Data Wrangling Using Dplyr

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Loading R packages

- dplyr: dataframe manipulation
- ggplot2: visualization

```
#install packages only if you have not already done so
list.of.packages <- c( "dplyr", "tidyverse")
new.packages <- list.of.packages[!(list.of.packages %in% installed.packages()[,"Package"])]
```

```
if(length(new.packages)) install.packages(new.packages)

#library packages
for (pkg in c("dplyr", "tidyverse")) {
  library(pkg, character.only = TRUE)
  }
```

```
load("surgery_data.RData")
```

I. Mutate Function

Example: Change the label for a categorical variable

```
anyNA(surgery_data$gender) #check whether there are NA values
```

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

```
table(is.na(surgery_data$gender)) #gives the count of NA values: 3
```

```
##
## FALSE  TRUE
## 31998     3
```

```
class(surgery_data$gender) #check the data type
```

```
## [1] "character"
```

```r
table(surgery_data$gender) #check how many non-NA levels are there in the gender variable
```

```
##
##     F     M
## 17230 14768
```

```r
#overwirte gender variable
surgery_data <- surgery_data%>%
  mutate(gender = if_else(gender == "F", "Female",
                  if_else(gender == "M", "Male", "Unknown")))
```

Example: Group patients whose race, gender are NA into a seperate group

There are 480 patients who have NA values for race. We don't want to exclude these sample from our data, let's treat them as a seperate group called "Unknown"

```r
anyNA(surgery_data$race) #check whether there are NA values
```

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

```r
table(is.na(surgery_data$race)) #gives the count of NA values: 3
```

```
##
## FALSE  TRUE
## 31521   480
```

```r
table(surgery_data$race)
```

```
##
## African American        Caucasian            Other
##             3790            26488             1243
```

```r
surgery_data <- surgery_data%>%
  mutate(race = if_else(is.na(race), "Unknown", race))%>%
  mutate(gender = if_else(is.na(gender), "Unknown", gender))

table(surgery_data$race)
```

```
##
## African American        Caucasian            Other          Unknown
##             3790            26488             1243              480
```

```r
table(surgery_data$gender)
```

```
##
##  Female    Male Unknown
##   17230   14768       3
```

```r
anyNA(surgery_data$race)
```

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

```r
anyNA(surgery_data$gender)
```

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

Example: Create age groups from numeric a age variable

```r
anyNA(surgery_data$age) #check whether there are NA values
```

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

```r
table(is.na(surgery_data$age)) #gives the count of NA values: 3
```

```
##
## FALSE  TRUE
## 31999     2
```

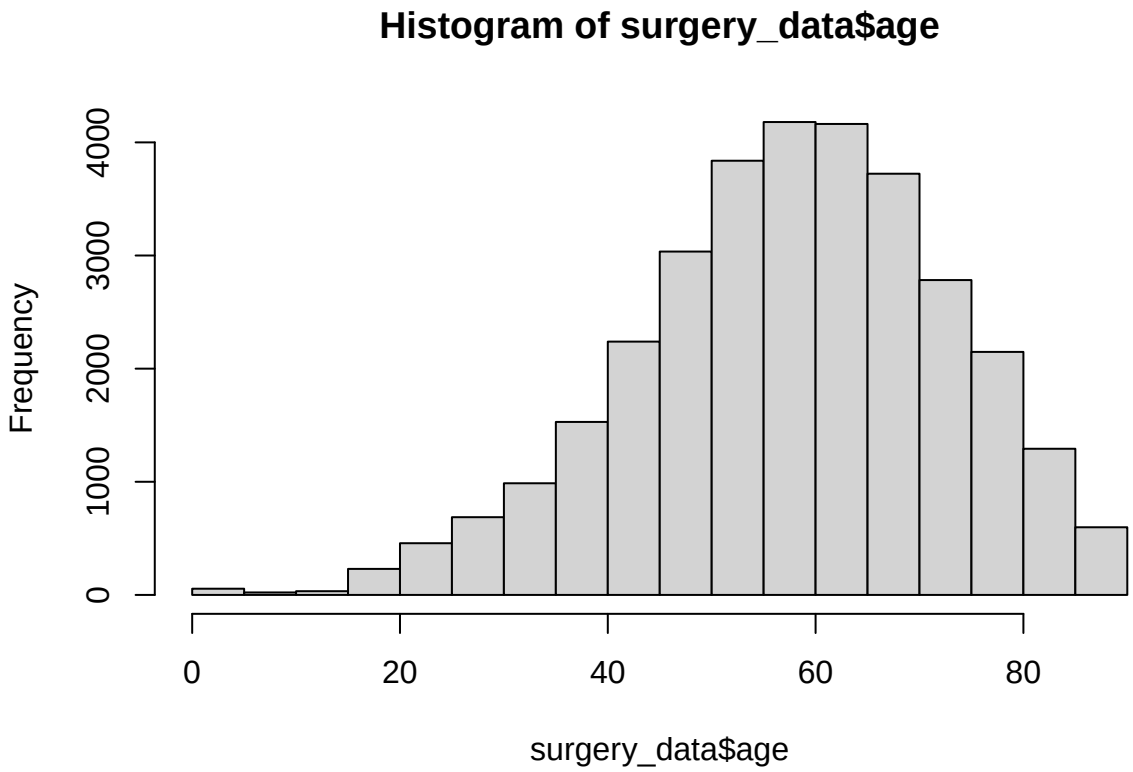
```r
class(surgery_data$age) #check the data type
```

```
## [1] "numeric"
```

```r
summary(surgery_data$age) #check the range of the variable
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##    1.00   48.20   58.60   57.66   68.30   90.00       2
```

```r
hist(surgery_data$age) #check the distribution of the variable, which helps us to seperate into groups
```




```
surgery_data <- surgery_data%>%
  mutate(age_group = if_else(age < 20, "less than 20",
                     if_else(age < 40, "20-40 yrs",
                     if_else(age < 60, "40-60 yrs",
                     if_else(age < 80, "60-80 yrs",
                             "80+")))))
table(surgery_data$age_group)
```

```
##
##    20-40 yrs    40-60 yrs    60-80 yrs          80+ less than 20
##         3628        13255        12857         1924          335
```

II. Select Function

Example: Only keep variables of interest in the dataframe

```
surgery_data_subset <- surgery_data%>%
  select(age, gender, bmi, hour, race)
glimpse(surgery_data_subset)
```

```
## Rows: 32,001
## Columns: 5
## $ age    <dbl> 67.8, 39.5, 56.5, 71.0, 56.3, 57.7, 56.6, 64.2, 66.2, 20.1, ...
## $ gender <chr> "Male", "Female", "Female", "Male", "Male", "Female", "Male"...
## $ bmi    <dbl> 28.04, 37.85, 19.56, 32.22, 24.32, 40.30, 64.57, 43.20, 28.0...
## $ hour   <dbl> 9.03, 18.48, 7.88, 8.80, 12.20, 7.67, 9.53, 7.52, 16.35, 16....
## $ race   <chr> "Caucasian", "Caucasian", "Caucasian", "Caucasian", "African...
```

III. Filter Function

Example: Identify one African American patients

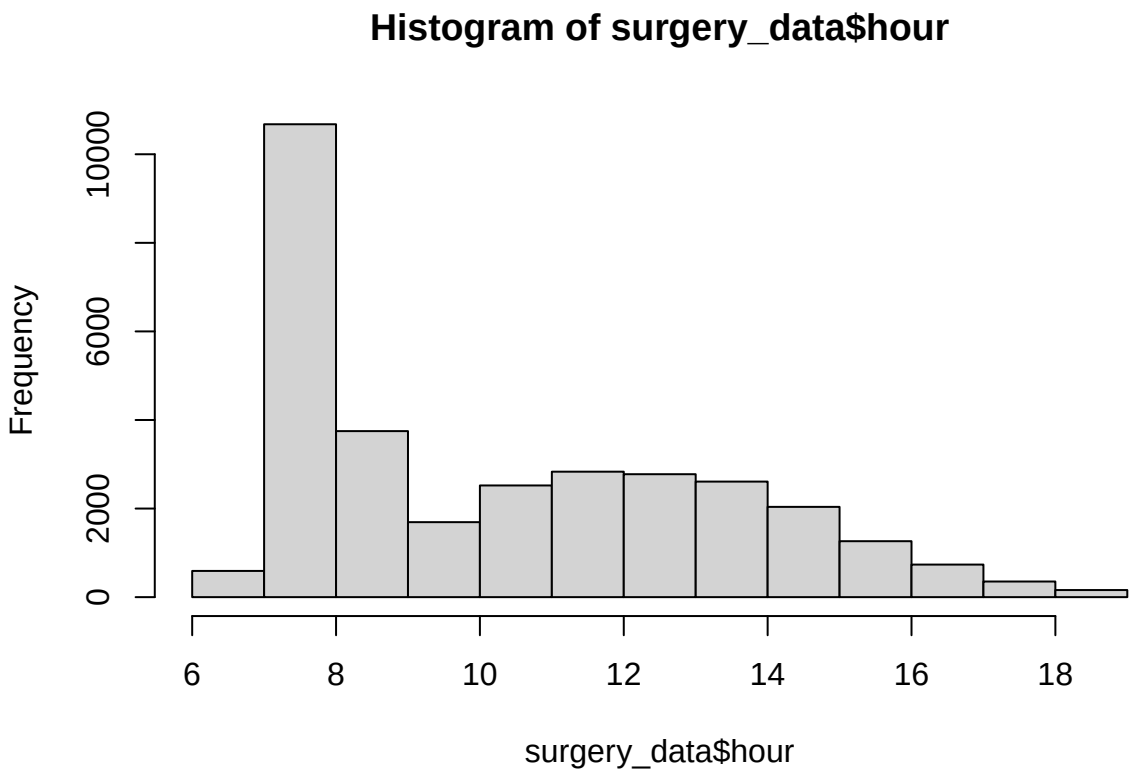
```
table(surgery_data$race)
```

```
##
## African American        Caucasian            Other          Unknown
##             3790            26488             1243              480
```

```
surgery_data_AfricanAmerican <- surgery_data%>%
  filter(race == "African American")
```

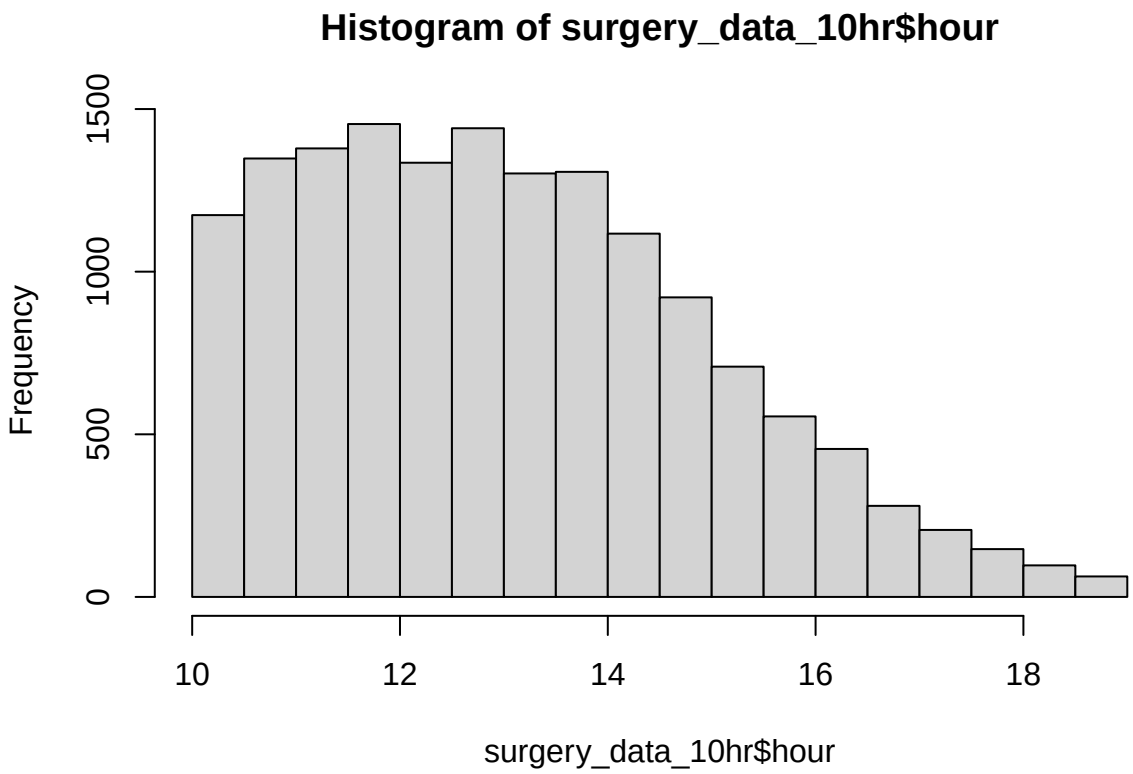
Example: Identify patients who's surgery time is longer than 10 hours

```
hist(surgery_data$hour)
```




```
surgery_data_10hr<- surgery_data%>%
  filter(hour > 10)

hist(surgery_data_10hr$hour)
```



IV. Summarize Function

Example: Identify the average surgery hour for each race group

```
surgery_data%>%
  group_by(race)%>%
  summarize(count = n(),
            hour_mean = mean(hour),
           hour_median= median(hour),
           hour_sd = sd(hour))%>%
  mutate(perc = count/sum(count) * 100)
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
## # A tibble: 4 x 6
##   race             count hour_mean hour_median hour_sd  perc
##   <chr>            <int>     <dbl>       <dbl>   <dbl> <dbl>
## 1 African American  3790      10.6        10.1     2.98 11.8
## 2 Caucasian        26488      10.4         9.6     2.91 82.8
## 3 Other             1243      10.3         9.28    2.94  3.88
## 4 Unknown            480      10.5         9.45    2.91  1.50
```

Example: Further investigate within each race, what's the average surgery hour for different asa statis

```
table <- surgery_data%>%
  mutate(asa_status = if_else(is.na(asa_status), "Unknown", asa_status))%>%
  group_by(race, asa_status)%>%
  summarize(count = n(),
            hour_mean = mean(hour),
            hour_median= median(hour),
            hour_sd = sd(hour))%>%
  filter(count > 5)
```

```
## `summarise()` regrouping output by 'race' (override with `.groups` argument)
```

```
table
```

```
## # A tibble: 13 x 6
## # Groups:   race [4]
##    race             asa_status count hour_mean hour_median hour_sd
##    <chr>            <chr>      <int>     <dbl>       <dbl>   <dbl>
##  1 African American I-II        1839      10.5        9.83    3.01
##  2 African American III         1785      10.6       10.2     2.94
##  3 African American IV-VI        165      11.1       11.1     2.93
##  4 Caucasian        I-II       14443      10.2        9.22    2.87
##  5 Caucasian        III        11201      10.5        9.87    2.92
##  6 Caucasian        IV-VI        837      11.1       11.0     3.04
##  7 Caucasian        Unknown        7      11.1       13.0     3.38
##  8 Other            I-II         718      10.3        8.87    2.98
##  9 Other            III          492      10.3        9.30    2.86
## 10 Other            IV-VI         33      11.5       11.0     3.18
## 11 Unknown          I-II         261      10.4        8.92    2.96
## 12 Unknown          III          199      10.4        9.58    2.85
## 13 Unknown          IV-VI         20      11.4       12.0     2.82
```

V. Arrange Function

Arrange the median surgery hour in race+asa status group in descending order

```
table%>%
  arrange(-hour_median)
```

```
## # A tibble: 13 x 6
## # Groups:   race [4]
##    race             asa_status count hour_mean hour_median hour_sd
##    <chr>            <chr>      <int>     <dbl>       <dbl>   <dbl>
##  1 Caucasian        Unknown        7      11.1       13.0     3.38
##  2 Unknown          IV-VI         20      11.4       12.0     2.82
##  3 African American IV-VI        165      11.1       11.1     2.93
##  4 Other            IV-VI         33      11.5       11.0     3.18
##  5 Caucasian        IV-VI        837      11.1       11.0     3.04
```

```
##  6 African American III         1785      10.6       10.2     2.94
##  7 Caucasian        III        11201      10.5        9.87    2.92
##  8 African American I-II        1839      10.5        9.83    3.01
##  9 Unknown          III          199      10.4        9.58    2.85
## 10 Other            III          492      10.3        9.30    2.86
## 11 Caucasian        I-II       14443      10.2        9.22    2.87
## 12 Unknown          I-II         261      10.4        8.92    2.96
## 13 Other            I-II         718      10.3        8.87    2.98
```