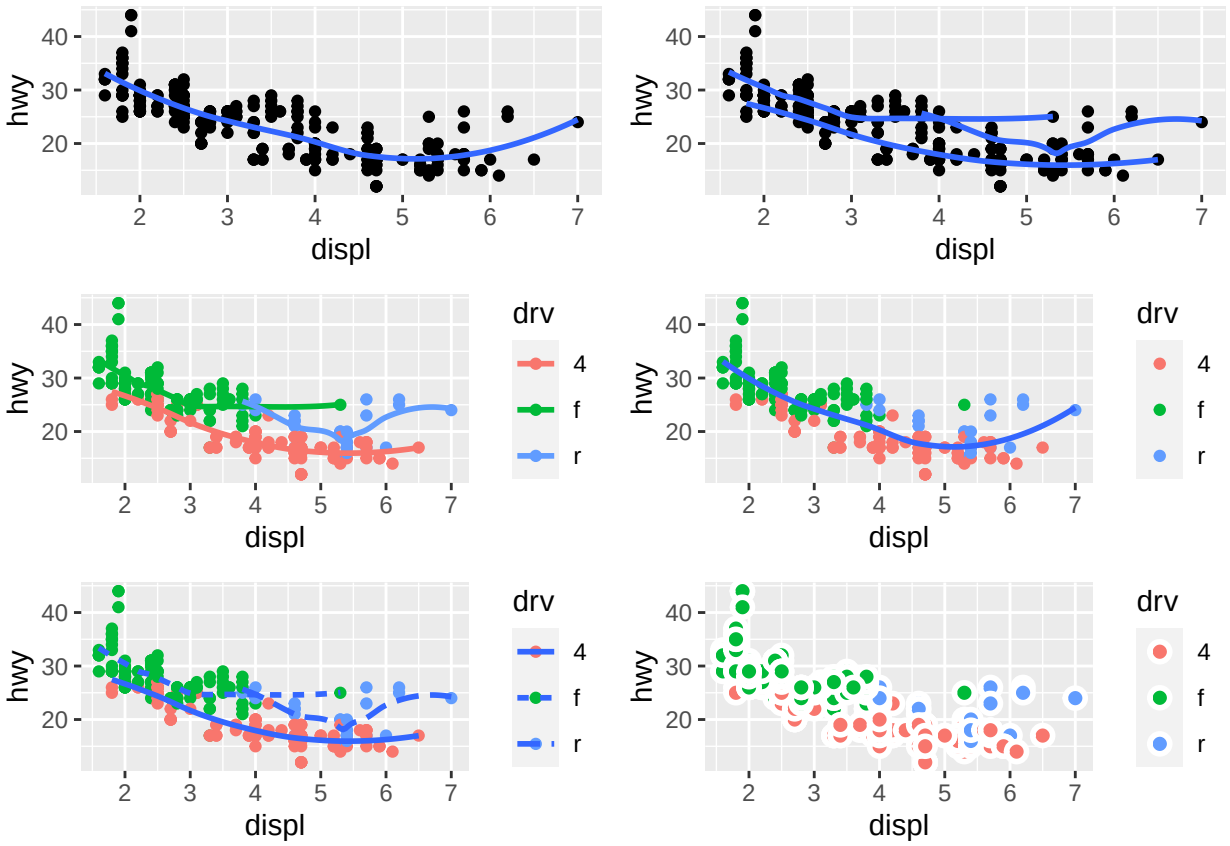
```
g4=ggplot() +
  geom_point(data = mpg, mapping = aes(x = displ, y = hwy, color=drv)) +
  geom_smooth(data = mpg, mapping = aes(x = displ, y = hwy), se=FALSE)
```

```
g5=ggplot() +
  geom_point(data = mpg, mapping = aes(x = displ, y = hwy, color=drv)) +
  geom_smooth(data = mpg, mapping = aes(x = displ, y = hwy, linetype=drv), se=FALSE)
```

```
g6=ggplot() +
  geom_point(data = mpg, mapping = aes(x = displ, y = hwy, fill=drv), shape = 21,color="white",size = 2
```

```
grid.arrange(g1,g2,g3,g4,g5,g6,nrow = 3)
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```



- Haz el ejercicio 1 de la Sección 5.2.4 de R4DS.

Find all flights that

Had an arrival delay of two or more hours

```
flights %>%
  filter(arr_delay>=120)
```

```
## # A tibble: 10,200 x 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     1     1      811            630       101     1047            830
##  2  2013     1     1      848           1835       853     1001           1950
##  3  2013     1     1      957            733       144     1056            853
##  4  2013     1     1     1114            900       134     1447           1222
##  5  2013     1     1     1505           1310       115     1638           1431
##  6  2013     1     1     1525           1340       105     1831           1626
##  7  2013     1     1     1549           1445        64     1912           1656
##  8  2013     1     1     1558           1359       119     1718           1515
##  9  2013     1     1     1732           1630        62     2028           1825
## 10  2013     1     1     1803           1620       103     2008           1750
## # ... with 10,190 more rows, and 11 more variables: arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

Flew to Houston (IAH or HOU) (2 opciones distintas)

```
flights %>%
filter(dest=='IAH'| dest=='HOU')
```

```
## # A tibble: 9,313 x 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     1     1      517            515         2      830            819
##  2  2013     1     1      533            529         4      850            830
##  3  2013     1     1      623            627        -4      933            932
##  4  2013     1     1      728            732        -4     1041           1038
##  5  2013     1     1      739            739         0     1104           1038
##  6  2013     1     1      908            908         0     1228           1219
##  7  2013     1     1     1028           1026         2     1350           1339
##  8  2013     1     1     1044           1045        -1     1352           1351
##  9  2013     1     1     1114            900       134     1447           1222
## 10  2013     1     1     1205           1200         5     1503           1505
## # ... with 9,303 more rows, and 11 more variables: arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

```
flights %>%
filter(dest %in% c('IAH','HOU'))
```

```
## # A tibble: 9,313 x 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
```

```
##  1  2013     1     1      517            515         2      830            819
##  2  2013     1     1      533            529         4      850            830
##  3  2013     1     1      623            627        -4      933            932
##  4  2013     1     1      728            732        -4     1041           1038
##  5  2013     1     1      739            739         0     1104           1038
##  6  2013     1     1      908            908         0     1228           1219
##  7  2013     1     1     1028           1026         2     1350           1339
##  8  2013     1     1     1044           1045        -1     1352           1351
##  9  2013     1     1     1114            900       134     1447           1222
## 10  2013     1     1     1205           1200         5     1503           1505
## # ... with 9,303 more rows, and 11 more variables: arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

Were operated by United, American, or Delta

```
flights %>%
filter(carrier=='UA'| carrier=='AA' | carrier=='DL')
```

```
## # A tibble: 139,504 x 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     1     1      517            515         2      830            819
##  2  2013     1     1      533            529         4      850            830
##  3  2013     1     1      542            540         2      923            850
##  4  2013     1     1      554            600        -6      812            837
##  5  2013     1     1      554            558        -4      740            728
##  6  2013     1     1      558            600        -2      753            745
##  7  2013     1     1      558            600        -2      924            917
##  8  2013     1     1      558            600        -2      923            937
##  9  2013     1     1      559            600        -1      941            910
## 10  2013     1     1      559            600        -1      854            902
## # ... with 139,494 more rows, and 11 more variables: arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

```
flights %>%
filter(carrier %in% c('UA','AA','DL'))
```

```
## # A tibble: 139,504 x 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     1     1      517            515         2      830            819
##  2  2013     1     1      533            529         4      850            830
##  3  2013     1     1      542            540         2      923            850
##  4  2013     1     1      554            600        -6      812            837
##  5  2013     1     1      554            558        -4      740            728
##  6  2013     1     1      558            600        -2      753            745
##  7  2013     1     1      558            600        -2      924            917
##  8  2013     1     1      558            600        -2      923            937
##  9  2013     1     1      559            600        -1      941            910
## 10  2013     1     1      559            600        -1      854            902
## # ... with 139,494 more rows, and 11 more variables: arr_delay <dbl>,
```

```
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

Departed in summer (July, August, and September) (2 opciones distintas)

```
flights %>%
filter(month==7 | month==8 | month==9 )
```

```
## # A tibble: 86,326 x 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     7     1        1           2029       212      236           2359
##  2  2013     7     1        2           2359         3      344            344
##  3  2013     7     1       29           2245       104      151              1
##  4  2013     7     1       43           2130       193      322             14
##  5  2013     7     1       44           2150       174      300            100
##  6  2013     7     1       46           2051       235      304           2358
##  7  2013     7     1       48           2001       287      308           2305
##  8  2013     7     1       58           2155       183      335             43
##  9  2013     7     1      100           2146       194      327             30
## 10  2013     7     1      100           2245       135      337            135
## # ... with 86,316 more rows, and 11 more variables: arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

```
flights %>%
filter(month %in% c(7:9))
```

```
## # A tibble: 86,326 x 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     7     1        1           2029       212      236           2359
##  2  2013     7     1        2           2359         3      344            344
##  3  2013     7     1       29           2245       104      151              1
##  4  2013     7     1       43           2130       193      322             14
##  5  2013     7     1       44           2150       174      300            100
##  6  2013     7     1       46           2051       235      304           2358
##  7  2013     7     1       48           2001       287      308           2305
##  8  2013     7     1       58           2155       183      335             43
##  9  2013     7     1      100           2146       194      327             30
## 10  2013     7     1      100           2245       135      337            135
## # ... with 86,316 more rows, and 11 more variables: arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

Arrived more than two hours late, but didn't leave late

```
flights %>%
filter(arr_delay >120, dep_delay<=0)
```

```
## # A tibble: 29 x 19
##     year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
```

```
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     1    27     1419           1420        -1     1754           1550
##  2  2013    10     7     1350           1350         0     1736           1526
##  3  2013    10     7     1357           1359        -2     1858           1654
##  4  2013    10    16      657            700        -3     1258           1056
##  5  2013    11     1      658            700        -2     1329           1015
##  6  2013     3    18     1844           1847        -3       39           2219
##  7  2013     4    17     1635           1640        -5     2049           1845
##  8  2013     4    18      558            600        -2     1149            850
##  9  2013     4    18      655            700        -5     1213            950
## 10  2013     5    22     1827           1830        -3     2217           2010
## # ... with 19 more rows, and 11 more variables: arr_delay <dbl>, carrier <chr>,
## #   flight <int>, tailnum <chr>, origin <chr>, dest <chr>, air_time <dbl>,
## #   distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

Were delayed by at least an hour, but made up over 30 minutes in flight

```
flights %>%
filter(dep_delay >=60,arr_delay<(dep_delay-30))
```

```
## # A tibble: 1,844 x 19
##    year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     1     1     2205           1720       285       46           2040
##  2  2013     1     1     2326           2130       116      131             18
##  3  2013     1     3     1503           1221       162     1803           1555
##  4  2013     1     3     1839           1700        99     2056           1950
##  5  2013     1     3     1850           1745        65     2148           2120
##  6  2013     1     3     1941           1759       102     2246           2139
##  7  2013     1     3     1950           1845        65     2228           2227
##  8  2013     1     3     2015           1915        60     2135           2111
##  9  2013     1     3     2257           2000       177       45           2224
## 10  2013     1     4     1917           1700       137     2135           1950
## # ... with 1,834 more rows, and 11 more variables: arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```

Departed between midnight and 6am (inclusive)

```
flights %>%
filter(dep_time==2400 | dep_time<=600)
```

```
## # A tibble: 9,373 x 19
##    year month   day dep_time sched_dep_time dep_delay arr_time sched_arr_time
##    <int> <int> <int>    <int>          <int>     <dbl>    <int>          <int>
##  1  2013     1     1      517            515         2      830            819
##  2  2013     1     1      533            529         4      850            830
##  3  2013     1     1      542            540         2      923            850
##  4  2013     1     1      544            545        -1     1004           1022
##  5  2013     1     1      554            600        -6      812            837
##  6  2013     1     1      554            558        -4      740            728
##  7  2013     1     1      555            600        -5      913            854
```

```
##  8  2013     1     1      557            600        -3      709            723
##  9  2013     1     1      557            600        -3      838            846
## 10  2013     1     1      558            600        -2      753            745
## # ... with 9,363 more rows, and 11 more variables: arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>, time_hour <dttm>
```