Practice 2

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```
path <- '/Users/ektachaudhary/Documents/practice_ex_2/Data/'
files = list.files(path = path, pattern = "*.csv", full.names = TRUE)
```

#Reading the datasets

```
data_csv = ldply(files, read_csv) %>%
  janitor::clean_names()
```

```
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )

## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
```

```
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
```

```
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   `HCC at 5 years` = col_character(),
##   Age = col_double(),
##   Weight = col_double(),
##   Height = col_double(),
##   Alcohol = col_double(),
##   Comorbidities = col_character(),
##   `Number of prior treatments for cirrhosis` = col_double()
## )
```

```
data_csv
```

```
##      x1 hcc_at_5_years  age  weight height alcohol
## 1     1              N 51.7  68.723 156.99       9
## 2     2              Y 59.6  76.644 160.79       8
## 3     3              N 57.0  74.014 159.53      17
## 4     4              N 69.1  86.085 165.32       2
## 5     5              N 59.5  76.462 160.70      14
## 6     6              N 62.0  78.983 161.91      15
## 7     7              N 50.7  67.728 156.51      24
## 8     8              Y 66.9  83.932 164.29      11
## 9     9              N 47.7  64.684 155.05      16
## 10   10              Y 53.5  70.502 157.84       5
```

```
## 11   11              N 59.1  76.124 160.54      19
## 12   12              Y 59.2  76.203 160.58      26
## 13    1              Y 74.2  91.222 167.79       5
## 14    2              N 57.1  74.116 159.58      19
## 15    3              N 52.7  69.740 157.48       5
## 16    4              N 72.3  89.267 166.85      11
## 17    5              N 52.7  69.661 157.44      NA
## 18    6              Y 75.4  92.446 168.37      27
## 19    7              N 54.3  71.298 158.22       7
## 20    8              Y 65.3  82.283 163.50      30
## 21    9              N 52.2  79.949 143.94       1
## 22   10              N 40.5  57.492 151.60       3
## 23   11              Y 99.3 116.302 179.82       7
## 24   12              Y 68.7  85.710 165.14      22
## 25   13              Y 72.5  89.513 166.97       1
## 26   14              Y 61.5  78.487 161.67      16
## 27   15              Y 57.8  74.831 159.92      20
## 28   16              Y 52.1  79.798 143.94       9
## 29   17              Y 59.5  76.516 160.73      12
## 30   18              N 51.7  68.743 157.00      22
## 31    1              Y 75.2  92.246 168.28      29
## 32    2              Y 52.9  69.925 157.56      23
## 33    3              Y 75.4  92.449 168.38      17
## 34    4              Y 67.2  84.232 164.43      14
## 35    5              Y 67.2  84.208 164.42      11
## 36    6              N 48.8  65.836 155.60      NA
## 37    7              Y 34.3  51.270 148.61       6
## 38    8              N 63.6  80.573 162.68       4
## 39    9              Y 63.7  80.703 162.74      12
## 40   10              N 38.9  55.923 150.84       8
## 41   11              N 57.0  73.993 159.52      21
## 42   12              N 53.7  70.750 157.96      12
## 43   13              N 58.7  75.671 160.32      NA
## 44   14              N 49.4  66.355 155.85      12
## 45   15              N 54.2  71.206 158.18       6
## 46   16              N 43.1  60.062 152.83      NA
## 47   17              Y 70.7  87.747 166.12      16
## 48   18              N 52.0  69.019 157.13      12
## 49   19              Y 49.8  66.756 156.04      17
## 50   20              Y 66.5  83.486 164.07      29
## 51   21              N 56.7  73.683 159.37      20
## 52   22              N 52.3  69.329 157.28      10
## 53   23              Y 74.8  91.768 168.05      10
## 54   24              Y 70.3  87.324 165.92      28
## 55   25              N 43.1  60.057 152.83      11
## 56   26              N 50.8  67.814 156.55      17
## 57   27              Y 70.3  87.275 165.89      15
## 58   28              N 37.3  54.283 150.06       4
## 59   29              N 44.0  61.004 153.28       7
## 60   30              N 43.4  60.365 152.98      22
## 61   31              N 43.8  60.762 153.17       9
## 62   32              N 41.9  58.940 152.29      15
## 63   33              Y 56.2  73.228 159.15       8
## 64   34              N 76.0  92.985 168.63      11
```

```
## 65   35             N 45.0  61.999 153.76      13
## 66   36             N 45.2  62.202 153.86      24
## 67   37             Y 71.7  88.685     NA      NA
## 68   38             N 32.8  49.826 147.92      21
## 69   39             N 44.9  61.918 153.72      25
## 70   40             Y 68.4  85.418 165.00      25
## 71   41             Y 65.6  82.608 163.65      12
## 72   42             Y 71.6  88.551 166.50       5
## 73   43             Y 60.2  77.159 161.04      19
## 74   44             N 77.0  93.952 169.10       9
## 75   45             Y 55.3  72.285 158.70      28
## 76   46             Y 56.6  73.647 159.35       5
## 77   47             N 53.5  70.529 157.85      29
## 78   48             Y 62.1  79.088 161.96       0
## 79   49             Y 32.8  49.838 147.92      21
## 80   50             N 56.1  73.129 159.10      19
## 81   51             Y 46.3  63.348 154.41      23
## 82   52             Y 61.5  78.480 161.67      27
## 83   53             Y 68.2  85.210 164.90      15
## 84   54             N 52.6  69.622 157.42      22
## 85   55             N 65.2  82.154 163.43      28
## 86   56             Y 60.2  77.212 161.06       3
## 87   57             Y 71.9  88.920 166.68      15
## 88    1             N 50.7  67.661 172.65       6
## 89    2             N 36.3  53.272 168.05      30
## 90    3             Y 66.2  83.171 177.61       1
## 91    4             Y 55.7  72.667 174.25       7
## 92    5             Y 66.0  82.992 177.56      27
## 93    6             Y 57.6  74.602 174.87       4
## 94    7             Y 70.5  87.528 179.01      11
## 95    8             N 50.0  66.987 172.44       5
## 96    9             N 61.1  78.138 176.00       5
## 97   10             Y 65.2  82.188 177.30      29
## 98   11             N 50.1  67.062 172.46      24
## 99   12             Y 68.7  85.716 178.43      29
## 100  13             Y 71.8  88.811 179.42      12
## 101  14             Y 27.9  44.935 165.38      26
## 102  15             N 49.2  66.238 172.20      NA
## 103  16             N 58.4  75.356 175.11       9
## 104  17             Y 79.5  96.469 181.87      15
## 105  18             N 43.9  60.896 170.49      19
## 106  19             Y 71.6  88.578 179.34      NA
## 107  20             N 74.3  91.324 180.22      24
## 108  21             N 45.6  62.647 171.05      17
## 109  22             N 55.2  72.157 174.09      11
## 110  23             Y 56.2  73.224 174.43      20
## 111  24             Y 63.0  79.950 176.58       7
## 112  25             N 33.8  50.757 167.24       8
## 113  26             N 43.4  68.653 161.72      16
## 114  27             Y 69.8  86.776 178.77      22
## 115  28             N 58.5  75.464 175.15      23
## 116  29             N 54.8  71.768 173.97       3
## 117  30             N 62.3  79.305 176.38      18
## 118  31             N 59.9  76.867 175.60      27
```

```
## 119  32             Y 69.8  86.756 178.76      19
## 120  33             Y 30.3  47.276 166.13       8
## 121  34             N 35.6  52.581 167.83      11
## 122  35             N 79.2  96.151 181.77      20
## 123  36             N 37.1  54.094 168.31      27
## 124  37             Y 36.3  53.285 168.05      22
## 125  38             Y 57.7  74.667 174.89      NA
## 126  39             N 58.8  75.823 175.26      11
## 127  40             Y 39.7  56.721 169.15      26
## 128  41             N 52.8  69.757 173.32       2
## 129  42             N 65.2  82.211 177.31       8
## 130  43             Y 50.4  67.413 172.57      11
## 131  44             N 57.1  74.135 174.72      11
## 132  45             Y 74.7  91.674 180.34       8
## 133  46             N 48.4  65.403 171.93      12
## 134  47             N 64.9  81.915 177.21      10
## 135  48             N 36.6  53.642 168.17       8
## 136  49             N 51.4  68.416 172.89      24
## 137  50             Y 83.8 100.797 183.26      30
## 138  51             N 63.3  80.297 176.69      NA
## 139  52             Y 70.6  87.607 179.03      18
## 140  53             Y 75.0  92.014 180.44      18
## 141  54             N 56.7  73.676 174.58      17
## 142  55             Y 58.5  75.519 175.17       7
## 143  56             Y 72.0  88.999 179.48      14
## 144  57             Y 61.0  77.990 175.96      30
## 145  58             N 45.0  62.011 170.84       2
## 146  59             Y 51.9  68.853 173.03       2
## 147  60             Y 62.8  79.802 176.54      15
## 148  61             Y 56.2  73.157 174.41       2
## 149  62             Y 49.9  66.869 172.40      29
## 150  63             N 58.7  75.704 175.23      19
## 151  64             Y 54.9  71.917 174.01       8
## 152  65             N 73.5  90.453 179.94      30
## 153  66             Y 55.8  72.771 174.29      11
## 154  67             N 73.5  90.456 179.95      11
## 155  68             N 44.5  61.473 170.67      10
## 156  69             N 51.8  68.823 173.02       3
## 157  70             N 36.6  53.611 168.16      17
## 158  71             N 58.5  75.501 175.16      10
## 159  72             N 51.0  67.986 172.76       0
## 160  73             Y 26.0  43.033 164.77      30
## 161  74             N 49.3  66.290 172.21      11
## 162  75             N 39.9  56.921 169.21       7
## 163  76             Y 61.9  78.948 176.26      22
## 164  77             Y 53.7  70.716 173.63       9
## 165  78             Y 33.9  50.858 167.27      12
## 166  79             N 61.0  78.035 175.97      12
## 167  80             N 53.5  70.465 173.55      13
## 168  81             Y 88.4 105.409 184.73      23
## 169  82             Y 65.4  82.401 177.37       6
## 170  83             N 50.8  67.797 172.70      22
## 171  84             N 63.1  80.083 176.63      18
## 172  85             Y 57.4  74.434 174.82      10
```

```
## 173  86             Y 63.5  80.511 176.76      11
## 174  87             N 85.9 102.942 183.94       1
## 175  88             N 50.7  67.673 172.66      15
## 176  89             Y 65.5  82.492 177.40      29
## 177  90             Y 73.9  90.928 180.10       0
## 178  91             Y 46.6  63.603 171.35       3
## 179  92             N 40.8  57.807 169.50      13
## 180  93             N 54.4  71.403 173.85       9
## 181  94             N 59.0  76.019 175.33      29
## 182  95             Y 62.2  79.224 176.35      18
## 183  96             Y 65.1  82.077 177.26      22
## 184  97             Y 46.3  63.322 171.26      20
## 185  98             Y 79.6  96.585 181.91      22
## 186  99             Y 77.9  94.854 181.35       3
## 187 100             Y 45.0  62.032 170.85       7
## 188 101             Y 62.6  79.619 176.48      19
## 189 102             Y 63.5  80.483 176.75      29
## 190   1             N 55.5  72.480 158.79       8
## 191   2             Y 67.2  84.248 164.44      12
## 192   3             N 59.5  76.542 160.74      23
## 193   4             N 57.6  74.634 159.82      20
## 194   5             N 53.1  70.139 157.67       6
## 195   6             Y 64.4  81.386 163.07      11
## 196   7             N 46.6  63.577 154.52      11
## 197   8             Y 86.9 103.879 173.86      21
## 198   9             N 52.5  69.524 157.37      16
## 199  10             Y 67.6  84.551 164.58      21
## 200  11             N 61.3  78.275 161.57      16
## 201  12             Y 67.7  84.668 164.64      22
## 202  13             Y 47.8  64.820 155.11      13
## 203  14             N 52.5  69.519 157.37       5
## 204  15             N 49.0  65.997 155.68      23
## 205  16             Y 60.9  77.887 161.39      26
## 206  17             N 43.5  60.528     NA      NA
## 207  18             Y 61.1  78.088 161.48       8
## 208  19             N 56.9  73.861 159.45      15
## 209  20             N 80.0  96.967 170.54      28
## 210  21             Y 56.3  73.276 159.17      10
## 211  22             N 56.6  73.610 159.33      29
## 212  23             N 49.4  66.375 155.86      21
## 213  24             N 55.2  72.228 158.67      27
## 214  25             Y 60.3  77.286 161.10       5
## 215  26             Y 63.2  80.217 162.50      19
## 216  27             N 71.3  88.318 166.39      30
## 217  28             N 70.1  87.128 165.82       4
## 218  29             N 56.7  73.730 159.39      10
## 219  30             Y 75.5  92.540 168.42      26
## 220  31             N 35.8  52.790 149.34      23
## 221  32             Y 65.8  82.786 163.74      25
## 222  33             N 51.5  68.471 156.87      18
## 223   1             Y 74.5  91.528 167.93      15
## 224   2             Y 53.5  70.457 157.82      23
## 225   3             N 74.5  91.488 167.91      27
## 226   4             N 58.5  75.547 160.26       6
```

```
## 227   5             Y 34.5  51.517 148.73       9
## 228   6             N 52.4  69.412 157.32      10
## 229   7             N 36.3  53.268 149.57       6
## 230   8             Y 60.2  77.236 161.07       7
## 231   9             Y 81.7  98.718 171.38       8
## 232  10             Y 29.6  46.601 146.37      18
## 233  11             Y 70.3  87.256 165.88       8
## 234  12             N 40.5  57.515 151.61       4
## 235  13             Y 80.8  97.811 170.95       7
## 236  14             Y 75.3  92.266 168.29      18
## 237  15             Y 47.5  64.514 154.97       6
## 238  16             N 54.7  71.725 158.43      14
## 239  17             Y 57.1  74.139 159.59      19
## 240  18             N 53.3  70.264 157.73      29
## 241  19             Y 90.3 107.274 175.49      20
## 242  20             N 59.6  76.623 160.78      13
## 243  21             N 49.1  66.087 155.72      11
## 244  22             N 66.0  82.975 163.83      14
## 245  23             Y 60.5  77.521 161.21      13
## 246  24             Y 57.1  74.126 159.58       7
## 247  25             Y 56.8  73.844 159.45      21
## 248  26             Y 63.6  80.611 162.69      12
## 249  27             N 44.7  61.696 153.61      10
## 250  28             N 43.5  60.470 153.03      17
## 251  29             Y 78.6  95.607 169.89      29
## 252  30             N 32.2  49.224 147.63      20
## 253  31             N 58.2  75.159 160.08      19
## 254  32             N 44.4  61.406 153.47      26
## 255  33             N 61.4  78.382 161.62      23
## 256  34             N 70.6  87.606 166.05      25
## 257  35             Y 32.1  49.070 147.55       3
## 258  36             Y 69.2  86.210 165.38      14
## 259  37             Y 57.4  74.375 159.70      18
## 260  38             N 41.2  58.183 151.93      28
## 261  39             Y 33.9  50.860 148.41      29
## 262  40             Y 66.9  83.870 164.26       1
## 263  41             N 56.0  73.026 159.05      NA
## 264  42             N 60.7  77.705 161.30      NA
## 265  43             N 68.2  85.217 164.90       7
## 266  44             Y 79.6  96.590 170.36       9
## 267  45             N 56.7  73.703 159.38      22
## 268  46             Y 51.0  68.036 156.66      NA
## 269  47             Y 75.9  92.854 168.57       6
## 270   1             N 46.8  63.838 154.64      11
## 271   2             N 43.5  60.530 153.05      13
## 272   3             N 51.4  68.371 156.82      27
## 273   4             N 88.6 105.571 174.67      12
## 274   5             N 47.6  64.594 155.01      16
## 275   6             Y 63.2  80.169 162.48       4
## 276   7             Y 43.3  60.266 152.93       1
## 277   8             Y 43.3  60.325 152.96      23
## 278   9             N 53.8  70.838 158.00      10
## 279  10             N 75.0  92.039 168.18      12
## 280  11             N 52.1  69.136 157.19      NA
```

```
## 281  12             N 68.5  85.536 165.06      11
## 282  13             Y 39.8  56.775 151.25      17
## 283  14             N 53.0  69.996 157.60      21
## 284  15             N 48.3  65.295 155.34      29
## 285  16             Y 53.4  70.384 157.78      21
## 286  17             N 73.5  90.501 167.44       0
## 287  18             N 56.7  73.657 159.36      16
## 288   1             Y 60.2  77.157 161.04      25
## 289   2             Y 61.2  78.183 161.53      24
## 290   3             N 50.3  67.318 156.31       2
## 291   4             Y 40.1  57.135 151.42       7
## 292   5             N 53.9  70.863 158.01      29
## 293   6             Y 59.6  76.605 160.77       1
## 294   7             Y 70.7  87.726 166.11      27
## 295   8             Y 54.8  71.805 158.47      22
## 296   9             N 54.2  71.218 158.18       6
## 297  10             N 78.2  95.190 169.69      25
## 298  11             Y 48.3  65.329 155.36      12
## 299  12             Y 63.3  80.300 162.54      12
## 300  13             N 50.7  67.701 156.50      14
## 301  14             Y 63.2  80.188 162.49      18
## 302  15             Y 38.7  55.684 150.73      11
## 303  16             N 51.5  68.516 156.89       1
## 304  17             N 54.5  71.503 158.32      30
## 305  18             Y 70.6  87.593 166.04      29
## 306  19             Y 52.1  69.130 157.18      17
## 307  20             Y 61.7  78.724     NA      NA
## 308  21             N 52.8  69.778 157.49       7
## 309  22             N 47.4  64.370 154.90      26
## 310  23             Y 66.6  83.613 164.13      22
## 311  24             N 52.2  69.248 157.24      15
## 312  25             N 74.9  91.852 168.09      17
## 313  26             Y 63.5  80.538 162.66       0
## 314  27             N 56.1  73.113 159.09      14
## 315  28             N 63.7  80.694 162.73       1
## 316  29             N 57.5  74.498 159.76      14
## 317  30             N 63.7  80.702 162.74      NA
## 318  31             N 52.9  69.895 157.55      NA
## 319  32             N 31.3  48.294 147.18       3
## 320  33             N 60.0  76.960 160.94       4
## 321  34             N 66.3  83.251 163.96      27
## 322  35             N 45.7  62.727 154.11       4
## 323  36             Y 44.1  61.079 153.32      22
## 324  37             N 52.5  69.533 157.38      29
## 325  38             N 51.5  68.549 156.90       1
## 326  39             N 63.2  80.237 162.51       1
## 327  40             Y 59.7  76.677 160.80       6
## 328  41             Y 70.9  87.934 166.21      15
## 329  42             N 78.7  95.669 169.92      28
## 330  43             Y 57.8  74.776 159.89       4
## 331  44             Y 57.7  74.697 159.85       5
## 332  45             N 61.1  78.128     NA      NA
## 333  46             N 53.8  70.786 157.98      24
## 334  47             N 56.6  73.583 159.32      25
```

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## 335  48             N 56.8  73.764 159.41      24
## 336  49             N 61.3  78.301 161.58       1
## 337  50             N 59.7  76.737 160.83      21
## 338  51             N 55.0  71.972 158.55      24
## 339  52             N 58.7  75.738 160.35      17
## 340  53             N 55.8  72.784 158.94      14
## 341  54             Y 67.9  84.934 164.77       5
## 342  55             N 58.1  75.084 160.04       3
## 343  56             Y 50.1  67.128 156.22       5
## 344  57             N 54.8  71.844 158.49       1
## 345  58             Y 49.4  66.370 155.86      21
## 346  59             Y 60.5  77.532 161.22      23
## 347  60             Y 68.6  85.580 165.08      26
## 348  61             Y 65.9  82.901 163.79      13
## 349  62             Y 60.5  77.518 161.21      13
## 350  63             Y 56.9  73.862 159.45      18
## 351  64             N 61.6  78.619 161.74      25
## 352  65             N 57.3  74.316 159.67      NA
## 353  66             Y 32.5  49.477 147.75      10
## 354  67             N 62.5  79.480 162.15      29
## 355  68             N 53.3  70.342 157.76      20
## 356  69             Y 73.9  90.854 167.61      NA
## 357  70             Y 85.1 102.108 173.01      NA
## 358  71             Y 42.5  59.503 152.56       9
## 359  72             Y 65.4  82.373 163.54      22
## 360  73             N 59.6  76.550 160.74      28
## 361  74             Y 51.5  68.454 156.86      20
## 362  75             N 65.8  82.753 163.72       6
## 363  76             Y 66.9  83.853     NA      NA
## 364  77             N 56.8  73.835 159.44       4
## 365  78             N 54.3  71.310 158.23       3
## 366  79             N 44.4  61.427 153.49       9
## 367  80             N 50.2  67.190 156.25      25
## 368  81             Y 55.1  72.087 158.60      30
## 369  82             N 54.9  71.865 158.50      13
## 370   1             Y 69.9  86.924 165.72       6
## 371   2             N 54.7  71.675 158.40      29
## 372   3             Y 81.7  98.691 171.37      20
## 373   4             Y 52.6  69.625 157.42       9
## 374   5             N 77.7  94.694 169.45       4
## 375   6             N 60.0  77.024 160.97      18
## 376   7             Y 44.4  61.432 153.49       4
## 377   8             Y 65.2  82.212 163.46      NA
## 378   9             Y 58.4  75.352 160.17      11
## 379  10             Y 53.5  70.541 157.86      29
## 380  11             Y 68.7  85.658 165.12      27
## 381  12             Y 64.4  81.417 163.08      25
## 382  13             Y 70.7  87.728 166.11      10
## 383  14             N 45.2  62.232 153.87      26
## 384  15             N 51.0  67.979 156.63      24
## 385  16             N 45.3  62.343 153.92      18
## 386  17             Y 31.6  53.549 141.88       2
## 387  18             Y 62.2  79.154 161.99      13
## 388  19             N 73.5  90.506 167.44      NA
```

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## 389  20             N 66.4  83.392 164.03      23
## 390  21             N 41.4  58.375 152.02       7
## 391  22             Y 47.4  64.368 154.90       9
## 392  23             N 35.6  52.640 149.27      11
## 393  24             Y 73.4  90.394 167.39      19
## 394  25             Y 53.8  70.820 157.99      27
## 395  26             Y 45.9  62.908 154.20      22
## 396  27             Y 69.0  85.992 165.28      14
## 397  28             Y 54.8  71.830 158.48       1
## 398   1             N 39.0  56.027 150.89      17
## 399   2             N 57.7  74.701 159.86      13
## 400   3             N 58.3  75.333 160.16      18
## 401   4             N 60.0  77.046 160.98      29
## 402   5             Y 63.1  80.125 162.46       8
## 403   6             N 50.2  67.158 156.24      20
## 404   7             Y 66.0  82.961 163.82       2
## 405   8             Y 43.0  59.976 152.79       2
## 406   9             Y 74.8  91.832 168.08      11
## 407  10             N 50.5  67.515 156.41       9
## 408  11             N 63.5  80.528 162.65      17
## 409  12             Y 65.7  82.669 163.68      11
## 410  13             N 54.3  71.261 158.21      25
## 411  14             Y 38.0  54.993 150.40      19
## 412  15             N 53.8  70.757     NA      NA
## 413  16             N 50.7  67.734 156.51       9
## 414  17             N 53.1  70.120 157.66      11
## 415  18             Y 68.6  85.569 165.07      21
## 416  19             Y 66.6  83.559 164.11      28
## 417  20             N 61.0  77.971 161.43      23
## 418  21             N 49.1  66.117 155.74       7
## 419  22             Y 90.7 107.666     NA      NA
## 420  23             N 37.7  54.667 150.24      20
## 421  24             N 37.9  54.909 150.36      21
## 422  25             N 62.3  79.254 162.04      NA
## 423  26             N 92.1 109.099 176.37      21
## 424  27             Y 53.9  70.910 158.04      20
## 425  28             Y 42.3  59.289 152.46       1
## 426  29             N 52.6  69.608 157.41       2
## 427  30             N 89.9 106.861 175.29       8
## 428  31             N 48.4  65.357 155.37       9
## 429  32             Y 51.7  68.658 156.96      29
## 430  33             N 54.6  71.625 158.38      12
## 431  34             Y 67.4  84.351 164.49      11
## 432  35             Y 66.4  83.357 164.01      25
## 433   1             Y 52.3  69.309 157.27      25
## 434   2             Y 33.9  50.902 148.43      10
## 435   3             Y 81.5  98.525 171.29       4
## 436   4             N 42.4  59.379 152.50      19
## 437   5             Y 51.9  68.883 157.06      24
## 438   6             Y 60.7  77.692 161.29      10
## 439   7             Y 63.3  80.276 162.53      27
## 440   8             Y 42.7  59.736 152.67       6
## 441   9             Y 61.9  78.903 161.87      24
## 442  10             Y 69.1  86.081 165.32      23
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## 443  11             N 63.9  80.935 162.85      27
## 444  12             Y 68.9  85.873 165.22      10
## 445  13             Y 46.9  63.918 154.68      NA
## 446  14             N 56.4  73.392 159.23      27
## 447  15             Y 71.7  88.706 166.58      NA
## 448  16             Y 64.5  81.475 163.11      20
## 449  17             Y 63.0  79.975 162.39      22
## 450  18             Y 71.3  88.333 166.40      13
## 451  19             N 52.4  69.381 157.30      NA
## 452  20             Y 65.8  82.826 163.76      NA
## 453  21             Y 47.8  64.765 155.09      22
## 454  22             Y 54.7  71.706     NA      NA
## 455  23             N 59.9  76.932 160.93       5
## 456  24             Y 65.1  82.106 163.41      20
## 457  25             Y 41.7  66.478 144.04       8
## 458  26             Y 72.2  89.207 166.82      10
## 459  27             N 63.3  80.272 162.53       6
## 460  28             N 74.9  91.876 168.10       0
## 461  29             N 71.8  88.797 166.62      11
## 462  30             Y 66.1  83.088 163.88      17
## 463  31             Y 60.2  77.195 161.05      20
## 464  32             Y 66.2  83.169 163.92      22
## 465   1             Y 57.2  74.181 159.61      29
## 466   2             Y 66.1  83.069 163.87       5
## 467   3             Y 62.6  79.554 162.19      10
## 468   4             Y 68.5  85.543 165.06       4
## 469   5             N 49.5  66.544 155.94      19
## 470   6             N 53.1  70.107 157.65      10
## 471   7             N 63.1  80.062 162.43      19
## 472   8             N 44.2  61.164 153.36       9
## 473   9             N 53.2  70.209 157.70       2
## 474  10             Y 61.7  78.675 161.76      20
## 475  11             Y 80.4  97.413 170.76      23
## 476  12             Y 68.2  85.175 164.88      17
## 477  13             N 41.5  58.500 152.08      16
## 478  14             Y 34.8  51.807 148.87      25
## 479  15             N 45.3  62.268 153.89      20
## 480  16             N 44.9  61.936 153.73      29
## 481  17             N 49.9  66.859 156.09      19
## 482  18             N 62.8  79.784 162.30      15
## 483  19             Y 70.9  87.899 166.19      29
## 484  20             N 59.6  76.638 160.79      15
## 485  21             Y 62.7  79.715 162.26      20
## 486  22             Y 34.4  51.404 148.67      18
## 487  23             Y 64.5  81.503 163.12      28
## 488  24             Y 68.7  85.739 165.15      11
## 489  25             N 48.0  64.969 155.19      26
## 490  26             Y 51.9  68.850 157.05      NA
## 491  27             N 55.4  72.363 158.73      15
## 492  28             Y 52.2  69.204 157.22      NA
## 493  29             N 61.7  78.743 161.80      19
## 494  30             Y 50.4  67.432 156.37      18
## 495  31             N 52.5  69.512 157.37      24
## 496  32             N 49.0  65.991 155.68      17
```

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## 497  33             Y 67.8  84.760 164.68      23
## 498  34             N 42.7  59.721 152.67      12
## 499  35             Y 69.1  86.140 165.35      15
## 500  36             Y 61.2  78.174 161.52      16
## 501  37             Y 57.2  74.177 159.61      30
## 502  38             Y 60.5  77.518 161.21      13
## 503  39             N 89.0 105.971 174.87      30
## 504  40             Y 63.9  80.897 162.83      24
## 505  41             N 74.6  91.577 167.96      15
## 506  42             N 66.4  83.357 164.01      15
## 507  43             Y 56.3  73.283 159.18      27
## 508  44             Y 40.4  57.360 151.53       8
## 509  45             Y 73.0  90.005 167.20       5
## 510  46             Y 61.7  78.739 161.79      12
## 511  47             Y 63.7  80.703 162.74      16
## 512  48             Y 63.5  80.476 162.63      NA
## 513  49             N 55.3  72.312 158.71      11
## 514  50             N 54.1  71.098 158.13      17
## 515  51             N 49.3  66.342 155.84       6
## 516  52             N 28.0  45.047 145.62      24
## 517  53             N 38.2  55.197 150.49      19
## 518  54             N 80.0  96.984 170.55      22
## 519  55             Y 28.5  45.464 145.82      13
## 520  56             Y 62.9  79.915 162.36      17
## 521  57             N 65.1  82.074 163.40       8
## 522  58             Y 45.0  61.950 153.74      NA
## 523  59             N 70.8  87.789 166.14       5
## 524  60             Y 51.6  68.592 156.92      18
## 525  61             N 58.6  75.597 160.29      NA
## 526  62             Y 75.4  92.411 168.36      14
## 527  63             Y 52.6  69.594 157.41      23
## 528  64             N 56.3  73.310 159.19       1
##     number_of_prior_treatments_for_cirrhosis             comorbidities
## 1                                         1                      <NA>
## 2                                         0                      <NA>
## 3                                         2                      <NA>
## 4                                         2                      <NA>
## 5                                         0                      <NA>
## 6                                         2                      <NA>
## 7                                         1                      <NA>
## 8                                         0                      <NA>
## 9                                         3                      <NA>
## 10                                        0                      <NA>
## 11                                        3                      <NA>
## 12                                        2                      <NA>
## 13                                        0              Hypertension
## 14                                        0                  Diabetes
## 15                                        1 Diabetes and hypertension
## 16                                        2 Diabetes and hypertension
## 17                                        2 Diabetes and hypertension
## 18                                        1              Hypertension
## 19                                        1 Diabetes and hypertension
## 20                                        0 Diabetes and hypertension
## 21                                        2 Diabetes and hypertension
```

```
## 22  1 Diabetes and hypertension
## 23  1 Diabetes and hypertension
## 24  2              Hypertension
## 25  0 Diabetes and hypertension
## 26  1              Hypertension
## 27  0 Diabetes and hypertension
## 28  1                  Diabetes
## 29  0              Hypertension
## 30  2              Hypertension
## 31  0              Hypertension
## 32  1                  Diabetes
## 33  0 Diabetes and hypertension
## 34  0              Hypertension
## 35  0              Hypertension
## 36  0                  Diabetes
## 37  2 Diabetes and hypertension
## 38  3              Hypertension
## 39  2 Diabetes and hypertension
## 40  2 Diabetes and hypertension
## 41  2 Diabetes and hypertension
## 42  2 Diabetes and hypertension
## 43  2 Diabetes and hypertension
## 44  0                  Diabetes
## 45  3              Hypertension
## 46  3              Hypertension
## 47  2              Hypertension
## 48  2 Diabetes and hypertension
## 49  0              Hypertension
## 50  0              Hypertension
## 51  0                  Diabetes
## 52  3              Hypertension
## 53  2                  Diabetes
## 54  3              Hypertension
## 55  2 Diabetes and hypertension
## 56  1 Diabetes and hypertension
## 57  2              Hypertension
## 58  0                  Diabetes
## 59  3              Hypertension
## 60  2 Diabetes and hypertension
## 61  3              Hypertension
## 62  3              Hypertension
## 63  0              Hypertension
## 64  3              Hypertension
## 65  2              Hypertension
## 66  1 Diabetes and hypertension
## 67  0              Hypertension
## 68  2 Diabetes and hypertension
## 69  1 Diabetes and hypertension
## 70  1              Hypertension
## 71  0 Diabetes and hypertension
## 72  0 Diabetes and hypertension
## 73  1              Hypertension
## 74  2 Diabetes and hypertension
## 75  0 Diabetes and hypertension
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## 76	0	Hypertension
## 77	1	Diabetes and hypertension
## 78	0	Hypertension
## 79	0	Diabetes and hypertension
## 80	2	Diabetes and hypertension
## 81	2	Hypertension
## 82	3	Diabetes and hypertension
## 83	0	Hypertension
## 84	2	Diabetes and hypertension
## 85	3	Hypertension
## 86	1	Hypertension
## 87	1	Hypertension
## 88	3	Hypertension
## 89	2	Diabetes and hypertension
## 90	0	Hypertension
## 91	0	Hypertension
## 92	2	Hypertension
## 93	0	Hypertension
## 94	3	Hypertension
## 95	0	Diabetes
## 96	2	Hypertension
## 97	0	Diabetes and hypertension
## 98	2	Diabetes and hypertension
## 99	1	Hypertension
## 100	3	Diabetes and hypertension
## 101	1	Hypertension
## 102	2	Hypertension
## 103	1	Diabetes and hypertension
## 104	1	Diabetes and hypertension
## 105	2	Hypertension
## 106	0	Diabetes and hypertension
## 107	0	Diabetes
## 108	1	Diabetes and hypertension
## 109	3	Hypertension
## 110	1	Hypertension
## 111	0	Hypertension
## 112	2	Diabetes and hypertension
## 113	1	Diabetes and hypertension
## 114	0	Hypertension
## 115	2	Hypertension
## 116	2	Diabetes and hypertension
## 117	0	Diabetes
## 118	1	Diabetes and hypertension
## 119	2	Diabetes and hypertension
## 120	0	Diabetes and hypertension
## 121	1	Diabetes and hypertension
## 122	0	Diabetes
## 123	1	Diabetes and hypertension
## 124	0	Hypertension
## 125	2	Hypertension
## 126	0	Diabetes and hypertension
## 127	0	Diabetes
## 128	1	Diabetes and hypertension
## 129	1	Diabetes and hypertension

```
## 130   0              Hypertension
## 131   1 Diabetes and hypertension
## 132   0                  Diabetes
## 133   1 Diabetes and hypertension
## 134   3              Hypertension
## 135   3              Hypertension
## 136   3              Hypertension
## 137   0              Hypertension
## 138   3              Hypertension
## 139   0              Hypertension
## 140   1              Hypertension
## 141   3              Hypertension
## 142   1              Hypertension
## 143   0 Diabetes and hypertension
## 144   0              Hypertension
## 145   2              Hypertension
## 146   2              Hypertension
## 147   1              Hypertension
## 148   0              Hypertension
## 149   1              Hypertension
## 150   2 Diabetes and hypertension
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## 152   1 Diabetes and hypertension
## 153   0              Hypertension
## 154   0                  Diabetes
## 155   2 Diabetes and hypertension
## 156   2 Diabetes and hypertension
## 157   2              Hypertension
## 158   2 Diabetes and hypertension
## 159   2 Diabetes and hypertension
## 160   0              Hypertension
## 161   1 Diabetes and hypertension
## 162   3              Hypertension
## 163   0              Hypertension
## 164   0              Hypertension
## 165   0              Hypertension
## 166   2              Hypertension
## 167   1 Diabetes and hypertension
## 168   1              Hypertension
## 169   2              Hypertension
## 170   1 Diabetes and hypertension
## 171   1 Diabetes and hypertension
## 172   2              Hypertension
## 173   2                  Diabetes
## 174   3              Hypertension
## 175   0                  Diabetes
## 176   2              Hypertension
## 177   2 Diabetes and hypertension
## 178   2 Diabetes and hypertension
## 179   2 Diabetes and hypertension
## 180   2 Diabetes and hypertension
## 181   2 Diabetes and hypertension
## 182   0 Diabetes and hypertension
## 183   2              Hypertension
```

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## 186   0              Hypertension
## 187   0              Hypertension
## 188   2 Diabetes and hypertension
## 189   3 Diabetes and hypertension
## 190   2              Hypertension
## 191   0              Hypertension
## 192   2 Diabetes and hypertension
## 193   3              Hypertension
## 194   2 Diabetes and hypertension
## 195   0              Hypertension
## 196   0 Diabetes and hypertension
## 197   0              Hypertension
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## 199   0              Hypertension
## 200   2 Diabetes and hypertension
## 201   2              Hypertension
## 202   0 Diabetes and hypertension
## 203   1 Diabetes and hypertension
## 204   3              Hypertension
## 205   3                  Diabetes
## 206   2 Diabetes and hypertension
## 207   2              Hypertension
## 208   2 Diabetes and hypertension
## 209   2 Diabetes and hypertension
## 210   0              Hypertension
## 211   3              Hypertension
## 212   1 Diabetes and hypertension
## 213   2 Diabetes and hypertension
## 214   1 Diabetes and hypertension
## 215   0              Hypertension
## 216   3              Hypertension
## 217   0 Diabetes and hypertension
## 218   0                  Diabetes
## 219   1              Hypertension
## 220   3              Hypertension
## 221   0              Hypertension
## 222   3              Hypertension
## 223   0              Hypertension
## 224   0              Hypertension
## 225   3              Hypertension
## 226   2              Hypertension
## 227   2              Hypertension
## 228   3              Hypertension
## 229   1 Diabetes and hypertension
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## 231   1              Hypertension
## 232   0              Hypertension
## 233   1              Hypertension
## 234   0                  Diabetes
## 235   1 Diabetes and hypertension
## 236   3              Hypertension
## 237   0 Diabetes and hypertension
```

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## 238  2 Diabetes and hypertension
## 239  0              Hypertension
## 240  2 Diabetes and hypertension
## 241  0              Hypertension
## 242  2              Hypertension
## 243  3              Hypertension
## 244  0                  Diabetes
## 245  0              Hypertension
## 246  1 Diabetes and hypertension
## 247  0              Hypertension
## 248  2 Diabetes and hypertension
## 249  1 Diabetes and hypertension
## 250  0 Diabetes and hypertension
## 251  2 Diabetes and hypertension
## 252  3              Hypertension
## 253  2 Diabetes and hypertension
## 254  0                  Diabetes
## 255  1 Diabetes and hypertension
## 256  2 Diabetes and hypertension
## 257  2              Hypertension
## 258  1              Hypertension
## 259  1 Diabetes and hypertension
## 260  2 Diabetes and hypertension
## 261  2 Diabetes and hypertension
## 262  0              Hypertension
## 263  1 Diabetes and hypertension
## 264  1 Diabetes and hypertension
## 265  1 Diabetes and hypertension
## 266  1              Hypertension
## 267  1 Diabetes and hypertension
## 268  0                  Diabetes
## 269  2 Diabetes and hypertension
## 270  2 Diabetes and hypertension
## 271  3              Hypertension
## 272  1 Diabetes and hypertension
## 273  1 Diabetes and hypertension
## 274  2 Diabetes and hypertension
## 275  1              Hypertension
## 276  1 Diabetes and hypertension
## 277  0              Hypertension
## 278  3              Hypertension
## 279  0                  Diabetes
## 280  3              Hypertension
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## 282  0 Diabetes and hypertension
## 283  2              Hypertension
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## 287  2 Diabetes and hypertension
## 288  2 Diabetes and hypertension
## 289  1              Hypertension
## 290  2 Diabetes and hypertension
## 291  0 Diabetes and hypertension
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## 292   1 Diabetes and hypertension
## 293   2              Hypertension
## 294   3              Hypertension
## 295   0              Hypertension
## 296   3              Hypertension
## 297   1 Diabetes and hypertension
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## 299   1              Hypertension
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## 303   3              Hypertension
## 304   3              Hypertension
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## 309   3              Hypertension
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## 322   2              Hypertension
## 323   1              Hypertension
## 324   3              Hypertension
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## 333   2              Hypertension
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## 335   2              Hypertension
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## 338   0                  Diabetes
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## 340   2 Diabetes and hypertension
## 341   2              Hypertension
## 342   0 Diabetes and hypertension
## 343   2              Hypertension
## 344   2 Diabetes and hypertension
## 345   1              Hypertension
```

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## 346  3 Diabetes and hypertension
## 347  0 Diabetes and hypertension
## 348  0              Hypertension
## 349  1                  Diabetes
## 350  0              Hypertension
## 351  2 Diabetes and hypertension
## 352  3              Hypertension
## 353  2              Hypertension
## 354  2 Diabetes and hypertension
## 355  2              Hypertension
## 356  1              Hypertension
## 357  2              Hypertension
## 358  0              Hypertension
## 359  0              Hypertension
## 360  1 Diabetes and hypertension
## 361  0 Diabetes and hypertension
## 362  3              Hypertension
## 363  3              Hypertension
## 364  1 Diabetes and hypertension
## 365  3              Hypertension
## 366  2 Diabetes and hypertension
## 367  1 Diabetes and hypertension
## 368  0              Hypertension
## 369  2              Hypertension
## 370  0 Diabetes and hypertension
## 371  3              Hypertension
## 372  2              Hypertension
## 373  0              Hypertension
## 374  3              Hypertension
## 375  1 Diabetes and hypertension
## 376  0              Hypertension
## 377  0                  Diabetes
## 378  0              Hypertension
## 379  0              Hypertension
## 380  0              Hypertension
## 381  1              Hypertension
## 382  0              Hypertension
## 383  0 Diabetes and hypertension
## 384  2 Diabetes and hypertension
## 385  3              Hypertension
## 386  1              Hypertension
## 387  1 Diabetes and hypertension
## 388  1 Diabetes and hypertension
## 389  1 Diabetes and hypertension
## 390  0                  Diabetes
## 391  1              Hypertension
## 392  0 Diabetes and hypertension
## 393  1              Hypertension
## 394  0              Hypertension
## 395  0 Diabetes and hypertension
## 396  0              Hypertension
## 397  0              Hypertension
## 398  1 Diabetes and hypertension
## 399  0                  Diabetes
```

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## 402   0              Hypertension
## 403   3              Hypertension
## 404   0 Diabetes and hypertension
## 405   1                  Diabetes
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## 407   3              Hypertension
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## 409   2 Diabetes and hypertension
## 410   0 Diabetes and hypertension
## 411   2 Diabetes and hypertension
## 412   3              Hypertension
## 413   1 Diabetes and hypertension
## 414   3              Hypertension
## 415   2 Diabetes and hypertension
## 416   1              Hypertension
## 417   1 Diabetes and hypertension
## 418   2 Diabetes and hypertension
## 419   0              Hypertension
## 420   0 Diabetes and hypertension
## 421   0                  Diabetes
## 422   0                  Diabetes
## 423   2              Hypertension
## 424   1              Hypertension
## 425   1              Hypertension
## 426   0                  Diabetes
## 427   1 Diabetes and hypertension
## 428   0 Diabetes and hypertension
## 429   2 Diabetes and hypertension
## 430   0                  Diabetes
## 431   1 Diabetes and hypertension
## 432   2 Diabetes and hypertension
## 433   0              Hypertension
## 434   0              Hypertension
## 435   0              Hypertension
## 436   2 Diabetes and hypertension
## 437   2              Hypertension
## 438   1 Diabetes and hypertension
## 439   2              Hypertension
## 440   0 Diabetes and hypertension
## 441   1              Hypertension
## 442   0 Diabetes and hypertension
## 443   2              Hypertension
## 444   1                  Diabetes
## 445   0              Hypertension
## 446   0                  Diabetes
## 447   0              Hypertension
## 448   1 Diabetes and hypertension
## 449   0              Hypertension
## 450   1              Hypertension
## 451   2 Diabetes and hypertension
## 452   0              Hypertension
## 453   1 Diabetes and hypertension
```

```
## 454  2              Hypertension
## 455  0 Diabetes and hypertension
## 456  0 Diabetes and hypertension
## 457  2              Hypertension
## 458  1              Hypertension
## 459  2 Diabetes and hypertension
## 460  2              Hypertension
## 461  0                  Diabetes
## 462  2              Hypertension
## 463  1              Hypertension
## 464  3                  Diabetes
## 465  1              Hypertension
## 466  2              Hypertension
## 467  1 Diabetes and hypertension
## 468  0              Hypertension
## 469  1 Diabetes and hypertension
## 470  0 Diabetes and hypertension
## 471  0 Diabetes and hypertension
## 472  2              Hypertension
## 473  2 Diabetes and hypertension
## 474  3 Diabetes and hypertension
## 475  3 Diabetes and hypertension
## 476  0              Hypertension
## 477  2 Diabetes and hypertension
## 478  0              Hypertension
## 479  2              Hypertension
## 480  3              Hypertension
## 481  0                  Diabetes
## 482  2              Hypertension
## 483  1              Hypertension
## 484  1 Diabetes and hypertension
## 485  0              Hypertension
## 486  1 Diabetes and hypertension
## 487  1              Hypertension
## 488  1              Hypertension
## 489  3              Hypertension
## 490  1              Hypertension
## 491  2 Diabetes and hypertension
## 492  2              Hypertension
## 493  2 Diabetes and hypertension
## 494  0              Hypertension
## 495  3              Hypertension
## 496  0                  Diabetes
## 497  1 Diabetes and hypertension
## 498  2 Diabetes and hypertension
## 499  2 Diabetes and hypertension
## 500  1              Hypertension
## 501  0 Diabetes and hypertension
## 502  1              Hypertension
## 503  1 Diabetes and hypertension
## 504  2 Diabetes and hypertension
## 505  0                  Diabetes
## 506  3              Hypertension
## 507  3              Hypertension
```

```
## 508                                    1              Hypertension
## 509                                    0 Diabetes and hypertension
## 510                                    3 Diabetes and hypertension
## 511                                    1              Hypertension
## 512                                    0              Hypertension
## 513                                    1 Diabetes and hypertension
## 514                                    2 Diabetes and hypertension
## 515                                    3              Hypertension
## 516                                    2 Diabetes and hypertension
## 517                                    0 Diabetes and hypertension
## 518                                    3              Hypertension
## 519                                    1                  Diabetes
## 520                                    3 Diabetes and hypertension
## 521                                    1 Diabetes and hypertension
## 522                                    3 Diabetes and hypertension
## 523                                    2              Hypertension
## 524                                    0 Diabetes and hypertension
## 525                                    1 Diabetes and hypertension
## 526                                    1 Diabetes and hypertension
## 527                                    0 Diabetes and hypertension
## 528                                    2 Diabetes and hypertension
```

#Created a new variable, BMI which is weight in kg/ (height in m)^2

```
data_csv = data_csv %>%
  mutate(
    age_cat = case_when(
      age <= 50 ~ '<50',
      age <= 65 ~ '51-65',
      age > 65  ~ '65+'
    ),
    bmi = weight/(height/100)^2
    )
```

#Checking for missing values

```
sapply(data_csv, function(x) sum(is.na(x))) %>%
  knitr::kable()
```

	x
x1	0
hcc_at_5_years	0
age	0
weight	0
height	8
alcohol	37
number_of_prior_treatments_for_cirrhosis	0
comorbidities	12
age_cat	0
bmi	8

#Imputing the missing values for alcohol, height, bmi with the mean

```
data_csv$alcohol[is.na(data_csv$alcohol)] <- mean(data_csv$alcohol, na.rm = TRUE)
data_csv$height[is.na(data_csv$height)] <- mean(data_csv$height, na.rm = TRUE)
data_csv$bmi[is.na(data_csv$bmi)] <- mean(data_csv$bmi, na.rm = TRUE)
```

#Exploring the minimimum and maximum value for each variable

```
data_csv %>%
  summarise(
    Min_Age = min(age),
    Min_Weight = min(weight),
    Min_Alcohol_intake = min(alcohol),
    Min_Height = min(height),
    Min_BMI = min(bmi)
  ) %>%
knitr::kable()
```

Min_Age	Min_Weight	Min_Alcohol_intake	Min_Height	Min_BMI
26	43.033	0	141.88	15.85059

```
data_csv %>%
  summarise(
    Max_Age = max(age),
    Max_Weight = max(weight),
    Max_Alcohol_intake = max(alcohol),
    Max_Height = max(height),
    Max_BMI = max(bmi)
  ) %>%
knitr::kable()
```

Max_Age	Max_Weight	Max_Alcohol_intake	Max_Height	Max_BMI
99.3	116.302	30	184.73	38.5878

#Checking the mean values for each variable

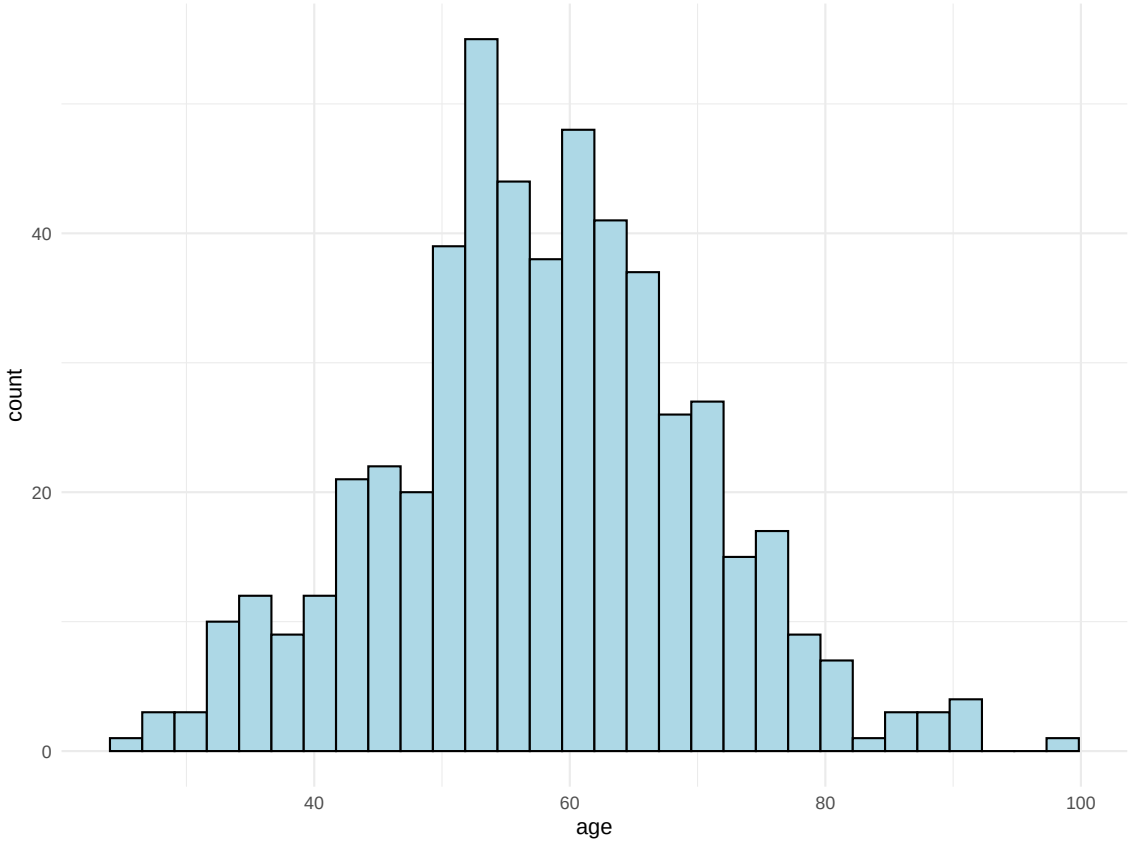
```
data_csv %>%
  summarise(
    Avg_Age = mean(age),
    Avg_Weight = mean(weight),
    Avg_Alcohol_intake = mean(alcohol),
    Avg_Height = mean(height),
    Avg_BMI = mean(bmi)
  ) %>%
knitr::kable()
```

Avg_Age	Avg_Weight	Avg_Alcohol_intake	Avg_Height	Avg_BMI
57.85568	74.93459	15.29939	162.7656	28.16391

#Chceking the age distribution:

```
data_csv %>%
  ggplot(aes(x = age)) + geom_histogram(color = "black", fill = "lightblue")
```

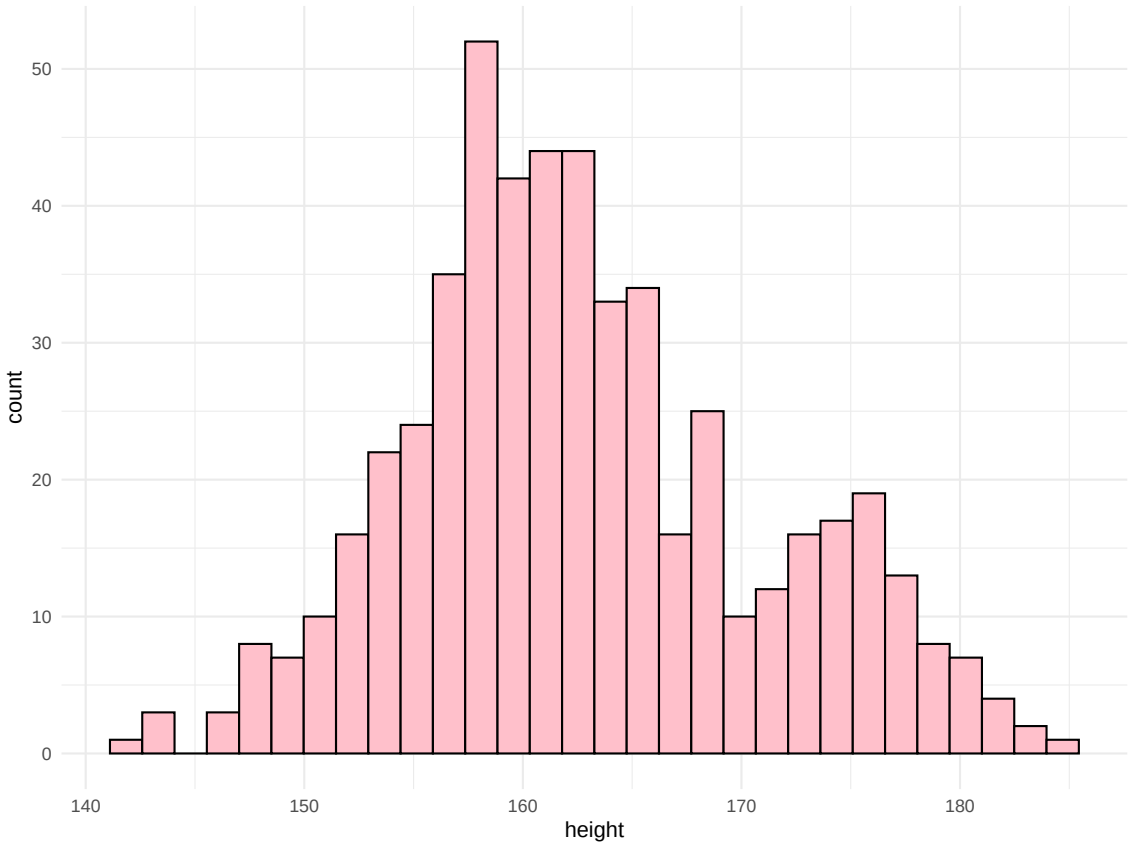
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



#Chceking the height distribution:

```
data_csv %>%
  ggplot(aes(x = height)) + geom_histogram(color = "black", fill = "pink")
```

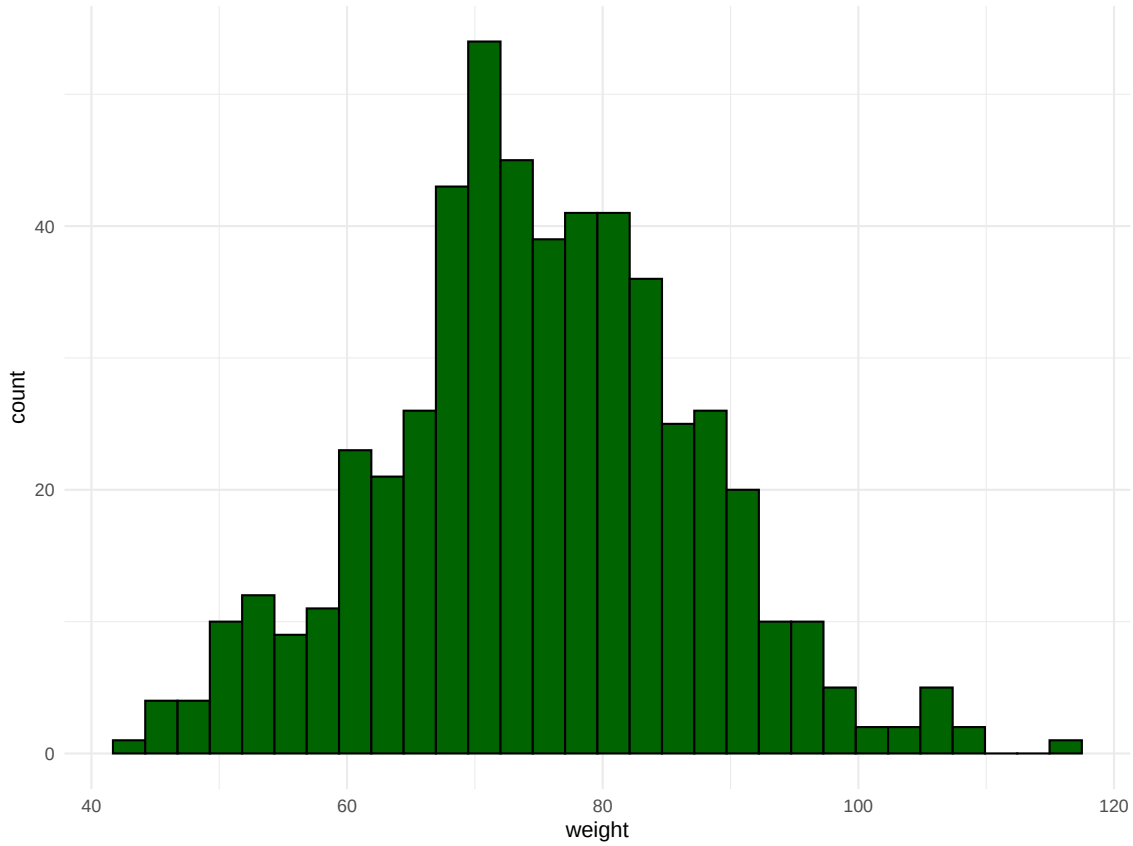
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



#Chceking the weight distribution:

```
data_csv %>%
  ggplot(aes(x = weight)) + geom_histogram(color = "black", fill = "dark green")
```

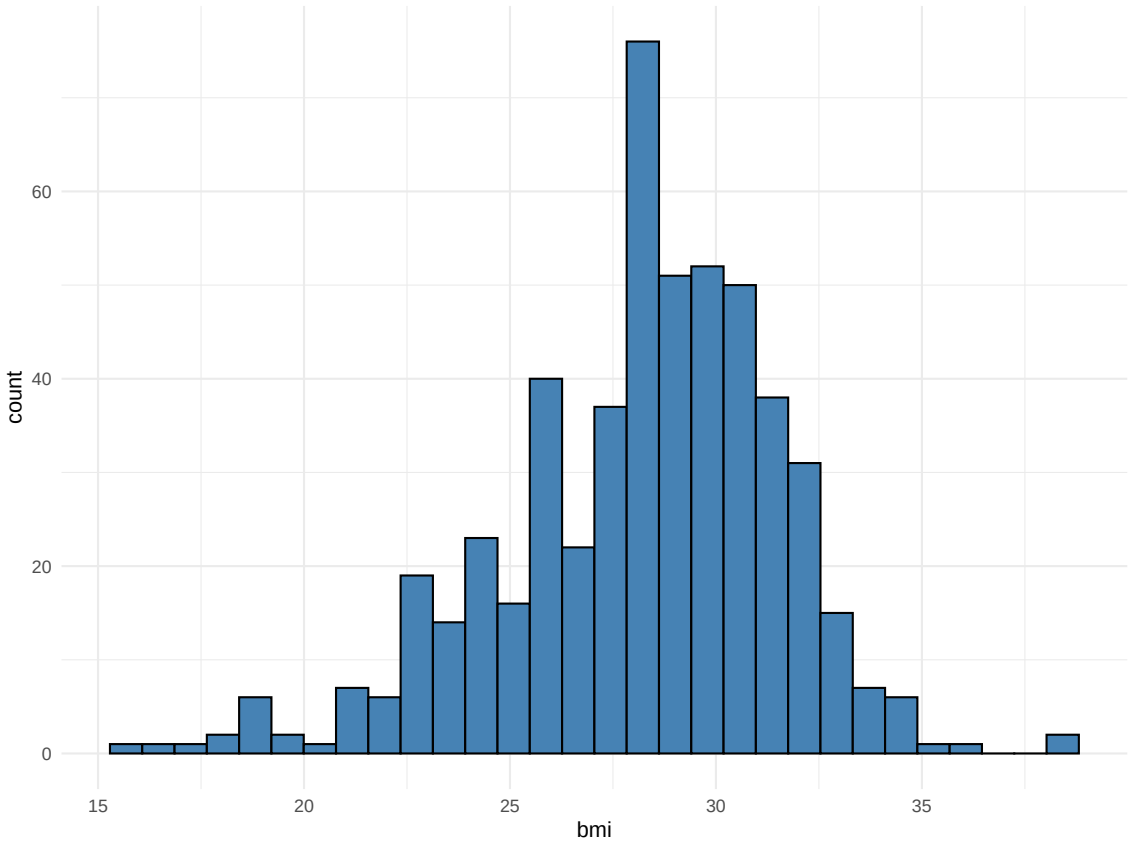
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



#Checking the BMI distribution

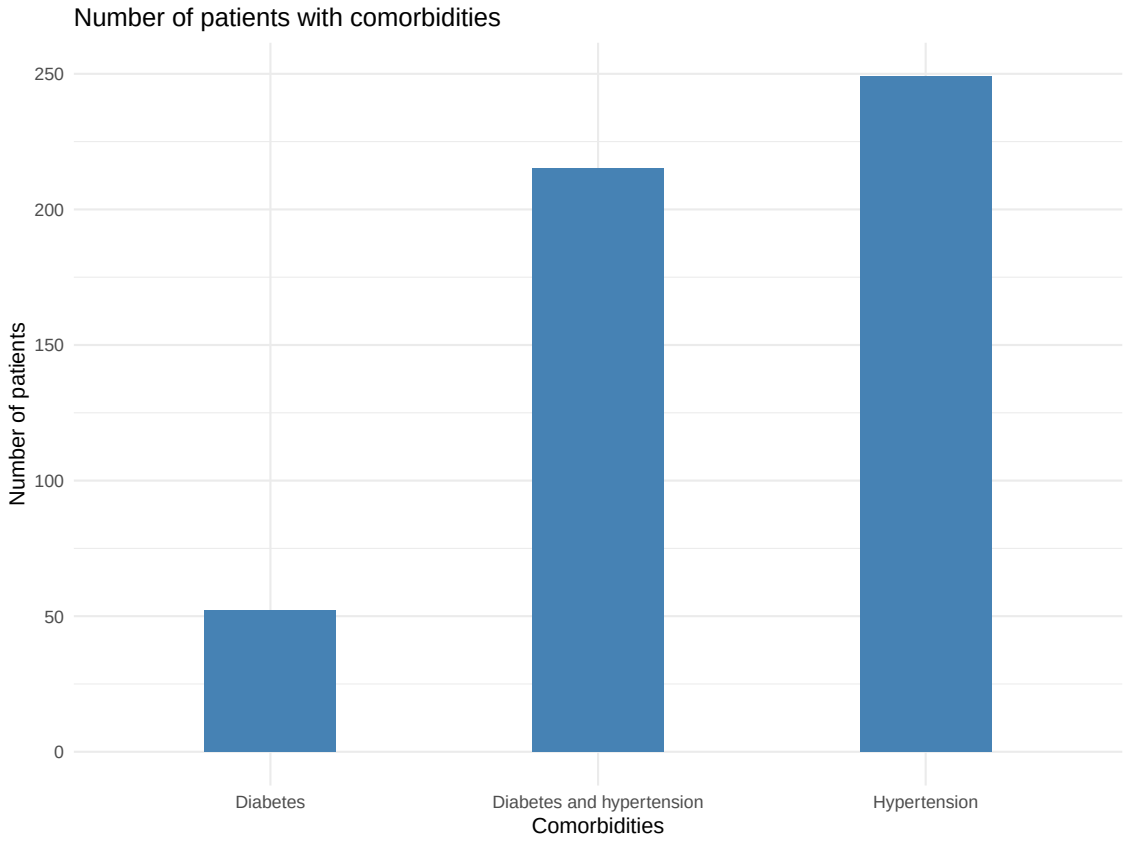
```
data_csv %>%
  ggplot(aes(x = bmi)) + geom_histogram(color = "black", fill = "steel blue")
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



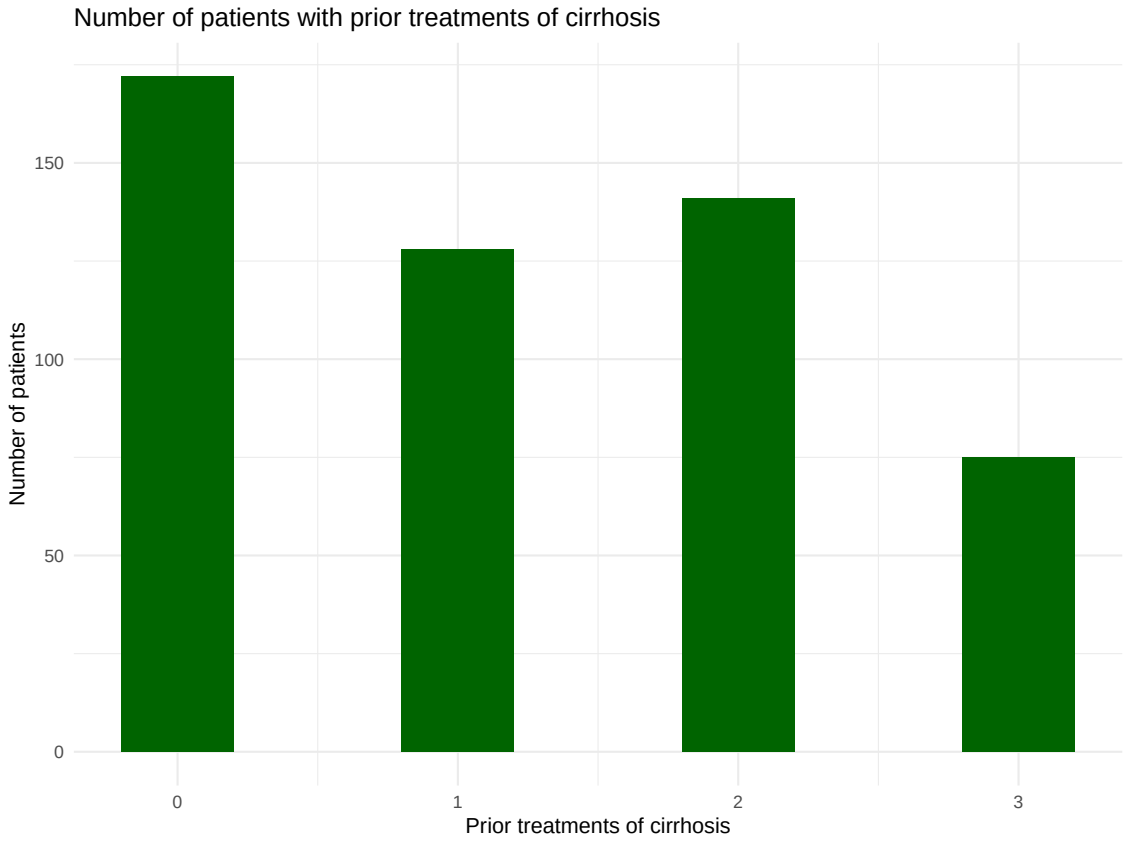
#Studying the comorbidities i.e., Diabetes, Hypertension, Diabetes&Hypertenion

```
data_csv %>%
  drop_na() %>%
  ggplot(
    aes(
      comorbidities
    )
  ) + geom_bar(width = 0.4, fill = "steelblue", position = "dodge") + labs(x = "Comorbidities", y = "Nu
```



#Number of prior treatment for cirrhosis

```
data_csv %>%
  drop_na() %>%
  ggplot(
    aes(
      number_of_prior_treatments_for_cirrhosis
    )
  ) + geom_bar(width = 0.4, fill = "darkgreen", position = "dodge") + labs(x = "Prior treatments of cir
```



Associations:

#HCC and age

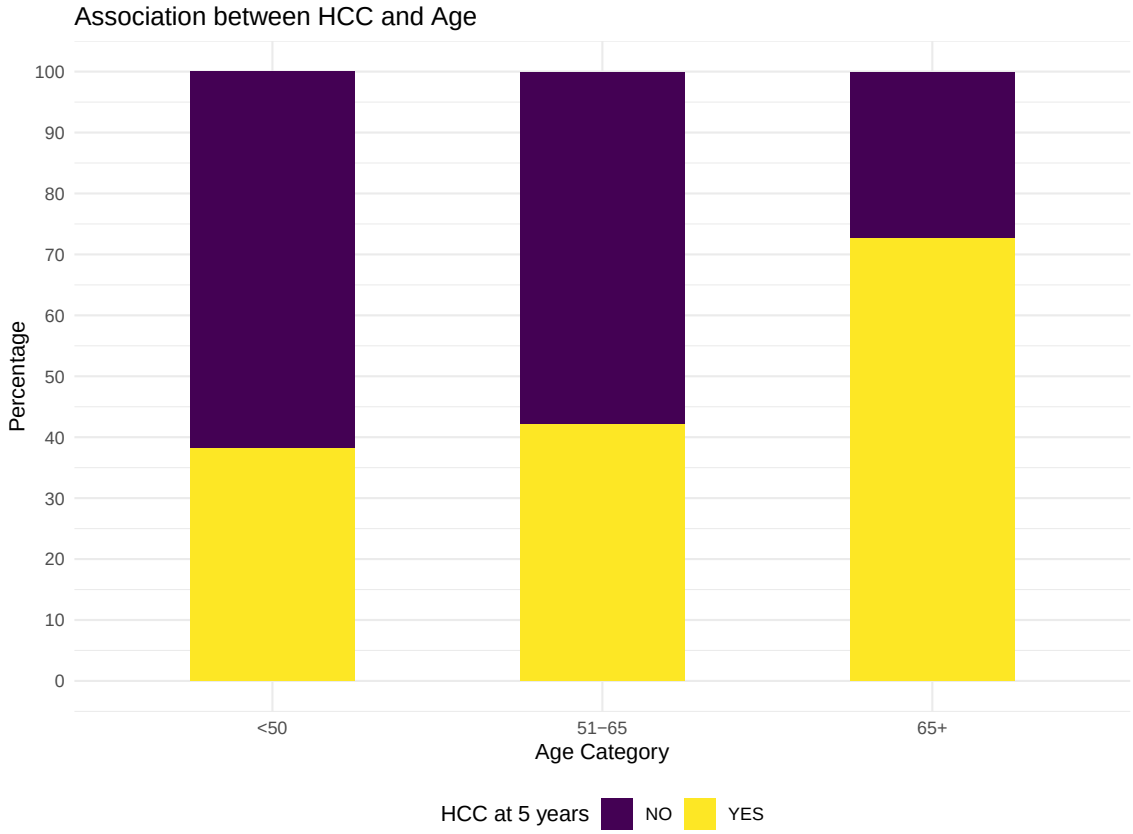
```
age_dis = data_csv %>%
  select(
    age_cat, hcc_at_5_years
  ) %>%
  group_by(
    age_cat, hcc_at_5_years
  ) %>%
    dplyr::summarize(
      n = n()
      ) %>%
dplyr::mutate(freq = n / sum(n)*100)
```

```
age_dis
```

```
## # A tibble: 6 x 4
## # Groups:   age_cat [3]
##   age_cat hcc_at_5_years     n  freq
##   <chr>   <chr>          <int> <dbl>
## 1 <50     N                 76  61.8
## 2 <50     Y                 47  38.2
```

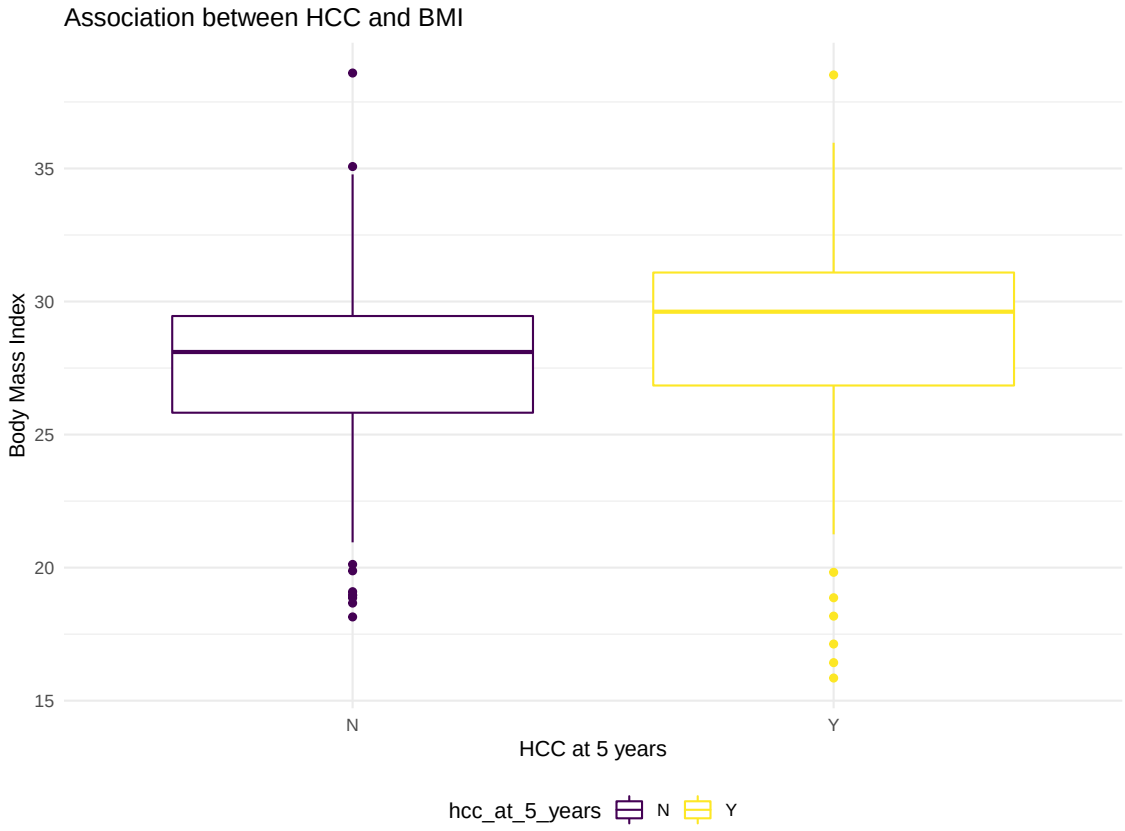
```
## 3 51-65   N               149  57.8
## 4 51-65   Y               109  42.2
## 5 65+     N                40  27.2
## 6 65+     Y               107  72.8
```

```
age_dis %>%
  ggplot(aes(x = age_cat, y = freq, fill = hcc_at_5_years)) + geom_bar(stat = "identity", width = 0.5) +
  scale_y_continuous(name = "Percentage",
                           breaks = seq(0, 100, 10),
                           limits = c(0, 100)) + labs(x = "Age Category", y = "Percentage" , title = "As
```



#HCC and BMI

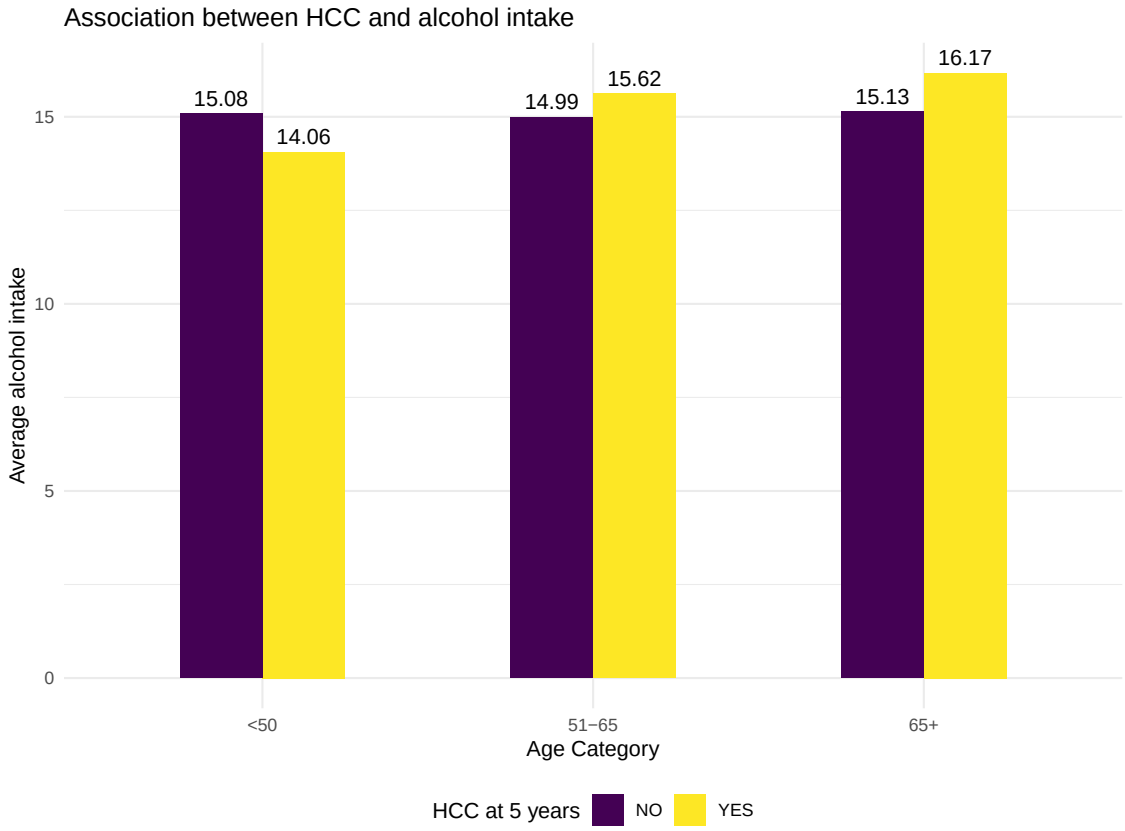
```
data_csv %>%
  mutate(
    hcc_at_5_years = factor(hcc_at_5_years)
  ) %>%
  ggplot(
    aes(
      x = hcc_at_5_years, y = bmi, color = hcc_at_5_years
    )
  ) + geom_boxplot()  + labs(x = "HCC at 5 years", y = "Body Mass Index" , title = "Association between
```



#HCC and alcohol

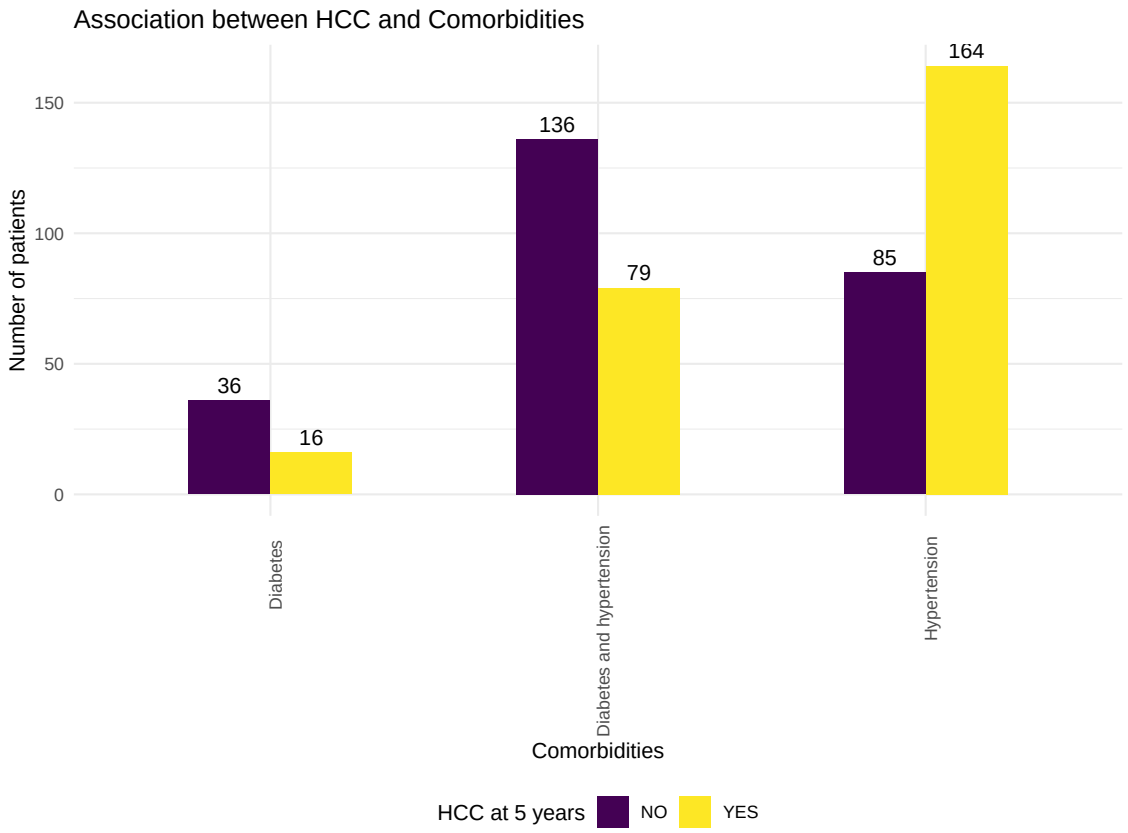
```
hcc_alc = data_csv %>%
  select(
    hcc_at_5_years, alcohol, age_cat
  ) %>%
  drop_na() %>%
  group_by(
    hcc_at_5_years, age_cat
  ) %>%
  dplyr::summarise(
    alc = mean(alcohol)
  ) %>%
  dplyr::mutate(
    alc = round(alc, digits = 2)
  )
```

```
ggplot(hcc_alc, aes(x = factor(age_cat), y = alc)) +
  geom_bar(aes(fill = hcc_at_5_years), position = "dodge", stat = "identity", width = .5) +
      geom_text(aes(label = alc, group = hcc_at_5_years), position = position_dodge(width = 0.5), vjust
```



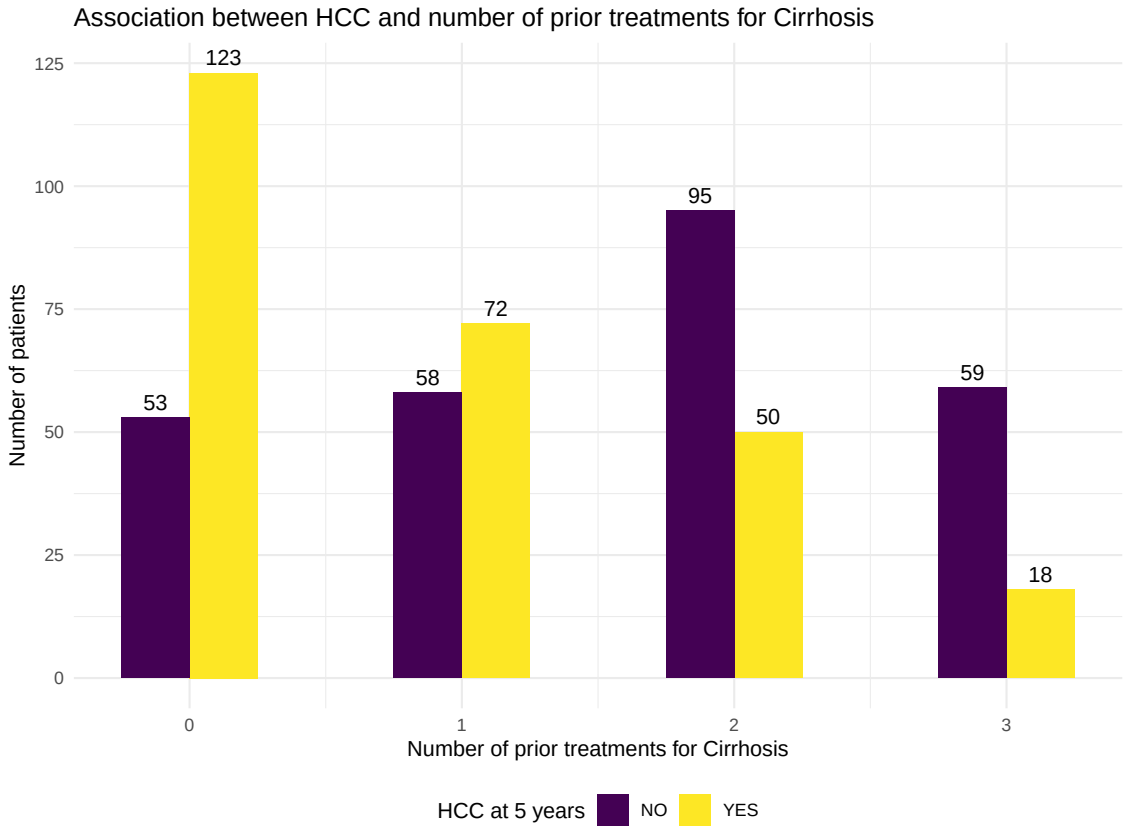
#Below 50, alcohol consumption doesn't effect the likelihood of developning HCC. As the age increases,higher alcohol consumption leads to an increased chances of developing HCC #Hcc and comorbidities

```
data_csv %>%
  select(
    hcc_at_5_years, comorbidities
  ) %>%
  drop_na() %>%
  group_by(
    hcc_at_5_years, comorbidities
  ) %>%
  dplyr::summarise(
    c = n()
  ) %>%
  ggplot(aes(x = comorbidities, y = c)) +
  geom_bar(aes(fill = hcc_at_5_years), position = "dodge", stat = "identity", width = .5) +
      geom_text(aes(label = c, group = hcc_at_5_years), position = position_dodge(width = 0.5), vjust =
```



#HCC and number of prior treatments for cirrhosis

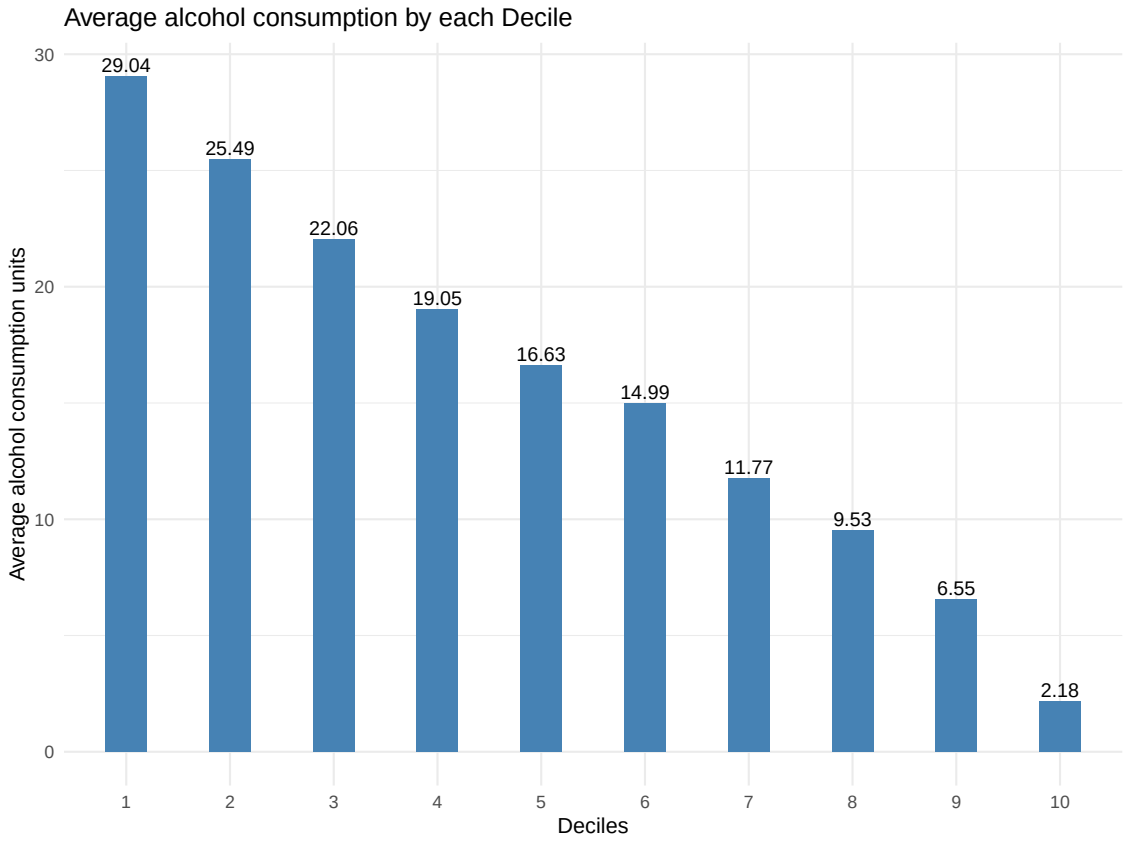
```
data_csv %>%
  select(
    hcc_at_5_years, number_of_prior_treatments_for_cirrhosis
  ) %>%
  drop_na() %>%
  group_by(
    hcc_at_5_years, number_of_prior_treatments_for_cirrhosis
  ) %>%
  dplyr::summarise(
    c = n()
  ) %>%
  ggplot(aes(x = number_of_prior_treatments_for_cirrhosis, y = c)) +
  geom_bar(aes(fill = hcc_at_5_years), position = "dodge", stat = "identity", width = .5) +
      geom_text(aes(label = c, group = hcc_at_5_years), position = position_dodge(width = 0.5), vjust =
      labs(x = "Number of prior treatments for Cirrhosis", y = "Number of patients", title = "Associati
```




```
data_csv$alcohol_dec <- decile(vector = data_csv$alcohol, decreasing = TRUE)
```

```
alc_dec = data_csv %>%
  select(
    alcohol,alcohol_dec
  ) %>%
  drop_na() %>%
  group_by(
    alcohol_dec
  ) %>%
  dplyr::summarise(
    alc = mean(alcohol)
  ) %>%
  dplyr::mutate(
    alc = round(alc, digits = 2)
  )
```

```
alc_dec %>%
  drop_na() %>%
  ggplot(
    aes(x = factor(alcohol_dec), y = alc)
  ) + geom_bar(width = 0.4, fill = "steelblue", position = "dodge", stat = "identity") +
  geom_text(aes(label = alc), vjust = -0.3, size = 3.5) + labs(x = "Deciles", y = "Average alcohol consu
```




```
hc = data_csv %>%
  select(
    alcohol_dec,hcc_at_5_years
  ) %>%
  drop_na() %>%
  group_by(
    alcohol_dec,hcc_at_5_years
  ) %>%
  dplyr::summarise(
    rc = n()
  ) %>%
  dplyr::mutate(freq = rc / sum(rc)*100)
```

```
hc
```

```
## # A tibble: 20 x 4
## # Groups:   alcohol_dec [10]
##    alcohol_dec hcc_at_5_years    rc  freq
##          <int> <chr>          <int> <dbl>
##  1           1 N                 21  46.7
##  2           1 Y                 24  53.3
##  3           2 N                 30  54.5
##  4           2 Y                 25  45.5
##  5           3 N                 20  38.5
##  6           3 Y                 32  61.5
##  7           4 N                 26  46.4
```

```
##  8           4 Y                 30  53.6
##  9           5 N                 19  63.3
## 10           5 Y                 11  36.7
## 11           6 N                 36  53.7
## 12           6 Y                 31  46.3
## 13           7 N                 33  51.6
## 14           7 Y                 31  48.4
## 15           8 N                 19  52.8
## 16           8 Y                 17  47.2
## 17           9 N                 29  43.9
## 18           9 Y                 37  56.1
## 19          10 N                 32  56.1
## 20          10 Y                 25  43.9
```

```
hc %>%
  ggplot(aes(x = factor(alcohol_dec), y = rc)) +
  geom_bar(aes(fill = hcc_at_5_years), position = "dodge", stat = "identity", width = .5) +
      geom_text(aes(label = rc, group = hcc_at_5_years), position = position_dodge(width = 0.5), vjust =
```