

# Cardiovascular disease worsens the maternal prognosis of COVID-19

Codes and outputs

08/20/2021

## Description

This file presents the documentation of the analysis of article “Cardiovascular disease worsens the maternal prognosis of COVID-19” with authors XXXXXX. ATUALIZAR AQUI COM AS QUESTÕES DOS AUTORES

## R packages used, functions and dataset import

The data are analyzed using the free-software R (<https://www.R-project.org>) in version 4.0.3. Next, we present and load the libraries used in the data analysis process.

```
loadlibrary <- function(x) {  
  if (!require(x, character.only = TRUE)) {  
    install.packages(x, dependencies = T)  
    if (!require(x, character.only = TRUE))  
      stop("Package not found")  
  }  
}  
  
packages <-  
c(  
  "dplyr",  
  "MatchIt",  
  "lubridate",  
  "readr",  
  "readxl",  
  "ggplot2",  
  "kableExtra",  
  "tables",  
  "questionr",  
  "car",  
  "data.table",  
  "magrittr",  
  "tidyverse",  
  "readxl",  
  "summarytools",  
  "modelsummary",  
  "RColorBrewer",  
)
```

```

    "zoo",
    "WeightIt",
    "jtools",
    "cobalt",
    "weights"
  )
lapply(packages, loadlibrary)

```

One can see below the functions that will be used in the data analysis.

```

#functions for summary measures
media <- function(x)
  mean(x, na.rm = TRUE)
mediana <- function(x)
  median(x, na.rm = TRUE)
DP <- function(x)
  sd(x, na.rm = TRUE)
minimo <- function(x)
  base::min(x, na.rm = TRUE)
maximo <- function(x)
  base::max(x, na.rm = TRUE)
q25 <- function(x)
  stats::quantile(x, p = 0.25, na.rm = TRUE)
q75 <- function(x)
  stats::quantile(x, p = 0.75, na.rm = TRUE)
IQR <- function(x)
  round(q75(x) - q25(x), 2)
n <- function(x)
  sum(!is.na(x))

```

The Influenza Epidemiological Surveillance Information System, SIVEP-Gripe (Sistema de Informação de Vigilância Epidemiológica da Gripe), is a nationwide surveillance database used to monitor severe acute respiratory infections in Brazil.

Notification is mandatory for Influenza Syndrome (characterized by at least two of the following signs and symptoms: fever, even if referred, chills, sore throat, headache, cough, runny nose, olfactory or taste disorders) and who has dyspnea/respiratory discomfort or persistent pressure in the chest or O<sub>2</sub> saturation less than 95% in room air or bluish color of the lips or face. Asymptomatic individuals with laboratory confirmation by molecular biology or immunological examination for COVID-19 infection are also reported.

For notifications in Sivep-Gripe, hospitalized cases in both public and private hospitals and all deaths due to severe acute respiratory infections regardless of hospitalization must be considered.

The search was limited to the first notified case of COVID-19 in February 2020 until the 15th epidemiological week of 2021 (up to April 17, 2021). The datasets were obtained on May 5, 2021, on the site <https://opendatasus.saude.gov.br/dataset>. The first period (8th to 53rd epidemiological week of 2020) and the second period (1st to 15th epidemiological week of 2021) datasets can be obtained at <https://drive.google.com/file/d/1jts4h0ovdwFh86SdKyslMLSG9rOy3UjX/view?usp=sharing> and at [https://drive.google.com/file/d/1gQSy\\_dcUkd1UrDEcsrDbyGl4gEvcI8z\\_/view?usp=sharing](https://drive.google.com/file/d/1gQSy_dcUkd1UrDEcsrDbyGl4gEvcI8z_/view?usp=sharing), respectively. The data are loaded below:

```

##### loading the datasets #####
#2021
data_2021 <- read_delim(
  "INFLUD21-03-05-2021.csv",

```

```

",",
escape_double = FALSE,
locale = locale(encoding = "ISO-8859-2"),
trim_ws = TRUE
)

#2020
data_2020 <- read_delim(
  "INFLUD-03-05-2021.csv",
  ",",
  escape_double = FALSE,
  locale = locale(encoding = "ISO-8859-2"),
  trim_ws = TRUE
)

sem <- 15 #limit of epidemiological week of 2021

#memory.limit(999999)

#### Concatenating 2020 and 2021 data #####
data_all <- rbind(data_2020, data_2021)

#Creating the case year variable
data_all <- data_all %>%
  dplyr::mutate(
    dt_sint = as.Date(DT_SIN_PRI, format = "%d/%m/%Y"),
    year_case = lubridate::year(dt_sint),
  )

```

There are 1905854 observations. The case selection is presented in the following according to the flowchart presented in the article.

## Case selection and data treatment

The first filter consists of selecting the cases from 8th epidemiological week of 2020 to 15th epidemiological week of 2021.

```

#Cases from the 8th epidemiological week of 2020 to 15th of 2021
data1 <- data_all %>%
  filter((year_case==2020 & SEM_PRI >=8) | year_case ==2021)

```

There are 12563 cases in 2021 in epidemiological week 53 of 2020. These are cases from the first two days of 2021, which are still part of the last epidemiological week of 2020 (<http://portalsinan.saude.gov.br/calendario-epidemiologico?layout=edit&id=168>). However, these cases belong to the 53rd week of 2020 and we corrected as follows:

```

data1 <- data1 %>%
  mutate(year_case = ifelse(year_case ==2021 & SEM_PRI ==53, 2020, year_case)) %>%
  filter(year_case==2020 | (year_case ==2021 & SEM_PRI <= sem))

```

There are 1876953 observations.

The next selection consists of selecting only confirmed cases of COVID-19:

```
##Filtering confirmed cases of COVID-19
data2 <- data1 %>%
  filter(CLASSI_FIN == 5)
```

There are 1174350 observations.

The next step is to identify hospitalized cases (HOSPITAL=1) and then select only those cases.

```
#Filtering only hospitalized cases
data3 <- data2 %>%
  filter(HOSPITAL == 1)
```

Now we have 1114042 observations.

The next selection consists of selecting females cases:

```
##Filtering female notifications
data4 <- filter(data3, CS_SEX0 == "F")
```

There are 495698 observations.

The next selection consists of selecting women between 10 and 55 years old.

```
#Filtering women aged 10-55
data5 <- data4 %>%
  filter(NU_IDADE_N > 9 & NU_IDADE_N <= 55)
```

There are 174525 observations.

The next step is to identify pregnant and postpartum people (variable `classi_gesta_puerp`) and then select only those cases.

```
#Creating the classification variable if pregnant, postpartum and not (neither pregnant nor postpartum)
data5 <- data5 %>%
  mutate(
    classi_gesta_puerp = case_when(
      CS_GESTANT == 1 ~ "1tri", #1st trimester
      CS_GESTANT == 2 ~ "2tri", #2nd trimester
      CS_GESTANT == 3 ~ "3tri", #3rd trimester
      CS_GESTANT == 4 ~ "IG_ig", #ignored gestational Age
      CS_GESTANT == 5 &
        PUERPERA == 1 ~ "puerp", #puerperium
      CS_GESTANT == 9 & PUERPERA == 1 ~ "puerp", #puerperium
      TRUE ~ "no" #neither pregnant nor postpartum
    )
  )

#Filtering only pregnant and postpartum women
data6 <- data5 %>%
  filter(classi_gesta_puerp != "no")
```

There are 10635 observations.

The variable identified as EVOLUCAO is categorized with 1 - cure, 2 - death by SARS, 3 - death by other cause, 9 - ignored.

```
with(data6, freq(EVOLUCAO))
```

```
## Frequencies
## data6$EVOLUCAO
## Type: Numeric
##
##          Freq  % Valid  % Valid Cum.  % Total  % Total Cum.
## -----
##          1   8005    85.38      85.38    75.27    75.27
##          2    979    10.44      95.82     9.21    84.48
##          3     15     0.16      95.98     0.14    84.62
##          9    377     4.02     100.00     3.54    88.16
##         <NA>  1259             11.84    100.00
##        Total 10635    100.00     100.00   100.00   100.00
```

Now we are going to select only the finalized cases:

```
#Filtering only finalized cases
data7 <- data6 %>%
  filter((EVOLUCAO == 1 | EVOLUCAO == 2 | EVOLUCAO == 3) & !is.na(EVOLUCAO))

#Creating the evolution variable
data7 <- data7 %>%
  mutate(evolution = case_when(
    EVOLUCAO == 1 ~ "cure",
    EVOLUCAO == 2 ~ "death",
    EVOLUCAO == 3 ~ "death"
  ))

with(data7, freq(evolution))
```

```
## Frequencies
## data7$evolution
## Type: Character
##
##          Freq  % Valid  % Valid Cum.  % Total  % Total Cum.
## -----
##        cure   8005    88.95      88.95    88.95    88.95
##       death    994    11.05     100.00    11.05   100.00
##        <NA>     0             0.00     0.00   100.00
##       Total  8999    100.00     100.00   100.00   100.00
```

There are 8999 confirmed and hospitalized cases of COVID-19 in pregnant and postpartum women aged 10 to 55 years. We identify 60.42% of these notifications without any information about the presence or absence of cardiovascular diseases (CVD). The next selection consists of selecting cases where the CVD variable (CARDIOPATI) indicates yes or no:

```
with(data7, freq(CARDIOPATI))
```

```
## Frequencies
## data7$CARDIOPATI
## Type: Numeric
##
##           Freq  % Valid  % Valid Cum.  % Total  % Total Cum.
## -----
##           1    602    16.55      16.55     6.69      6.69
##           2   2960    81.39     97.94    32.89     39.58
##           9     75     2.06    100.00     0.83     40.42
##          <NA>  5362    100.00    100.00    59.58    100.00
##          Total 8999    100.00    100.00   100.00   100.00
```

```
#Creating the CVD variable
data7 <- data7 %>%
  mutate(CVD = case_when(
    CARDIOPATI == 1 ~ "yes",
    CARDIOPATI == 2 ~ "no",
    TRUE ~ NA_character_
  ))
```

Now we present the final dataset.

```
#Filtering cases with information about CVD
data <- data7 %>%
  filter(!is.na(CVD))
```

```
questionr::freq(
  data$CVD,
  cum = FALSE,
  total = TRUE,
  na.last = FALSE,
  valid = FALSE
) %>%
  kable(caption = "Frequency of CVD", digits = 2) %>%
  kable_styling(latex_options = "HOLD_position")
```

Table 1: Frequency of CVD

	n	%
no	2960	83.1
yes	602	16.9
Total	3562	100.0

## # Epidemiologic characteristics

### Ethnicity

```
# Ethnicity
data <- data %>%
  mutate(
    ethnicity = case_when(
      CS_RACA == 1 ~ "white",
      CS_RACA == 2 ~ "black",
      CS_RACA == 3 ~ "yellow",
      CS_RACA == 4 ~ "brown",
      CS_RACA == 5 ~ "indigenous",
      TRUE ~ NA_character_
    )
  )
```

```
with(data, ctable(ethnicity, CVD, prop = "c", useNA = "no", chisq = FALSE))
```

```
## Cross-Tabulation, Column Proportions
```

```
## ethnicity * CVD
```

```
## Data Frame: data
```

```
##
```

```
## -----
```

	CVD	no	yes	Total
ethnicity				
black	167 ( 6.5%)	46 ( 9.1%)	213 ( 6.9%)	
brown	1375 ( 53.5%)	244 ( 48.1%)	1619 ( 52.6%)	
indigenous	30 ( 1.2%)	1 ( 0.2%)	31 ( 1.0%)	
white	975 ( 37.9%)	214 ( 42.2%)	1189 ( 38.6%)	
yellow	24 ( 0.9%)	2 ( 0.4%)	26 ( 0.8%)	
Total	2571 (100.0%)	507 (100.0%)	3078 (100.0%)	

```
## -----
```

```
fisher.test(data$ethnicity, data$CVD)
```

```
##
```

```
## Fisher's Exact Test for Count Data
```

```
##
```

```
## data: data$ethnicity and data$CVD
```

```
## p-value = 0.007096
```

```
## alternative hypothesis: two.sided
```

## Education

```
data <- data %>%
  mutate(education = case_when(CS_ESCOL_N == 0 ~ "No schooling",
    CS_ESCOL_N == 1 ~ "1st to 5th grade",
    CS_ESCOL_N == 2 ~ "6th to 9th grade",
    CS_ESCOL_N == 3 ~ "Middle school",
    CS_ESCOL_N == 4 ~ "Superior",
    TRUE ~ NA_character_))
```

```
data$education <- factor(data$education,
levels = c("No schooling", "1st to 5th grade", "6th to 9th grade",
"Middle school", "Superior"))
```

```
with(data, ctable(education, CVD, prop = "c", useNA = "no", chisq = FALSE))
```

```
## Cross-Tabulation, Column Proportions
```

```
## education * CVD
```

```
## Data Frame: data
```

```
##
```

```
## -----
##               CVD               no               yes               Total
##      education
##      No schooling           11 ( 0.7%)           2 ( 0.7%)           13 ( 0.7%)
##      1st to 5th grade        123 ( 7.9%)          33 (12.2%)          156 ( 8.5%)
##      6th to 9th grade        307 (19.7%)          52 (19.2%)          359 (19.6%)
##      Middle school          857 (55.0%)          140 (51.7%)          997 (54.5%)
##      Superior               260 (16.7%)           44 (16.2%)           304 (16.6%)
##      Total                 1558 (100.0%)          271 (100.0%)         1829 (100.0%)
## -----
```

```
fisher.test(data$education, data$CVD)
```

```
##
```

```
## Fisher's Exact Test for Count Data
```

```
##
```

```
## data: data$education and data$CVD
```

```
## p-value = 0.2405
```

```
## alternative hypothesis: two.sided
```

## Age (Years)

```
datasummary((CVD) ~ NU_IDADE_N*(n+media+DP+mediana+minimo+maximo+q25+q75+IQR),
data = data, output = 'markdown')
```

	n	media	DP	mediana	minimo	maximo	q25	q75	IQR
no	2960.00	30.00	7.43	30.00	13.00	55.00	24.00	35.00	11.00
yes	602.00	34.76	8.52	34.00	15.00	55.00	29.00	39.75	10.75

```
t.test(NU_IDADE_N ~ CVD, data = data)
```

```
##
```

```
## Welch Two Sample t-test
```

```
##
```

```
## data: NU_IDADE_N by CVD
```

```
## t = -12.745, df = 797.4, p-value < 2.2e-16
```

```
## alternative hypothesis: true difference in means is not equal to 0
```



```
## 95 percent confidence interval:
## -5.485124 -4.021042
## sample estimates:
## mean in group no mean in group yes
## 30.00439 34.75748
```

## Age group

```
data <- data %>%
  mutate(
    age_group = case_when(
      NU_IDADE_N <= 19 ~ "<20",
      NU_IDADE_N >= 20
      & NU_IDADE_N <= 34 ~ "20-34",
      NU_IDADE_N > 34 ~ ">=35",
      TRUE ~ NA_character_
    )
  )
data$age_group <-
  factor(data$age_group, levels = c("<20", "20-34", ">=35"))
```

```
with(data, ctable(age_group, CVD, prop = "c", useNA = "no", chisq = FALSE))
```

```
## Cross-Tabulation, Column Proportions
## age_group * CVD
## Data Frame: data
##
## -----
##           CVD           no           yes           Total
## age_group
##   <20         237 ( 8.0%)         10 ( 1.7%)         247 ( 6.9%)
##   20-34       1895 ( 64.0%)        292 ( 48.5%)       2187 ( 61.4%)
##   >=35         828 ( 28.0%)        300 ( 49.8%)       1128 ( 31.7%)
##   Total       2960 (100.0%)        602 (100.0%)       3562 (100.0%)
## -----
```

```
with(data, fisher.test(age_group, CVD))
```

```
##
## Fisher's Exact Test for Count Data
##
## data: age_group and CVD
## p-value < 2.2e-16
## alternative hypothesis: two.sided
```

## Residence area

```
data <- data %>%
  mutate(zone = case_when(CS_ZONA ==1 ~ "Urban",
                           CS_ZONA == 2 ~ "Rural",
                           CS_ZONA == 3 ~ "Periurban",
                           TRUE ~ NA_character_))

with(data, ctable( zone, CVD, prop = "c", useNA = "no", chisq = FALSE))
```

```
## Cross-Tabulation, Column Proportions
## zone * CVD
## Data Frame: data
##
## -----
##           CVD           no           yes           Total
## zone
## Periurban      10 ( 0.4%)      3 ( 0.5%)      13 ( 0.4%)
## Rural          159 ( 5.7%)     24 ( 4.4%)     183 ( 5.5%)
## Urban          2618 ( 93.9%)    522 ( 95.1%)   3140 ( 94.1%)
## Total          2787 (100.0%)    549 (100.0%)   3336 (100.0%)
## -----
```

```
fisher.test(data$zone, data$CVD)
```

```
##
## Fisher's Exact Test for Count Data
##
## data: data$zone and data$CVD
## p-value = 0.3673
## alternative hypothesis: two.sided
```

## Gestational moment

```
ctable(data$classi_gesta_puerp, data$CVD, prop="c", OR=TRUE, useNA = "no", chisq = TRUE)
```

```
## Cross-Tabulation, Column Proportions
## classi_gesta_puerp * CVD
## Data Frame: data
##
## -----
##           CVD           no           yes           Total
## classi_gesta_puerp
## 1tri          161 ( 5.4%)      34 ( 5.6%)      195 ( 5.5%)
## 2tri          471 (15.9%)     120 (19.9%)     591 (16.6%)
## 3tri         1199 (40.5%)     248 (41.2%)    1447 (40.6%)
## IG_ig          84 ( 2.8%)      30 ( 5.0%)     114 ( 3.2%)
## puerp         1045 (35.3%)     170 (28.2%)    1215 (34.1%)
## Total         2960 (100.0%)    602 (100.0%)   3562 (100.0%)
## -----
```

```
##
## -----
## Chi.squared   df   p.value
## -----
##      19.4898     4     6e-04
## -----
```

## Hospital-acquired infection

```
data <- data %>%
  mutate(hospital_infection = case_when(NOSOCOMIAL == 1 ~ "yes",
                                         NOSOCOMIAL == 2 ~ "no",
                                         TRUE ~ NA_character_))

with(data, ctable( hospital_infection, CVD, prop = "c", useNA = "no", chisq = FALSE))
```

```
## Cross-Tabulation, Column Proportions
## hospital_infection * CVD
## Data Frame: data
##
## -----
##           CVD           no           yes           Total
## hospital_infection
##           no      2551 ( 98.0%)    448 ( 98.0%)    2999 ( 98.0%)
##           yes         53 (  2.0%)         9 (  2.0%)         62 (  2.0%)
##           Total    2604 (100.0%)    457 (100.0%)    3061 (100.0%)
## -----
```

```
fisher.test(data$hospital_infection, data$CVD)
```

```
##
## Fisher's Exact Test for Count Data
##
## data:  data$hospital_infection and data$CVD
## p-value = 1
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.4163122 1.9955578
## sample estimates:
## odds ratio
##  0.9669453
```

## Symptoms

### Fever

```
data <- data %>%
  mutate(fever = case_when(FEBRE == 1 ~ "yes",
                           FEBRE == 2 ~ "no",
                           TRUE ~ NA_character_))

with(data, ctable(CVD, fever, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * fever
## Data Frame: data
##
##
## -----
##      fever      no      yes      Total
## CVD
## no      1289 (44.2%)  1625 (55.8%)  2914 (100.0%)
## yes      209 (38.3%)   337 (61.7%)   546 (100.0%)
## Total    1498 (43.3%)  1962 (56.7%)  3460 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      6.4048    1  0.0114
## -----
##
## -----
## Odds Ratio  Lo - 95%  Hi - 95%
## -----
##      1.28      1.06    1.54
## -----
##
## -----
## Risk Ratio  Lo - 0%  Hi - 0%
## -----
##      1.16      1.16    1.16
## -----
```

## Cough

```
data <- data %>%
  mutate(cough = case_when(TOSSE == 1 ~ "yes",
                           TOSSE == 2 ~ "no",
                           TRUE ~ NA_character_))

with(data, ctable(CVD, cough, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * cough
```

```
## Data Frame: data
##
##
## -----
##      cough      no      yes      Total
## CVD
## no      1002 (34.4%)  1913 (65.6%)  2915 (100.0%)
## yes      138 (24.6%)   424 (75.4%)   562 (100.0%)
## Total    1140 (32.8%)  2337 (67.2%)  3477 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    20.1693    1    0
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##    1.61       1.31      1.98
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##    1.40       1.40      1.40
## -----
```

## Sore throat

```
data <- data %>%
  mutate(sore_throat = case_when(GARGANTA == 1 ~ "yes",
                                   GARGANTA == 2 ~ "no",
                                   TRUE ~ NA_character_))

with(data, ctable(CVD, sore_throat, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * sore_throat
## Data Frame: data
##
##
## -----
##      sore_throat      no      yes      Total
## CVD
## no      2245 (78.5%)   616 (21.5%)  2861 (100.0%)
## yes      367 (74.7%)   124 (25.3%)   491 (100.0%)
## Total    2612 (77.9%)   740 (22.1%)  3352 (100.0%)
## -----
##
```

```
## -----
## Chi.squared  df  p.value
## -----
##      3.1648    1  0.0752
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.23      0.99      1.54
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.05      1.05      1.05
## -----
```

## Dyspnea

```
data <- data %>%
  mutate(dyspnea = case_when(DISPNIEIA == 1 ~ "yes",
                             DISPNEIA == 2 ~ "no",
                             TRUE ~ NA_character_))
```

```
with(data, ctable(CVD, dyspnea, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * dyspnea
## Data Frame: data
##
## -----
##      dyspnea      no      yes      Total
## CVD
## no      1361 (46.7%)  1553 (53.3%)  2914 (100.0%)
## yes      154 (27.7%)   401 (72.3%)   555 (100.0%)
## Total    1515 (43.7%)  1954 (56.3%)  3469 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      67.3439    1    0
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      2.28      1.87      2.79
## -----
```

```
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.68      1.68      1.68
## -----
```

## Respiratory distress

```
data <- data %>%
  mutate(resp_dist = case_when(DESC_RESP == 1 ~ "yes",
                                DESC_RESP == 2 ~ "no",
                                TRUE ~ NA_character_))
```

```
with(data, ctable(CVD, resp_dist, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * resp_dist
## Data Frame: data
```

```
##
## -----
##      resp_dist      no      yes      Total
## CVD
## no      1541 (53.1%)  1361 (46.9%)  2902 (100.0%)
## yes      213 (40.3%)   316 (59.7%)   529 (100.0%)
## Total    1754 (51.1%)  1677 (48.9%)  3431 (100.0%)
## -----
```

```
##
## -----
## Chi.squared  df  p.value
## -----
##      28.9948   1      0
## -----
```

```
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.68      1.39      2.03
## -----
```

```
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.32      1.32      1.32
## -----
```

## Saturation

```
data <- data %>%
  mutate(saturation = case_when(SATURACAO == 1 ~ "yes",
                                SATURACAO == 2 ~ "no",
                                TRUE ~ NA_character_))

with(data, ctable(CVD, saturation, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * saturation
## Data Frame: data
##
##
## -----
##      saturation      no      yes      Total
## CVD
## no      1873 (65.1%)  1003 (34.9%)  2876 (100.0%)
## yes      231 (43.4%)   301 (56.6%)   532 (100.0%)
## Total    2104 (61.7%)  1304 (38.3%)  3408 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      88.612    1      0
## -----
##
## -----
## Odds Ratio  Lo - 95%  Hi - 95%
## -----
##      2.43      2.02    2.94
## -----
##
## -----
## Risk Ratio  Lo - 0%  Hi - 0%
## -----
##      1.50      1.50    1.50
## -----
```

## Diarrhea

```
data <- data %>%
  mutate(diarrhea = case_when(DIARREIA == 1 ~ "yes",
                                DIARREIA == 2 ~ "no",
                                TRUE ~ NA_character_))

with(data, ctable(CVD, diarrhea, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * diarrhea
```



```
## Data Frame: data
##
##
## -----
##           diarrhea           no           yes           Total
## CVD
## no           2557 (88.8%)    324 (11.2%)    2881 (100.0%)
## yes           421 (87.0%)     63 (13.0%)    484 (100.0%)
## Total         2978 (88.5%)    387 (11.5%)    3365 (100.0%)
## -----
##
## -----
## Chi.squared   df   p.value
## -----
##    1.1081      1   0.2925
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##    1.18        0.88       1.58
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##    1.02        1.02       1.02
## -----
```

## Vomit

```
data <- data %>%
  mutate(vomit = case_when(VOMITO == 1 ~ "yes",
                           VOMITO == 2 ~ "no",
                           TRUE ~ NA_character_))

with(data, ctable(CVD, vomit, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * vomit
## Data Frame: data
##
##
## -----
##           vomit           no           yes           Total
## CVD
## no           2589 (90.2%)    282 ( 9.8%)    2871 (100.0%)
## yes           423 (87.9%)     58 (12.1%)    481 (100.0%)
## Total         3012 (89.9%)    340 (10.1%)    3352 (100.0%)
## -----
##
```

```
## -----
## Chi.squared  df  p.value
## -----
##      2.021      1  0.1551
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.26      0.93      1.70
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.03      1.03      1.03
## -----
```

## Abdominal pain

```
data <- data %>%
  mutate(abd_pain = case_when(DOR_ABD == 1 ~ "yes",
                              DOR_ABD == 2 ~ "no",
                              TRUE ~ NA_character_))
```

```
with(data, ctable(CVD, abd_pain, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * abd_pain
## Data Frame: data
##
## -----
##      abd_pain      no      yes      Total
## CVD
## no      1877 (91.1%)  183 ( 8.9%)  2060 (100.0%)
## yes      291 (89.0%)   36 (11.0%)   327 (100.0%)
## Total    2168 (90.8%)  219 ( 9.2%)  2387 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      1.2858      1  0.2568
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.27      0.87      1.85
## -----
```

```
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.02      1.02      1.02
## -----
```

## Fatigue

```
data <- data %>%
  mutate(fatigue = case_when(FADIGA == 1 ~ "yes",
                             FADIGA == 2 ~ "no",
                             TRUE ~ NA_character_))
```

```
with(data, ctable(CVD, fatigue, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * fatigue
## Data Frame: data
##
## -----
##      fatigue      no      yes      Total
## CVD
## no      1609 (77.8%)  460 (22.2%)  2069 (100.0%)
## yes      238 (69.6%)  104 (30.4%)   342 (100.0%)
## Total    1847 (76.6%)  564 (23.4%)  2411 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    10.4972    1  0.0012
## -----
##
## -----
## Odds Ratio  Lo - 95%  Hi - 95%
## -----
##      1.53      1.19      1.97
## -----
##
## -----
## Risk Ratio  Lo - 0%  Hi - 0%
## -----
##      1.12      1.12      1.12
## -----
```

## Loss of smell

```
data <- data %>%
  mutate(loss_smell = case_when(PERD_OLFT == 1 ~ "yes",
                                PERD_OLFT == 2 ~ "no",
                                TRUE ~ NA_character_))

with(data, ctable(CVD, loss_smell, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * loss_smell
## Data Frame: data
##
##
## -----
##      loss_smell      no      yes      Total
## CVD
## no      1683 (81.4%)   384 (18.6%)  2067 (100.0%)
## yes      250 (74.2%)   87 (25.8%)   337 (100.0%)
## Total    1933 (80.4%)  471 (19.6%)  2404 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      9.1828    1  0.0024
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.53      1.17      1.99
## -----
##
## -----
## Risk Ratio   Lo - 0%    Hi - 0%
## -----
##      1.10      1.10      1.10
## -----
```

## Loss of taste

```
data <- data %>%
  mutate(loss_taste = case_when(PERD_PALA == 1 ~ "yes",
                                 PERD_PALA == 2 ~ "no",
                                 TRUE ~ NA_character_))

with(data, ctable(CVD, loss_taste, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * loss_taste
```

```
## Data Frame: data
##
##
## -----
##           loss_taste           no           yes           Total
## CVD
##   no           1694 (82.1%)   369 (17.9%)   2063 (100.0%)
##   yes           250 (74.0%)    88 (26.0%)    338 (100.0%)
## Total           1944 (81.0%)   457 (19.0%)   2401 (100.0%)
## -----
##
## -----
## Chi.squared   df   p.value
## -----
##    11.9908     1    5e-04
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##     1.62       1.24       2.11
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##     1.11       1.11       1.11
## -----
```

## Any respiratory symptom

Now we are going to create the variable `resp_symp` indicating the presence of at least one respiratory symptom (Dyspnea, Fadigue, Saturation, Respiratory distress). Empty cells are considered missing data (<NA>). The variable `qt_resp_symp` indicates the number of respiratory symptoms of each case.

```
df <- select(data,dyspnea,fatigue,saturation,resp_dist )
soma <- function(x){
  if (sum(is.na(x))==4)
    return(NA_character_)
  else
    return(sum(!is.na(x) & x=="yes"))
}
data$qt_sintomas_resp_aux <- apply(df,1,soma)

data <- data %>%
  mutate(resp_symp = case_when(qt_sintomas_resp_aux >=1 ~ "yes",
                                qt_sintomas_resp_aux ==0 ~ "no",
                                TRUE ~ NA_character_))

with(data, ctable(CVD, resp_symp, prop="r", useNA = "no", chisq = TRUE, OR = TRUE))

## Cross-Tabulation, Row Proportions
## CVD * resp_symp
```

```
## Data Frame: data
##
##
## -----
##      resp_symp      no      yes      Total
##      CVD
##      no      935 (31.9%)  1992 (68.1%)  2927 (100.0%)
##      yes      94 (16.3%)   484 (83.7%)   578 (100.0%)
##      Total    1029 (29.4%)  2476 (70.6%)  3505 (100.0%)
## -----
##
## -----
##      Chi.squared  df  p.value
## -----
##      56.4759      1      0
## -----
##
## -----
##      Odds Ratio  Lo - 95%  Hi - 95%
## -----
##      2.42        1.91      3.05
## -----
##
## -----
##      Risk Ratio  Lo - 0%  Hi - 0%
## -----
##      1.96        1.96      1.96
## -----
```

```
data <- data %>%
  mutate(qt_resp_symp = case_when(qt_sintomas_resp_aux == 4 ~ "4 symptoms",
                                   qt_sintomas_resp_aux == 3 ~ "3 symptoms",
                                   qt_sintomas_resp_aux == 2 ~ "2 symptoms",
                                   qt_sintomas_resp_aux == 1 ~ "1 symptom",
                                   qt_sintomas_resp_aux == 0 ~ "No respiratory symptom",
                                   TRUE ~ NA_character_))

with(data, ctable(qt_resp_symp, CVD, prop="c", useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Column Proportions
```

```
## qt_resp_symp * CVD
```

```
## Data Frame: data
```

```
##
##
## -----
##      CVD      no      yes      Total
##      qt_resp_symp
##      1 symptom      640 ( 21.9%)  116 ( 20.1%)  756 ( 21.6%)
##      2 symptoms      528 ( 18.0%)  151 ( 26.1%)  679 ( 19.4%)
##      3 symptoms      615 ( 21.0%)  164 ( 28.4%)  779 ( 22.2%)
##      4 symptoms      209 (  7.1%)   53 (  9.2%)  262 (  7.5%)
##      No respiratory symptom      935 ( 31.9%)   94 ( 16.3%)  1029 ( 29.4%)
##      Total      2927 (100.0%)  578 (100.0%)  3505 (100.0%)
## -----
```

```
##
## -----
##  Chi.squared    df    p.value
## -----
##    71.8703      4      0
## -----
```

## Any symptom

```
df <- select(data, dyspnea, fatigue, saturation, resp_dist, fever, cough, sore_throat, diarrhea, vomit,

soma <- function(x){
  if (sum(is.na(x)) == 12)
    return(NA_character_)
  else
    return(sum(!is.na(x) & x=="yes"))
}
data$qt_symp_aux <- apply(df,1,soma)

data <- data %>%
  mutate(symp = case_when(qt_symp_aux >= 1 ~ "yes",
                           qt_symp_aux == 0 ~ "no",
                           TRUE ~ NA_character_))

with(data, ctable(CVD, symp, prop="r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * symp
## Data Frame: data
##
## -----
##      symp      no      yes      Total
## CVD
## no      256 (8.7%) 2685 (91.3%) 2941 (100.0%)
## yes      22 (3.7%)  574 (96.3%)  596 (100.0%)
## Total    278 (7.9%) 3259 (92.1%) 3537 (100.0%)
## -----
##
## -----
##  Chi.squared    df    p.value
## -----
##    16.513      1      0
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##    2.49      1.59      3.88
## -----
##
## -----
```

```
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      2.36         2.36      2.36
## -----
```

## Comorbidities

```
#Hematologic
data <- data %>%
mutate(hematologic = case_when(HEMATOLOGI == 1 ~ "yes",
                              HEMATOLOGI == 2 ~ "no",
                              TRUE ~ NA_character_))

#Immunodepression
data <- data %>%
mutate(imunodepre = case_when(IMUNODEPRE == 1 ~ "yes",
                              IMUNODEPRE == 2 ~ "no",
                              TRUE ~ NA_character_))

#Hepatic
data <- data %>%
mutate(hepatic = case_when(HEPATICA == 1 ~ "yes",
                           HEPATICA == 2 ~ "no",
                           TRUE ~ NA_character_))

#Asthma
data <- data %>%
mutate(asthma = case_when(ASMA == 1 ~ "yes",
                          ASMA == 2 ~ "no",
                          TRUE ~ NA_character_))

#Diabetes
data <- data %>%
mutate(diabetes = case_when(DIABETES == 1 ~ "yes",
                            DIABETES == 2 ~ "no",
                            TRUE ~ NA_character_))

#Neurologic
data <- data %>%
mutate(neurologic = case_when(NEUROLOGIC == 1 ~ "yes",
                              NEUROLOGIC == 2 ~ "no",
                              TRUE ~ NA_character_))

#Pneumologic
data <- data %>%
mutate(pneumologic = case_when(PNEUMOPATI == 1 ~ "yes",
                               PNEUMOPATI == 2 ~ "no",
                               TRUE ~ NA_character_))

#Renal
data <- data %>%
mutate(renal = case_when(RENAL == 1 ~ "yes",
                        RENAL == 2 ~ "no",
                        TRUE ~ NA_character_))

#Obesity
data <- data %>%
mutate(obesity = case_when(OBESIDADE == 1 ~ "yes",
                           OBESIDADE == 2 ~ "no",
                           TRUE ~ NA_character_))
```



## Hematologic

```
with(data, ctable(CVD, hematologic, prop = "r", useNA = "no", chisq = TRUE, OR=TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * hematologic
## Data Frame: data
##
## -----
##           hematologic          no          yes          Total
## CVD
## no          2919 (98.9%)      31 (1.1%)    2950 (100.0%)
## yes          428 (97.9%)       9 (2.1%)     437 (100.0%)
## Total        3347 (98.8%)     40 (1.2%)    3387 (100.0%)
## -----
##
## -----
## Chi.squared   df   p.value
## -----
##      2.5101      1   0.1131
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.98      0.94      4.19
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.01      1.01      1.01
## -----
```

## Diabetes

```
ctable(data$CVD, data$diabetes, chisq=TRUE, prop="r", OR=TRUE, useNA = "no")
```

```
## Cross-Tabulation, Row Proportions
## CVD * diabetes
## Data Frame: data
##
## -----
##           diabetes          no          yes          Total
## CVD
```

```
##      no      2610 (88.6%)   337 (11.4%)   2947 (100.0%)
##      yes      312 (66.4%)   158 (33.6%)    470 (100.0%)
##      Total    2922 (85.5%)   495 (14.5%)   3417 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      159.2143      1      0
## -----
##
## -----
##      Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      3.92          3.14        4.90
## -----
##
## -----
##      Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.33          1.33        1.33
## -----
```

## Obesity

```
ctable(data$CVD, data$obesity, chisq=TRUE, prop="r", OR=TRUE, useNA = "no")
```

```
## Cross-Tabulation, Row Proportions
## CVD * obesity
## Data Frame: data
##
## -----
##      obesity      no      yes      Total
##      CVD
##      no      2651 (91.2%)   255 ( 8.8%)   2906 (100.0%)
##      yes      344 (76.6%)   105 (23.4%)    449 (100.0%)
##      Total    2995 (89.3%)   360 (10.7%)   3355 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      85.149      1      0
## -----
##
## -----
##      Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      3.17          2.46        4.09
## -----
##
```

```
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.19      1.19      1.19
## -----
```

## Asthma

```
ctable(data$CVD, data$asthma, chisq=TRUE, prop="r", OR=TRUE, useNA = "no")
```

```
## Cross-Tabulation, Row Proportions
## CVD * asthma
## Data Frame: data
##
##
## -----
##          asthma          no          yes          Total
## CVD
## no      2734 (93.2%)    199 (6.8%)    2933 (100.0%)
## yes      396 (90.8%)     40 (9.2%)     436 (100.0%)
## Total    3130 (92.9%)    239 (7.1%)    3369 (100.0%)
## -----
##
## -----
## Chi.squared    df    p.value
## -----
##      2.9356      1    0.0866
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.39      0.97      1.98
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.03      1.03      1.03
## -----
```

## Hepatic

```
ctable(data$CVD, data$hepatic, chisq=TRUE, prop="r", OR=TRUE, useNA = "no")
```

```
## Cross-Tabulation, Row Proportions
## CVD * hepatic
## Data Frame: data
##
```

```
##
## -----
##          hepatic          no          yes          Total
##      CVD
##      no          2921 ( 99.6%)    12 (0.4%)    2933 (100.0%)
##      yes          426 ( 98.8%)     5 (1.2%)     431 (100.0%)
##      Total        3347 ( 99.5%)    17 (0.5%)    3364 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##          2.8535         1    0.0912
## -----
##
## -----
##      Odds Ratio    Lo - 95%    Hi - 95%
## -----
##          2.86         1.00         8.15
## -----
##
## -----
##      Risk Ratio    Lo - 0%    Hi - 0%
## -----
##          1.01         1.01         1.01
## -----
```

```
fisher.test(data$hepatic, data$CVD)
```

```
##
## Fisher's Exact Test for Count Data
##
## data:  data$hepatic and data$CVD
## p-value = 0.05627
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.7841874 8.7612195
## sample estimates:
## odds ratio
##  2.855734
```

## Neurologic

```
ctable(data$CVD, data$neurologic, chisq=TRUE, prop="r", OR=TRUE, useNA = "no")
```

```
## Cross-Tabulation, Row Proportions
## CVD * neurologic
## Data Frame: data
##
##
## -----
```

```
##           neurologic           no           yes           Total
## CVD
## no           2915 (99.0%)    28 (1.0%)    2943 (100.0%)
## yes           422 (97.9%)     9 (2.1%)    431 (100.0%)
## Total        3337 (98.9%)    37 (1.1%)    3374 (100.0%)
## -----
##
## -----
## Chi.squared   df   p.value
## -----
##      3.4923      1   0.0617
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      2.22      1.04      4.74
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.01      1.01      1.01
## -----
```

```
fisher.test(data$neurologic, data$CVD)
```

```
##
## Fisher's Exact Test for Count Data
##
## data: data$neurologic and data$CVD
## p-value = 0.04511
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.9148775 4.8799321
## sample estimates:
## odds ratio
##  2.219605
```

## Pneumologic

```
ctable(data$CVD, data$pneumologic, chisq=TRUE, prop="r", OR=TRUE, useNA = "no")
```

```
## Cross-Tabulation, Row Proportions
## CVD * pneumologic
## Data Frame: data
##
## -----
##           pneumologic           no           yes           Total
## CVD
```

```
##      no                2905 (98.9%)   31 (1.1%)   2936 (100.0%)
##      yes                424 (97.0%)   13 (3.0%)   437 (100.0%)
##      Total              3329 (98.7%)   44 (1.3%)   3373 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      9.4404         1    0.0021
## -----
##
## -----
##      Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      2.87          1.49        5.53
## -----
##
## -----
##      Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.02          1.02        1.02
## -----
##
```

## Immunodepression

```
ctable(data$CVD, data$imunodepre, chisq=TRUE, prop="r", OR=TRUE, useNA = "no")
```

```
## Cross-Tabulation, Row Proportions
## CVD * imunodepre
## Data Frame: data
##
## -----
##      imunodepre          no          yes          Total
##      CVD
##      no                2874 (98.0%)   58 (2.0%)   2932 (100.0%)
##      yes                418 (96.5%)   15 (3.5%)   433 (100.0%)
##      Total              3292 (97.8%)   73 (2.2%)   3365 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      3.2567         1    0.0711
## -----
##
## -----
##      Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.78          1.00        3.17
## -----
##
```

```
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.02      1.02      1.02
## -----
```

## Renal

```
ctable(data$CVD, data$renal, chisq=TRUE, prop="r", OR=TRUE, useNA = "no")
```

```
## Cross-Tabulation, Row Proportions
## CVD * renal
## Data Frame: data
##
##
## -----
##      renal      no      yes      Total
## CVD
## no      2890 (98.8%)  36 (1.2%)  2926 (100.0%)
## yes      414 (95.6%)  19 (4.4%)   433 (100.0%)
## Total    3304 (98.4%)  55 (1.6%)  3359 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      21.431    1      0
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      3.68      2.09      6.48
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.03      1.03      1.03
## -----
```

The variable `comorb_group` indicates the number o comorbidities of each notification.

## Any comorbidity

```
df <- select(data,obesity,hematologic,hepatic,asthma,diabetes,neurologic,pneumologic,imunodepre,renal)
soma <- function(x){
  if (sum(is.na(x))==9)
    return(NA_character_)
}
```

```

else
  return(sum(!is.na(x) & x=="yes"))
}
data$qt_comorb_aux <- apply(df,1,soma)

data <- data %>%
  mutate(qt_comorb = case_when(qt_comorb_aux== 9 ~ "9 comorbidities",
                                qt_comorb_aux == 7 ~ "7 comorbidities",
                                qt_comorb_aux== 6 ~ "6 comorbidities",
                                qt_comorb_aux == 5 ~ "5 comorbidities",
                                qt_comorb_aux== 4 ~ "4 comorbidities",
                                qt_comorb_aux == 3 ~ "3 comorbidities",
                                qt_comorb_aux == 2 ~ "2 comorbidities",
                                qt_comorb_aux == 1 ~ "1 comorbidity",
                                qt_comorb_aux == 0 ~ "No comorbidity",
                                TRUE ~ NA_character_))

data <- data %>%
  mutate(comorb_group = case_when(qt_comorb_aux == 0 ~ "No comorbidity",
                                   qt_comorb_aux == 1 ~ "1 comorbidity",
                                   qt_comorb_aux == 2 ~ "2 comorbidities",
                                   qt_comorb_aux > 2 ~ ">2 comorbidities",
                                   TRUE ~ NA_character_))

data$comorb_group <-
  factor(data$comorb_group, levels = c("No comorbidity", "1 comorbidity", "2 comorbidities", ">2 comorbidity"))

with(data, ctable(comorb_group, CVD, prop="c", useNA = "no", chisq = TRUE, OR = TRUE))

```

```
## Cross-Tabulation, Column Proportions
```

```
## comorb_group * CVD
```

```
## Data Frame: data
```

```
##
```

```
##
```

```
## -----
```

	CVD	no	yes	Total
comorb_group				
No comorbidity	2126 ( 71.8%)	234 ( 46.8%)	2360 ( 68.2%)	
1 comorbidity	701 ( 23.7%)	186 ( 37.2%)	887 ( 25.6%)	
2 comorbidities	116 ( 3.9%)	64 ( 12.8%)	180 ( 5.2%)	
>2 comorbidities	17 ( 0.6%)	16 ( 3.2%)	33 ( 1.0%)	
Total	2960 (100.0%)	500 (100.0%)	3460 (100.0%)	

```
## -----
```

```
##
```

```
## -----
```

	Chi.squared	df	p.value
	165.5306	3	0

```
## -----
```

```
##
```

```
##
```

```
##
```



## Outcome

```
# ICU
data <- data %>%
  mutate(icu = case_when(UTI == 1 ~ "yes",
                        UTI == 2 ~ "no",
                        TRUE ~ NA_character_))

# Ventilatory support
data <- data %>%
  mutate(ven_support = case_when(SUPPORT_VEN == 1 ~ "yes, invasive",
                                SUPPORT_VEN == 2 ~ "yes, noninvasive",
                                SUPPORT_VEN == 3 ~ "No",
                                TRUE ~ NA_character_))
```

## ICU

```
#tabela cruzada de uti
with(data, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * icu
## Data Frame: data
##
##
## -----
##          icu          no          yes          Total
##    CVD
##    no      2043 (71.8%)    802 (28.2%)    2845 (100.0%)
##    yes       356 (63.0%)    209 (37.0%)     565 (100.0%)
##    Total    2399 (70.4%)   1011 (29.6%)    3410 (100.0%)
## -----
##
## -----
##    Chi.squared    df    p.value
## -----
##      17.0872      1         0
## -----
##
## -----
##    Odds Ratio    Lo - 95%    Hi - 95%
## -----
##        1.50         1.24         1.81
## -----
##
## -----
##    Risk Ratio    Lo - 0%    Hi - 0%
## -----
##        1.14         1.14         1.14
## -----
```

## 1st trimester

```
df4 <- data %>%  
  filter(classi_gesta_puerp == "1tri")  
  
with(df4, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions  
## CVD * icu  
## Data Frame: df4  
##  
##  
## -----  
##          icu          no          yes          Total  
## CVD  
## no      121 (77.1%)   36 (22.9%)   157 (100.0%)  
## yes      18 (58.1%)   13 (41.9%)    31 (100.0%)  
## Total    139 (73.9%)   49 (26.1%)   188 (100.0%)  
## -----  
##  
## -----  
## Chi.squared  df    p.value  
## -----  
##      3.9164     1    0.0478  
## -----  
##  
## -----  
## Odds Ratio   Lo - 95%   Hi - 95%  
## -----  
##      2.43      1.09      5.43  
## -----  
##  
## -----  
## Risk Ratio   Lo - 0%    Hi - 0%  
## -----  
##      1.33      1.33      1.33  
## -----
```

## 2nd trimester

```
df4 <- data %>%  
  filter(classi_gesta_puerp == "2tri")  
  
with(df4, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions  
## CVD * icu  
## Data Frame: df4  
##  
##
```

```
## -----
##          icu          no          yes          Total
##      CVD
##      no          315 (68.8%)    143 (31.2%)    458 (100.0%)
##      yes          66 (58.4%)     47 (41.6%)    113 (100.0%)
##      Total        381 (66.7%)    190 (33.3%)    571 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      3.9355         1    0.0473
## -----
##
## -----
##      Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.57          1.03        2.39
## -----
##
## -----
##      Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.18          1.18        1.18
## -----
##
```

### 3rd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "3tri")

with(df4, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * icu
## Data Frame: df4
##
## -----
##          icu          no          yes          Total
##      CVD
##      no          883 (76.6%)    270 (23.4%)    1153 (100.0%)
##      yes          159 (68.2%)     74 (31.8%)    233 (100.0%)
##      Total        1042 (75.2%)    344 (24.8%)    1386 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      6.7894         1    0.0092
## -----
##
```

```
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.52      1.12      2.07
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.12      1.12      1.12
## -----
```

## Puerperium

```
df4 <- data %>%
  filter(classi_gesta_puerp == "puerp")

with(df4, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * icu
## Data Frame: df4
##
##
## -----
##           icu           no           yes           Total
## CVD
## no           678 (66.9%)   335 (33.1%)   1013 (100.0%)
## yes           94 (58.4%)    67 (41.6%)    161 (100.0%)
## Total        772 (65.8%)   402 (34.2%)   1174 (100.0%)
## -----
##
## -----
## Chi.squared   df   p.value
## -----
##      4.1332      1     0.042
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.44      1.03      2.03
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.15      1.15      1.15
## -----
```

## Duration of hospitalization in ICU

```
data <- data %>%
  dplyr::mutate(
    dt_entuti = as.Date(DT_ENTUTI, format = "%d/%m/%Y"),
    dt_saiduti = as.Date(DT_SAIDUTI, format = "%d/%m/%Y"),
    icu_days = as.numeric(dt_saiduti-dt_entuti)
  )
```

```
df <- data[data$icu== "yes" & !is.na(data$icu) & !is.na(data$icu_days),]

datasummary((CVD) ~ icu_days*(n+media+DP+mediana+minimo+maximo+q25+q75+IQR),
  data = df, output = 'markdown')
```

	n	media	DP	mediana	minimo	maximo	q25	q75	IQR
no	514.00	10.53	10.73	7.00	0.00	94.00	3.00	15.00	12.00
yes	114.00	13.46	14.49	10.50	0.00	105.00	4.00	17.00	13.00

```
wilcox.test(icu_days ~ CVD, data = df)
```

```
##
## Wilcoxon rank sum test with continuity correction
##
## data: icu_days by CVD
## W = 25486, p-value = 0.02941
## alternative hypothesis: true location shift is not equal to 0
```

## Ventilatory support

```
with(data, ctable(CVD, ven_support, prop="r", useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * ven_support
## Data Frame: data
##
## -----
##          ven_support          No  yes, invasive  yes, noninvasive  Total
## CVD
## no          1470 (52.7%)    443 (15.9%)    877 (31.4%)  2790 (100.0%)
## yes          226 (40.7%)    110 (19.8%)    219 (39.5%)   555 (100.0%)
## Total        1696 (50.7%)    553 (16.5%)    1096 (32.8%)  3345 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    26.5268    2      0
## -----
```

## Intubation

```
data <- data %>%
  mutate(intubation = case_when(SUPPORT_VEN == 1 ~ "yes",
                                SUPPORT_VEN == 2 ~ "no",
                                SUPPORT_VEN == 3 ~ "no",
                                TRUE ~ NA_character_)
  )
```

```
with(data, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
```

```
## CVD * intubation
```

```
## Data Frame: data
```

```
##
```

```
##
```

```
## -----
##           intubation           no           yes           Total
##   CVD
##   no           2347 (84.1%)    443 (15.9%)    2790 (100.0%)
##   yes           445 (80.2%)    110 (19.8%)    555 (100.0%)
##   Total          2792 (83.5%)    553 (16.5%)    3345 (100.0%)
## -----
```

```
##
```

```
## -----
```

```
##   Chi.squared   df   p.value
## -----
```

```
##     4.9304      1    0.0264
## -----
```

```
##
```

```
## -----
```

```
##   Odds Ratio   Lo - 95%   Hi - 95%
## -----
```

```
##     1.31       1.04       1.65
## -----
```

```
##
```

```
## -----
```

```
##   Risk Ratio   Lo - 0%   Hi - 0%
## -----
```

```
##     1.05       1.05       1.05
## -----
```

```
##
```

1st trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "1tri")
```

```
with(df4, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = FALSE))
```

```
## Cross-Tabulation, Row Proportions
```

```
## CVD * intubation
## Data Frame: df4
##
##
## -----
##           intubation           no           yes           Total
##    CVD
##    no           135 (88.8%)    17 (11.2%)    152 (100.0%)
##    yes           23 (79.3%)     6 (20.7%)     29 (100.0%)
##    Total         158 (87.3%)    23 (12.7%)    181 (100.0%)
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      2.07      0.74      5.80
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.12      1.12      1.12
## -----
```

```
fisher.test(df4$CVD, df4$intubation)
```

```
##
## Fisher's Exact Test for Count Data
##
## data: df4$CVD and df4$intubation
## p-value = 0.2182
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.601484 6.248095
## sample estimates:
## odds ratio
##  2.061721
```

## 2nd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "2tri")

with(df4, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * intubation
## Data Frame: df4
##
##
## -----
```

```
##          intubation          no          yes          Total
##      CVD
##      no          373 (85.0%)    66 (15.0%)    439 (100.0%)
##      yes          88 (79.3%)    23 (20.7%)    111 (100.0%)
##      Total        461 (83.8%)    89 (16.2%)    550 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      1.7139         1    0.1905
## -----
##
## -----
##      Odds Ratio     Lo - 95%    Hi - 95%
## -----
##      1.48           0.87        2.51
## -----
##
## -----
##      Risk Ratio     Lo - 0%     Hi - 0%
## -----
##      1.07           1.07        1.07
## -----
```

### 3rd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "3tri")

with(df4, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * intubation
## Data Frame: df4
##
## -----
##          intubation          no          yes          Total
##      CVD
##      no          1007 (89.0%)    125 (11.0%)    1132 (100.0%)
##      yes          195 (84.4%)    36 (15.6%)    231 (100.0%)
##      Total        1202 (88.2%)    161 (11.8%)    1363 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      3.3759         1    0.0662
## -----
##
## -----
```



```
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.49      1.00      2.22
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.05      1.05      1.05
## -----
```

## Puerperium

```
df4 <- data %>%
  filter(classi_gesta_puerp == "puerp")

with(df4, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * intubation
## Data Frame: df4
##
## -----
##      intubation      no      yes      Total
## CVD
## no      778 (77.6%)    224 (22.4%)    1002 (100.0%)
## yes     118 (75.2%)     39 (24.8%)     157 (100.0%)
## Total    896 (77.3%)    263 (22.7%)    1159 (100.0%)
## -----
##
## -----
## Chi.squared   df   p.value
## -----
##      0.3468      1   0.5559
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.15      0.78      1.70
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.03      1.03      1.03
## -----
```

## Outcome - cure x death

```
with(data, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * evolution
## Data Frame: data
##
## -----
##          evolution          cure          death          Total
## CVD
## no          2559 (86.5%)    401 (13.5%)    2960 (100.0%)
## yes          488 (81.1%)    114 (18.9%)    602 (100.0%)
## Total        3047 (85.5%)    515 (14.5%)    3562 (100.0%)
## -----
##
## -----
## Chi.squared   df   p.value
## -----
##    11.3176     1    8e-04
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##     1.49       1.19     1.88
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##     1.07       1.07     1.07
## -----
```

1st trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "1tri")

with(df4, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = FALSE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * evolution
## Data Frame: df4
##
## -----
##          evolution          cure          death          Total
## CVD
```

```
##      no      146 (90.7%)   15 ( 9.3%)   161 (100.0%)
##      yes      30 (88.2%)    4 (11.8%)    34 (100.0%)
##      Total    176 (90.3%)   19 ( 9.7%)   195 (100.0%)
## -----
##
## -----
##      Odds Ratio      Lo - 95%      Hi - 95%
## -----
##      1.30           0.40          4.18
## -----
##
## -----
##      Risk Ratio      Lo - 0%      Hi - 0%
## -----
##      1.03           1.03          1.03
## -----
```

```
fisher.test(df4$CVD, df4$evolution)
```

```
##
## Fisher's Exact Test for Count Data
##
## data: df4$CVD and df4$evolution
## p-value = 0.7494
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.2926084 4.4639958
## sample estimates:
## odds ratio
##  1.295924
```

## 2nd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "2tri")

with(df4, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * evolution
## Data Frame: df4
##
## -----
##      evolution      cure      death      Total
##      CVD
##      no      410 (87.0%)   61 (13.0%)   471 (100.0%)
##      yes      90 (75.0%)   30 (25.0%)   120 (100.0%)
##      Total    500 (84.6%)   91 (15.4%)   591 (100.0%)
## -----
##
```

```
## -----
## Chi.squared  df  p.value
## -----
##      9.753      1  0.0018
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      2.24      1.37      3.67
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.16      1.16      1.16
## -----
```

### 3rd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "3tri")

with(df4, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * evolution
## Data Frame: df4
##
## -----
##      evolution      cure      death      Total
## CVD
## no      1071 (89.3%)  128 (10.7%)  1199 (100.0%)
## yes      212 (85.5%)   36 (14.5%)   248 (100.0%)
## Total    1283 (88.7%)  164 (11.3%)  1447 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      2.6461      1  0.1038
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.42      0.95      2.12
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
```

```
## -----
##      1.04      1.04      1.04
## -----
```

## Puerperium

```
df4 <- data %>%
  filter(classi_gesta_puerp == "puerp")

with(df4, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE))
```

```
## Cross-Tabulation, Row Proportions
## CVD * evolution
## Data Frame: df4
##
## -----
##      evolution      cure      death      Total
##      CVD
##      no      856 (81.9%)  189 (18.1%)  1045 (100.0%)
##      yes      133 (78.2%)   37 (21.8%)   170 (100.0%)
##      Total      989 (81.4%)  226 (18.6%)  1215 (100.0%)
## -----
##
## -----
##      Chi.squared   df   p.value
## -----
##      1.0751       1   0.2998
## -----
##
## -----
##      Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.26         0.85       1.87
## -----
##
## -----
##      Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.05         1.05       1.05
## -----
```

## Time elapsed between the start of symptoms and the outcome (days)

```
data <- data %>%
  dplyr::mutate(
    dt_sin_pri = as.Date(DT_SIN_PRI, format = "%d/%m/%Y"),
    dt_evoluca = as.Date(DT_EVOLUCA, format = "%d/%m/%Y"),
    days_symp_evol = as.numeric(dt_evoluca-dt_sin_pri)
  )
```

```
df <- data[!is.na(data$days_symp_evol) & !is.na(data$CVD),]

datasummary((CVD) ~ days_symp_evol*(n+media+DP+mediana+minimo+maximo+q25+q75+IQR),
  data = df, output = 'markdown')
```

	n	media	DP	mediana	minimo	maximo	q25	q75	IQR
no	2863.00	16.00	15.80	13.00	0.00	244.00	8.00	19.00	11.00
yes	586.00	17.10	12.80	14.00	0.00	113.00	9.00	20.75	11.75

```
wilcox.test(days_symp_evol ~ CVD, data = df)
```

```
##
## Wilcoxon rank sum test with continuity correction
##
## data:  days_symp_evol by CVD
## W = 751451, p-value = 6.809e-05
## alternative hypothesis: true location shift is not equal to 0
```

Considering only death cases

```
df <- data[!is.na(data$days_symp_evol) & !is.na(data$CVD),]

df <- df %>%
  filter(evolution == "death")

datasummary((CVD) ~ days_symp_evol*(n+media+DP+mediana+minimo+maximo+q25+q75+IQR),
  data = df, output = 'markdown')
```

	n	media	DP	mediana	minimo	maximo	q25	q75	IQR
no	399.00	20.34	13.86	18.00	0.00	158.00	12.00	27.00	15.00
yes	114.00	20.04	14.11	17.00	0.00	113.00	11.00	26.75	15.75

```
wilcox.test(days_symp_evol ~ CVD, data = df)
```

```
##
## Wilcoxon rank sum test with continuity correction
##
## data:  days_symp_evol by CVD
## W = 23410, p-value = 0.6331
## alternative hypothesis: true location shift is not equal to 0
```

Considering only cure cases

```
df <- data[!is.na(data$days_symp_evol) & !is.na(data$CVD),]

df <- df %>%
  filter(evolution == "cure")

datasummary((CVD) ~ days_symp_evol*(n+media+DP+mediana+minimo+maximo+q25+q75+IQR),
  data = df, output = 'markdown')
```

	n	media	DP	mediana	minimo	maximo	q25	q75	IQR
no	2464.00	15.30	15.99	12.00	0.00	244.00	7.00	18.00	11.00
yes	472.00	16.39	12.37	13.00	0.00	93.00	9.00	19.00	10.00

```
wilcox.test(days_symp_evol ~ CVD, data = df)
```

```
##
## Wilcoxon rank sum test with continuity correction
##
## data: days_symp_evol by CVD
## W = 513735, p-value = 5.814e-05
## alternative hypothesis: true location shift is not equal to 0
```

## Distribution of number of hospitalizations due to COVID-19 infection by month of first symptoms, stratified by groups with and without CVD

```
# Date of the first symptoms
data <- data %>%
mutate(dt_first_symp = as.Date(DT_SIN_PRI, format = "%d/%m/%Y")
)
```

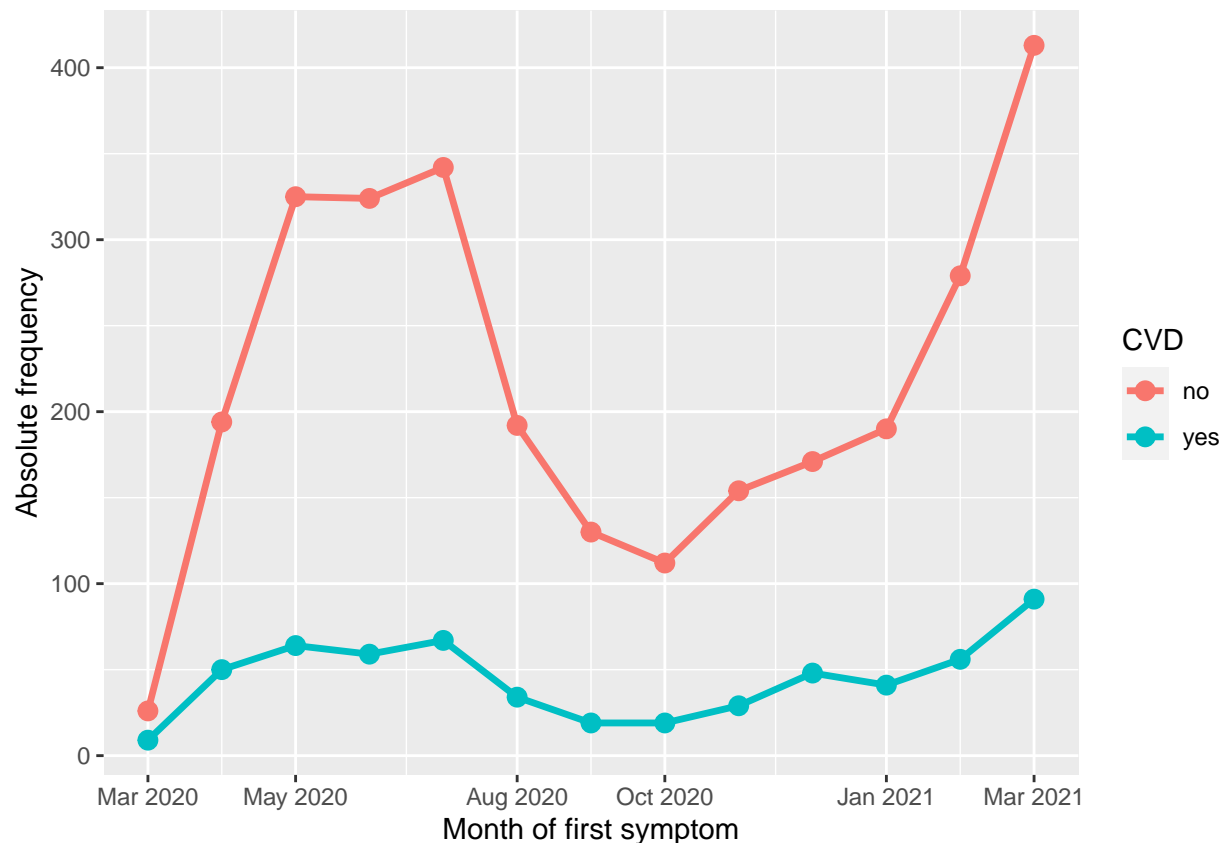
The next graph presents the temporal evolution of hospitalizations by month of first symptoms, stratified by groups with and without cardiovascular disease.

```
## Creating the variable month_year
d1 <- data[data$dt_first_symp < as.Date("01/04/2021",format="%d/%m/%Y"),]
d1 <- d1 %>%
mutate(month_year = paste(formatC(month(dt_first_symp), width=2, format="d", flag="0"),year(dt_first_symp)))

d<- table(factor(d1$month_year, levels = c("03/2020", "04/2020", "05/2020", "06/2020", "07/2020", "08/2020")))
G <- data.table(d)
Sys.setlocale("LC_TIME", "C")
```

```
## [1] "C"
```

```
G$V1 <- as.yearmon(G$V1, format = "%m/%Y")
ggplot(G, aes(x=V1, y=N, colour=factor(V2), group=V2)) +
  geom_line(size=1.2) + geom_point(size=3) +
  labs( x="Month of first symptom", y="Absolute frequency", color = "CVD")
```



Frequency table of number of hospitalizations due to COVID-19 infection by month of first symptoms, stratified by groups with and without CVD.

```
d1$mes_ano <- factor(d1$month_year, levels = c("03/2020", "04/2020", "05/2020", "06/2020", "07/2020", "08/2020", "09/2020", "10/2020", "11/2020", "12/2020", "01/2021", "02/2021", "03/2021"),
ctable(d1$month_year, d1$CVD, prop="c", useNA = "no")
```

```
## Cross-Tabulation, Column Proportions
```

```
## month_year * CVD
```

```
## Data Frame: d1
```

```
##
```

```
## -----
##          CVD          no          yes          Total
## month_year
## 01/2021      190 ( 6.7%)      41 ( 7.0%)      231 ( 6.7%)
## 02/2021      279 ( 9.8%)      56 ( 9.6%)      335 ( 9.7%)
## 03/2020       26 ( 0.9%)       9 ( 1.5%)       35 ( 1.0%)
## 03/2021      413 (14.5%)      91 (15.5%)      504 (14.7%)
## 04/2020      194 ( 6.8%)      50 ( 8.5%)      244 ( 7.1%)
## 05/2020      325 (11.4%)      64 (10.9%)      389 (11.3%)
## 06/2020      324 (11.4%)      59 (10.1%)      383 (11.1%)
## 07/2020      342 (12.0%)      67 (11.4%)      409 (11.9%)
## 08/2020      192 ( 6.7%)      34 ( 5.8%)      226 ( 6.6%)
## 09/2020      130 ( 4.6%)      19 ( 3.2%)      149 ( 4.3%)
## 10/2020      112 ( 3.9%)      19 ( 3.2%)      131 ( 3.8%)
## 11/2020      154 ( 5.4%)      29 ( 4.9%)      183 ( 5.3%)
## 12/2020      171 ( 6.0%)      48 ( 8.2%)      219 ( 6.4%)
```



```
##           Total           2852 (100.0%)    586 (100.0%)    3438 (100.0%)
## -----
```

Now, to understand better the monthly growth rate of hospitalized cases by COVID-19, we present the following graph:

```
D1<- table(d1$month_year, d1$CVD) %>%
  data.table()
D1$V1 <- as.yearmon(D1$V1, format = "%m/%Y")

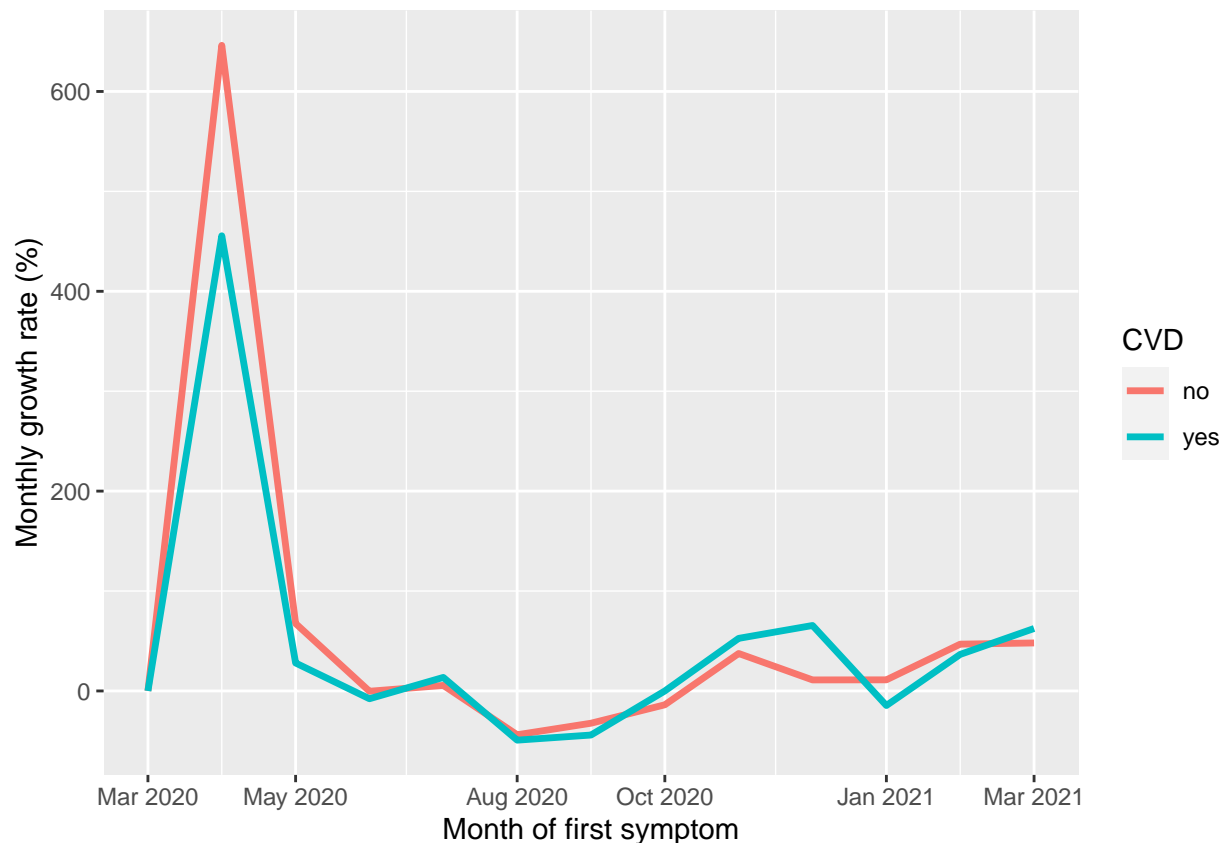
# Calculating the monthly growth rate
D1 <- D1 %>%
  arrange(D1)

dif<-c()
dif[1:2]<-0
for(i in 1:nrow(D1)){
  if( i %% 2 == 0){
    dif[i]<-D1$N[i+2]-D1$N[i]
  }
  else{
    dif[i]<-D1$N[i+2]-D1$N[i]
  }
}
D1$dif<-dif

taxa_cresc<-c()
taxa_cresc[1:2]<-0
for(i in 1:(nrow(D1)-2)){
  if( i %% 2 == 0){
    taxa_cresc[i+2]<-(dif[i])/(D1$N[i])
  }
  else{
    taxa_cresc[i+2]<-(dif[i])/(D1$N[i])
  }
}

D1$growth_rate <-taxa_cresc*100

ggplot(D1) + geom_line(aes(x=V1, y = growth_rate, color = V2), size=1.2) + labs( x="Month of first symp
```



Proportion of deaths in the CVD and non-CVD groups, fixed the month of the first symptom.

```
# Proportion of deaths in the group with presence of CVD
d1 <- data
d1 <- d1 %>%
  filter(CVD == 'yes')
d1 <- d1 %>%
  mutate(month_year = paste(formatC(month(dt_first_symp), width=2, format="d", flag="0"),year(dt_first_symp)))

d<- prop.table(table(d1$month_year, d1$evolution),1)
G3 <- as.data.frame(d)
G3 <- G3[G3$Var2 == "death",]
G3$Freq <- round((G3$Freq)*100, 2)
G3$Var1 <- as.yearmon(G3$Var1, format = "%m/%Y")

# Proportion of deaths in the group with absence of CVD
d2 <- data
d2 <- d2 %>%
  filter(CVD == 'no')
d2 <- d2 %>%
  mutate(month_year = paste(formatC(month(dt_first_symp), width=2, format="d", flag="0"),year(dt_first_symp)))

d2<- prop.table(table(d2$month_year, d2$evolution),1)
G32 <- as.data.frame(d2)
```

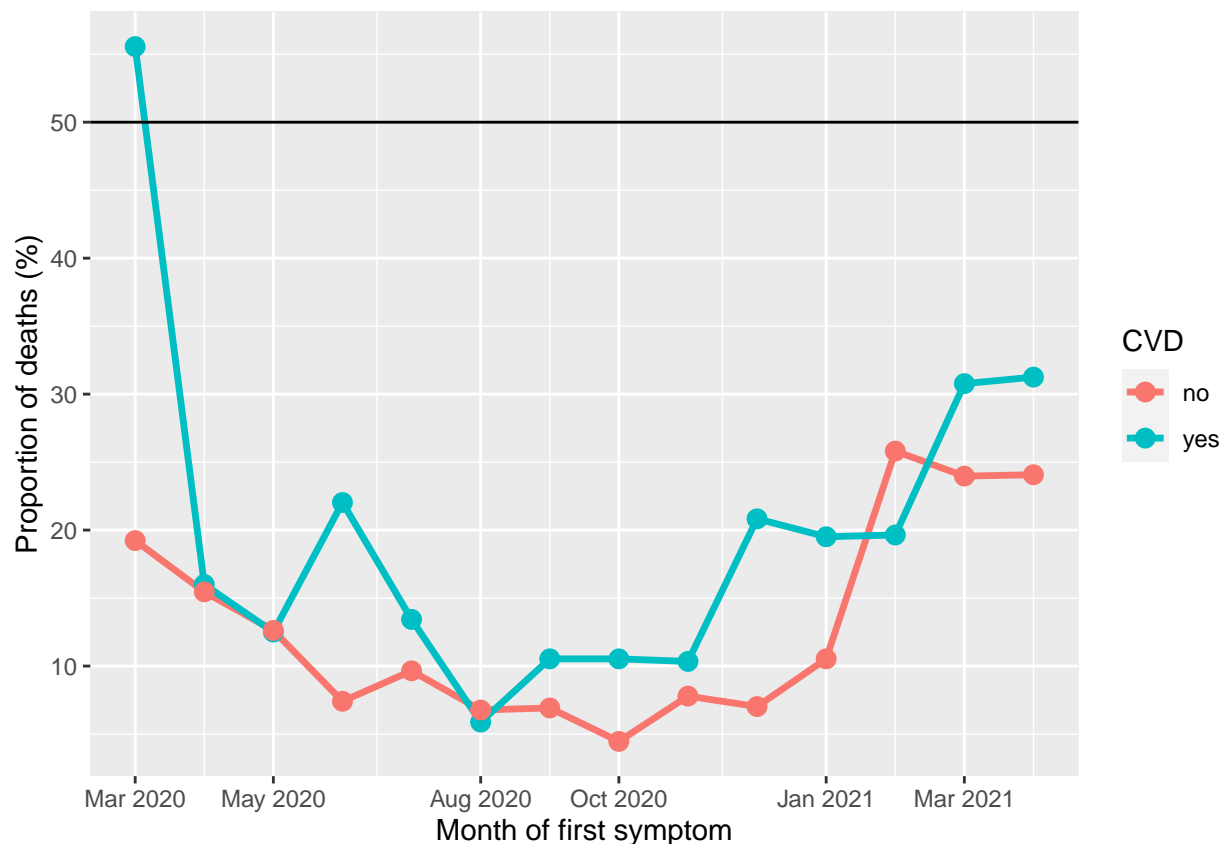
```

G32 <- G32[G32$Var2 == "death",]
G32$Freq <- round((G32$Freq)*100, 2)
G32$Var1 <- as.yearmon(G32$Var1, format = "%m/%Y")

# Concatening the proportion of deaths in both groups, with and without CVD
G33 <- rbind(G3, G32)
cardio <- c(rep("yes", nrow(G3)), rep("no", nrow(G32)))
G33 <- cbind(G33, cardio)

ggplot(data=G33,aes(x = Var1, y=Freq, color = cardio)) + geom_line(size=1.2) +
geom_point(size=3) +
geom_hline(yintercept = 50) +
labs( x="Month of first symptom", y="Proportion of deaths (%)", color = "CVD")

```



## Propensity Score Matching (PSM):

The analysis that will be made in this section aims to understand the effect of having cardiovascular disease or not on some variables of interest such as symptoms and outcome. In order to make the CVD and non-CVD groups similar with respect to the distribution of some variables that may bring confusion to the study, we will make use of the Propensity Score Matching (PSM) technique. The variables we will control in the analysis are: age, race, diabetes and obesity.

First, we present the difference result between the groups regarding the control variables before the PSM. We consider as “balanced” the cases with mean difference greater than 0.05. As we can see, for most categories of control variables the groups are not balanced before the matching.

```

data$cardio <- ifelse(data$CVD=="yes",1,0)

bal.tab(cardio ~ NU_IDADE_N + ethnicity + diabetes + obesity, data = data, estimand = "ATE", m.threshold

## Balance Measures
##
##          Type Diff.Un      M.Threshold.Un
## NU_IDADE_N      Contin.  0.5949 Not Balanced, >0.05
## ethnicity_black  Binary  0.0258   Balanced, <0.05
## ethnicity_brown  Binary -0.0535 Not Balanced, >0.05
## ethnicity_indigenous Binary -0.0097   Balanced, <0.05
## ethnicity_white  Binary  0.0429   Balanced, <0.05
## ethnicity_yellow Binary -0.0054   Balanced, <0.05
## ethnicity:<NA>    Binary  0.0264   Balanced, <0.05
## diabetes_yes     Binary  0.2218 Not Balanced, >0.05
## diabetes:<NA>    Binary  0.2149 Not Balanced, >0.05
## obesity_yes      Binary  0.1461 Not Balanced, >0.05
## obesity:<NA>     Binary  0.2359 Not Balanced, >0.05
##
## Balance tally for mean differences
##          count
## Balanced, <0.05      5
## Not Balanced, >0.05   6
##
## Variable with the greatest mean difference
##      Variable Diff.Un      M.Threshold.Un
## NU_IDADE_N  0.5949 Not Balanced, >0.05
##
## Sample sizes
##      Control Treated
## All      2960      602

```

As one can see, all variables categories are balanced after PSM.

```

## Estimating the weights of each sampling unit
fit <- weightit(cardio ~ NU_IDADE_N + ethnicity + diabetes + obesity, use.mlogit = FALSE, data = data,
               method = "ps", estimand = "ATE")

data$weight <- fit$weights

bal.tab(fit, m.threshold = 0.05, disp.v.ratio = TRUE)

## Call
## weightit(formula = cardio ~ NU_IDADE_N + ethnicity + diabetes +
##          obesity, data = data, method = "ps", estimand = "ATE", use.mlogit = FALSE)
##
## Balance Measures
##
##          Type Diff.Adj      M.Threshold V.Ratio.Adj
## prop.score      Distance  0.0394 Balanced, <0.05      1.3504
## NU_IDADE_N      Contin.   0.0041 Balanced, <0.05      0.9849
## ethnicity_black  Binary  -0.0003 Balanced, <0.05      .
## ethnicity_brown  Binary  -0.0088 Balanced, <0.05      .
## ethnicity_indigenous Binary   0.0056 Balanced, <0.05      .

```

```
## ethnicity_white      Binary    0.0088 Balanced, <0.05      .
## ethnicity_yellow     Binary   -0.0052 Balanced, <0.05      .
## ethnicity:<NA>        Binary    0.0144 Balanced, <0.05      .
## diabetes_yes         Binary   -0.0036 Balanced, <0.05      .
## diabetes:<NA>         Binary    0.0117 Balanced, <0.05      .
## obesity_yes          Binary    0.0064 Balanced, <0.05      .
## obesity:<NA>          Binary    0.0133 Balanced, <0.05      .
##
## Balance tally for mean differences
##               count
## Balanced, <0.05      12
## Not Balanced, >0.05    0
##
## Variable with the greatest mean difference
##      Variable Diff.Adj      M.Threshold
## ethnicity:<NA>  0.0144 Balanced, <0.05
##
## Effective sample sizes
##           Control Treated
## Unadjusted  2960.    602.
## Adjusted    2332.6  331.15
```

Symptom analysis after PSM:

```
with(data, ctable(CVD, fever, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Fever

```
## Cross-Tabulation, Row Proportions
## CVD * fever
## Data Frame: data
##
## -----
##           fever              no              yes              Total
## CVD
## no          1535.7 (44.5%)    1914.5 (55.5%)    3450.2 (100.0%)
## yes          1510.0 (43.0%)    1997.8 (57.0%)    3507.8 (100.0%)
## Total        3045.8 (43.8%)    3912.2 (56.2%)    6958.0 (100.0%)
## -----
##
## -----
## Chi.squared  df    p.value
## -----
##      1.4563    1    0.2275
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.06      0.97      1.17
```

```
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.03      1.03      1.03
## -----
```

```
with(data, ctable(CVD, cough, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Cough

```
## Cross-Tabulation, Row Proportions
## CVD * cough
## Data Frame: data
##
##
## -----
##      cough      no      yes      Total
## CVD
## no      1161.8 (33.7%)  2290.8 (66.3%)  3452.6 (100.0%)
## yes      1124.8 (32.0%)  2395.0 (68.0%)  3519.8 (100.0%)
## Total    2286.6 (32.8%)  4685.8 (67.2%)  6972.4 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      2.1957    1    0.1384
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.08      0.98      1.19
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.05      1.05      1.05
## -----
```

```
with(data, ctable(CVD, sore_throat, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Sore throat

```
## Cross-Tabulation, Row Proportions
## CVD * sore_throat
## Data Frame: data
##
##
## -----
##      sore_throat      no      yes      Total
##      CVD
##      no      2651.6 (78.2%)      738.2 (21.8%)      3389.8 (100.0%)
##      yes      2588.7 (76.6%)      790.8 (23.4%)      3379.6 (100.0%)
##      Total      5240.3 (77.4%)      1529.0 (22.6%)      6769.3 (100.0%)
## -----
##
## -----
##      Chi.squared      df      p.value
## -----
##      2.4586      1      0.1169
## -----
##
## -----
##      Odds Ratio      Lo - 95%      Hi - 95%
## -----
##      1.10      0.98      1.23
## -----
##
## -----
##      Risk Ratio      Lo - 0%      Hi - 0%
## -----
##      1.02      1.02      1.02
## -----
```

```
with(data, ctable(CVD, dyspnea, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Dyspnea

```
## Cross-Tabulation, Row Proportions
## CVD * dyspnea
## Data Frame: data
##
##
## -----
##      dyspnea      no      yes      Total
##      CVD
##      no      1574.0 (45.6%)      1876.2 (54.4%)      3450.2 (100.0%)
##      yes      1196.9 (33.9%)      2337.6 (66.1%)      3534.4 (100.0%)
##      Total      2770.8 (39.7%)      4213.8 (60.3%)      6984.6 (100.0%)
## -----
##
## -----
##      Chi.squared      df      p.value
## -----
```

```
##      100.3512      1      0
## -----
##
## -----
##      Odds Ratio      Lo - 95%      Hi - 95%
## -----
##          1.64          1.49          1.80
## -----
##
## -----
##      Risk Ratio      Lo - 0%      Hi - 0%
## -----
##          1.35          1.35          1.35
## -----
```

```
with(data, ctable(CVD, resp_dist, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

### Respiratory distress

```
## Cross-Tabulation, Row Proportions
## CVD * resp_dist
## Data Frame: data
##
##
## -----
##      resp_dist      no      yes      Total
##      CVD
##      no      1789.1 (52.1%)  1645.7 (47.9%)  3434.8 (100.0%)
##      yes      1578.1 (45.4%)  1900.2 (54.6%)  3478.3 (100.0%)
##      Total      3367.2 (48.7%)  3545.9 (51.3%)  6913.1 (100.0%)
## -----
##
## -----
##      Chi.squared      df      p.value
## -----
##          30.9549          1          0
## -----
##
## -----
##      Odds Ratio      Lo - 95%      Hi - 95%
## -----
##          1.31          1.19          1.44
## -----
##
## -----
##      Risk Ratio      Lo - 0%      Hi - 0%
## -----
##          1.15          1.15          1.15
## -----
```



```
with(data, ctable(CVD, saturation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Saturation

```
## Cross-Tabulation, Row Proportions
## CVD * saturation
## Data Frame: data
##
##
## -----
##          saturation          no          yes          Total
## CVD
## no          2164.0 (63.5%)    1241.8 (36.5%)    3405.8 (100.0%)
## yes          1810.9 (52.3%)    1654.5 (47.7%)    3465.4 (100.0%)
## Total        3974.9 (57.8%)    2896.3 (42.2%)    6871.2 (100.0%)
## -----
##
## -----
## Chi.squared   df   p.value
## -----
##      89.2193    1       0
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.59       1.45       1.75
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.22       1.22       1.22
## -----
```

```
with(data, ctable(CVD, diarrhea, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Diarrhea

```
## Cross-Tabulation, Row Proportions
## CVD * diarrhea
## Data Frame: data
##
##
## -----
##          diarrhea          no          yes          Total
## CVD
## no          3021.0 (88.6%)    389.7 (11.4%)    3410.7 (100.0%)
```

```
##      yes                3002.5 (89.0%)   371.5 (11.0%)   3374.1 (100.0%)
##      Total              6023.5 (88.8%)   761.2 (11.2%)   6784.7 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      0.2517         1    0.6159
## -----
##
## -----
##      Odds Ratio     Lo - 95%   Hi - 95%
## -----
##      0.96           0.82       1.12
## -----
##
## -----
##      Risk Ratio     Lo - 0%    Hi - 0%
## -----
##      1.00           1.00       1.00
## -----
```

```
with(data, ctable(CVD, vomit, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Vomit

```
## Cross-Tabulation, Row Proportions
## CVD * vomit
## Data Frame: data
##
## -----
##      vomit                no                yes                Total
##      CVD
##      no                3062.7 (90.1%)   337.3 ( 9.9%)   3400.1 (100.0%)
##      yes                2998.6 (89.3%)   359.5 (10.7%)   3358.1 (100.0%)
##      Total              6061.3 (89.7%)   696.8 (10.3%)   6758.1 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      1.0397         1    0.3079
## -----
##
## -----
##      Odds Ratio     Lo - 95%   Hi - 95%
## -----
##      1.09           0.93       1.27
## -----
##
```

```
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.01      1.01      1.01
## -----
```

```
with(data, ctable(CVD, fatigue, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Fatigue

```
## Cross-Tabulation, Row Proportions
## CVD * fatigue
## Data Frame: data
##
## -----
##      fatigue      no      yes      Total
## CVD
## no      1892.0 (76.5%)    579.8 (23.5%)    2471.8 (100.0%)
## yes      1733.2 (74.8%)    583.8 (25.2%)    2317.0 (100.0%)
## Total    3625.2 (75.7%)    1163.6 (24.3%)    4788.8 (100.0%)
## -----
##
## -----
## Chi.squared    df    p.value
## -----
##      1.871      1    0.1714
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.10      0.96      1.25
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.02      1.02      1.02
## -----
```

```
with(data, ctable(CVD, loss_smell, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## Loss of smell

```
## Cross-Tabulation, Row Proportions
## CVD * loss_smell
```

```
## Data Frame: data
##
##
## -----
##           loss_smell           no           yes           Total
## CVD
##   no           2002.3 (81.1%)   467.5 (18.9%)   2469.8 (100.0%)
##   yes           1787.6 (77.5%)   520.4 (22.5%)   2308.0 (100.0%)
## Total           3789.9 (79.3%)   987.9 (20.7%)   4777.7 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    9.2983      1  0.0023
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##    1.25        1.08      1.43
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##    1.05        1.05      1.05
## -----
```

```
with(data, ctable(CVD, loss_taste, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

### Loss of taste

```
## Cross-Tabulation, Row Proportions
## CVD * loss_taste
## Data Frame: data
##
##
## -----
##           loss_taste           no           yes           Total
## CVD
##   no           2008.7 (81.5%)   455.8 (18.5%)   2464.6 (100.0%)
##   yes           1792.7 (77.6%)   518.6 (22.4%)   2311.3 (100.0%)
## Total           3801.4 (79.6%)   974.4 (20.4%)   4775.9 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    11.1723      1  8e-04
## -----
```

```
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.27         1.11         1.47
## -----
##
## -----
## Risk Ratio     Lo - 0%     Hi - 0%
## -----
##      1.05         1.05         1.05
## -----
```

```
with(data, ctable(CVD, abd_pain, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

### Abdominal pain

```
## Cross-Tabulation, Row Proportions
## CVD * abd_pain
## Data Frame: data
##
## -----
##          abd_pain          no          yes          Total
## CVD
## no          2243.3 (91.3%)    214.6 (8.7%)    2457.9 (100.0%)
## yes          2102.5 (92.1%)    180.7 (7.9%)    2283.2 (100.0%)
## Total        4345.8 (91.7%)    395.3 (8.3%)    4741.2 (100.0%)
## -----
##
## -----
## Chi.squared    df    p.value
## -----
##      0.9274         1    0.3355
## -----
##
## -----
## Odds Ratio     Lo - 95%     Hi - 95%
## -----
##      0.90         0.73         1.10
## -----
##
## -----
## Risk Ratio     Lo - 0%     Hi - 0%
## -----
##      0.99         0.99         0.99
## -----
```

**Any respiratory symptom** Now we are going to create the variable `resp_symp` indicating the presence of at least one respiratory symptom (Dyspnea, Fadigue, Saturation, Respiratory distress). Empty cells are

considered missing data (<NA>). The variable qt\_resp\_symp indicates the number of respiratory symptoms of each case.

```
with(data, ctable(CVD, resp_symp, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
```

```
## CVD * resp_symp
```

```
## Data Frame: data
```

```
##
```

```
##
```

```
## -----
```

	resp_symp	no	yes	Total
CVD				
no		1056.4 (30.5%)	2408.6 (69.5%)	3465.1 (100.0%)
yes		738.7 (20.7%)	2834.6 (79.3%)	3573.4 (100.0%)
Total		1795.2 (25.5%)	5243.3 (74.5%)	7038.5 (100.0%)

```
## -----
```

```
##
```

```
##
```

```
## -----
```

Chi.squared	df	p.value
88.6786	1	0

```
## -----
```

```
##
```

```
##
```

```
## -----
```

Odds Ratio	Lo - 95%	Hi - 95%
1.68	1.51	1.88

```
## -----
```

```
##
```

```
## -----
```

Risk Ratio	Lo - 0%	Hi - 0%
1.47	1.47	1.47

```
## -----
```

```
##
```

```
##
```

```
## -----
```

Risk Ratio	Lo - 0%	Hi - 0%
1.47	1.47	1.47

```
## -----
```

```
##
```

```
##
```

```
## -----
```

Risk Ratio	Lo - 0%	Hi - 0%
1.47	1.47	1.47

```
## -----
```

```
##
```

```
with(data, ctable(CVD, qt_resp_symp, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
```

```
## CVD * qt_resp_symp
```

```
## Data Frame: data
```

```
##
```

```
##
```

```
## -----
```

	qt_resp_symp	1 symptom	2 symptoms	3 symptoms	4 symptoms	No respir
CVD						
no		763.3 (22.0%)	616.1 (17.8%)	768.8 (22.2%)	260.4 (7.5%)	1
yes		709.1 (19.8%)	892.6 (25.0%)	949.9 (26.6%)	283.0 (7.9%)	1
Total		1472.4 (20.9%)	1508.7 (21.4%)	1718.8 (24.4%)	543.3 (7.7%)	1

```
## -----
```

```
##
```

```
##
```

```
## -----
```

Chi.squared	df	p.value

```
## -----
```

```
## -----
## 127.2795      4      0
## -----
```

**Any symptom** Similar to the analysis of any respiratory symptom, we are going to create the variable symp indicating the presence of at least one symptom (Dyspnea, Fatigue, Saturation, Respiratory distress, Fever, Cough, Sore throat, Diarrhea, Vomit, Abdominal pain, Loss of smell, Loss of taste). Empty cells are considered missing data (<NA>).

```
with(data, ctable(CVD, symp, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * symp
## Data Frame: data
##
## -----
##      symp      no      yes      Total
## CVD
## no      285.8 (8.2%)  3197.3 (91.8%)  3483.1 (100.0%)
## yes     135.9 (3.8%)  3458.6 (96.2%)  3594.5 (100.0%)
## Total   421.7 (6.0%)  6655.9 (94.0%)  7077.6 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    61.0734    1    0
## -----
##
## -----
## Odds Ratio  Lo - 95%  Hi - 95%
## -----
##    2.28      1.85     2.81
## -----
##
## -----
## Risk Ratio  Lo - 0%  Hi - 0%
## -----
##    2.17      2.17     2.17
## -----
```

**Outcome analysis after PSM:**

**ICU**

```
with(data, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * icu
```

```
## Data Frame: data
##
##
## -----
##          icu          no          yes          Total
## CVD
## no      2421.5 (71.6%)   959.7 (28.4%)   3381.2 (100.0%)
## yes     2318.3 (67.5%)   1117.4 (32.5%)   3435.7 (100.0%)
## Total   4739.9 (69.5%)   2077.1 (30.5%)   6817.0 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    13.5876    1    2e-04
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##    1.22       1.10      1.35
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##    1.06       1.06      1.06
## -----
```

```
df43 <- data %>%
  filter(classi_gesta_puerp == "1tri")

with(df43, ctable(CVD, icu, prop="r", useNA = "no", OR=TRUE, chisq = TRUE, weights = weight))
```

1st trimester

```
## Cross-Tabulation, Row Proportions
## CVD * icu
## Data Frame: df43
##
##
## -----
##          icu          no          yes          Total
## CVD
## no      137.3 (76.8%)   41.4 (23.2%)   178.7 (100.0%)
## yes     83.2 (63.3%)   48.2 (36.7%)   131.4 (100.0%)
## Total   220.5 (71.1%)   89.6 (28.9%)   310.2 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
```



```
## -----
##      6.0614      1      0.0138
## -----
##
## -----
## Odds Ratio      Lo - 95%      Hi - 95%
## -----
##      1.92      1.17      3.15
## -----
##
## -----
## Risk Ratio      Lo - 0%      Hi - 0%
## -----
##      1.21      1.21      1.21
## -----
```

```
df43 <- data %>%
  filter(classi_gesta_puerp == "2tri")

with(df43, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

## 2nd trimester

```
## Cross-Tabulation, Row Proportions
## CVD * icu
## Data Frame: df43
##
## -----
##      icu      no      yes      Total
## CVD
## no      362.9 (68.1%)  169.9 (31.9%)  532.9 (100.0%)
## yes      377.5 (61.4%)  237.4 (38.6%)  614.9 (100.0%)
## Total      740.4 (64.5%)  407.4 (35.5%)  1147.8 (100.0%)
## -----
##
## -----
## Chi.squared      df      p.value
## -----
##      5.3395      1      0.0208
## -----
##
## -----
## Odds Ratio      Lo - 95%      Hi - 95%
## -----
##      1.34      1.05      1.71
## -----
##
## -----
## Risk Ratio      Lo - 0%      Hi - 0%
## -----
```

```
##      1.11      1.11      1.11
## -----
```

```
df43 <- data %>%
  filter(classi_gesta_puerp == "3tri")

with(df43, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

### 3rd trimester

```
## Cross-Tabulation, Row Proportions
## CVD * icu
## Data Frame: df43
##
##
## -----
##      icu      no      yes      Total
## CVD
## no      1058.1 (76.8%)  318.8 (23.2%)  1376.8 (100.0%)
## yes      1252.9 (74.1%)  437.2 (25.9%)  1690.1 (100.0%)
## Total      2311.0 (75.4%)  755.9 (24.6%)  3066.9 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      2.8646      1  0.0905
## -----
##
## -----
## Odds Ratio  Lo - 95%  Hi - 95%
## -----
##      1.16      0.98      1.37
## -----
##
## -----
## Risk Ratio  Lo - 0%  Hi - 0%
## -----
##      1.04      1.04      1.04
## -----
```

```
df43 <- data %>%
  filter(classi_gesta_puerp == "puerp")

with(df43, ctable(CVD, icu, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

### Puerperium

```
## Cross-Tabulation, Row Proportions
## CVD * icu
## Data Frame: df43
##
##
## -----
##          icu          no          yes          Total
## CVD
## no      802.7 (66.3%)  407.6 (33.7%)  1210.3 (100.0%)
## yes      540.2 (60.3%)  355.7 (39.7%)   896.0 (100.0%)
## Total    1342.9 (63.8%)  763.4 (36.2%)  2106.3 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    7.8264    1  0.0051
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##    1.30       1.08      1.55
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##    1.10       1.10      1.10
## -----
```

### Days of hospitalization in ICU

```
d_yes <- data %>%
  filter(CVD == "yes" & !is.na(icu_days))
d_no <- data %>%
  filter(CVD == "no" & !is.na(icu_days))

wtd.t.test(d_yes$icu_days, d_no$icu_days, weight = d_yes$weight, weighty = d_no$weight)
```

```
## $test
## [1] "Two Sample Weighted T-Test (Welch)"
##
## $coefficients
##      t.value      df      p.value
##  1.2896729 164.523473  0.1989742
##
## $additional
## Difference   Mean.x   Mean.y   Std. Err
##    1.437357  11.941962  10.504606  1.114513
```

## Ventilatory support

```
with(data, ctable(CVD, ven_support, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * ven_support
## Data Frame: data
##
##
## -----
##          ven_support          No    yes, invasive    yes, noninvasive          Total
##    CVD
##    no          1693.0 (51.3%)    540.7 (16.4%)    1068.2 (32.4%)    3301.9 (100.0%)
##    yes          1611.5 (47.2%)    603.3 (17.7%)    1197.4 (35.1%)    3412.2 (100.0%)
##    Total        3304.6 (49.2%)    1144.0 (17.0%)    2265.6 (33.7%)    6714.2 (100.0%)
## -----
##
## -----
##    Chi.squared    df    p.value
## -----
##      10.9876      2    0.0041
## -----
```

## Intubation

```
with(data, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * intubation
## Data Frame: data
##
##
## -----
##          intubation          no          yes          Total
##    CVD
##    no          2761.2 (83.6%)    540.7 (16.4%)    3301.9 (100.0%)
##    yes          2809.0 (82.3%)    603.3 (17.7%)    3412.2 (100.0%)
##    Total        5570.2 (83.0%)    1144.0 (17.0%)    6714.2 (100.0%)
## -----
##
## -----
##    Chi.squared    df    p.value
## -----
##      1.927        1    0.1651
## -----
##
## -----
##    Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.10        0.97        1.25
```

```
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.02      1.02      1.02
## -----
```

1st trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "1tri")

with(df4, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * intubation
## Data Frame: df4
##
## -----
##          intubation          no          yes          Total
## CVD
## no          153.4 (88.7%)    19.6 (11.3%)    173.0 (100.0%)
## yes          97.1 (80.6%)    23.4 (19.4%)    120.5 (100.0%)
## Total        250.5 (85.3%)    43.0 (14.7%)    293.5 (100.0%)
## -----
##
## -----
## Chi.squared    df    p.value
## -----
##      3.1142      1    0.0776
## -----
##
## -----
## Odds Ratio    Lo - 95%    Hi - 95%
## -----
##      1.89      0.98      3.62
## -----
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.10      1.10      1.10
## -----
```

2nd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "2tri")
```

```
with(df4, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * intubation
## Data Frame: df4
##
##
## -----
##          intubation          no          yes          Total
## CVD
## no          429.5 (84.4%)    79.6 (15.6%)    509.2 (100.0%)
## yes          493.7 (81.6%)   111.4 (18.4%)    605.1 (100.0%)
## Total        923.2 (82.9%)   191.1 (17.1%)   1114.3 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##      1.31      1  0.2524
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##      1.22      0.89     1.67
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##      1.03      1.03     1.03
## -----
##
```

3rd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "3tri")
with(df4, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * intubation
## Data Frame: df4
##
##
## -----
##          intubation          no          yes          Total
## CVD
## no          1205.3 (89.1%)   147.2 (10.9%)   1352.5 (100.0%)
## yes          1479.2 (86.3%)   234.6 (13.7%)   1713.7 (100.0%)
##
```

```
##      Total                2684.5 (87.5%)   381.8 (12.5%)   3066.3 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      5.1945         1    0.0227
## -----
##
## -----
##      Odds Ratio     Lo - 95%   Hi - 95%
## -----
##      1.30           1.04       1.62
## -----
##
## -----
##      Risk Ratio     Lo - 0%    Hi - 0%
## -----
##      1.03           1.03       1.03
## -----
```

## Puerperium

```
df4 <- data %>%
  filter(classi_gesta_puerp == "puerp")

with(df4, ctable(CVD, intubation, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * intubation
## Data Frame: df4
##
## -----
##      intubation          no          yes          Total
##      CVD
##      no          903.0 (76.3%)   280.6 (23.7%)   1183.6 (100.0%)
##      yes          654.0 (75.2%)   215.5 (24.8%)   869.5 (100.0%)
##      Total        1557.0 (75.8%)   496.2 (24.2%)   2053.1 (100.0%)
## -----
##
## -----
##      Chi.squared    df    p.value
## -----
##      0.2619         1    0.6088
## -----
##
## -----
##      Odds Ratio     Lo - 95%   Hi - 95%
## -----
##      1.06           0.86       1.30
## -----
```

```
##
## -----
## Risk Ratio    Lo - 0%    Hi - 0%
## -----
##      1.01      1.01      1.01
## -----
```

## Outcome - cure x death

```
with(data, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * evolution
## Data Frame: data
##
## -----
##      evolution      cure      death      Total
## CVD
## no      3020.3 (86.0%)    491.3 (14.0%)    3511.6 (100.0%)
## yes     2974.7 (82.4%)    636.8 (17.6%)    3611.5 (100.0%)
## Total   5995.0 (84.2%)    1128.1 (15.8%)    7123.1 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    17.433    1    0
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##    1.32      1.16      1.50
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##    1.04      1.04      1.04
## -----
```

## 1st trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "1tri")

with(df4, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))

## Cross-Tabulation, Row Proportions
```



```
## CVD * evolution
## Data Frame: df4
##
##
## -----
##          evolution          cure          death          Total
## CVD
##   no          165.5 (90.4%)    17.5 ( 9.6%)    183.1 (100.0%)
##   yes          121.1 (88.1%)    16.4 (11.9%)    137.4 (100.0%)
## Total          286.6 (89.4%)    33.9 (10.6%)    320.5 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
## -----
##    0.2366      1  0.6267
## -----
##
## -----
## Odds Ratio   Lo - 95%   Hi - 95%
## -----
##    1.28        0.62      2.60
## -----
##
## -----
## Risk Ratio   Lo - 0%   Hi - 0%
## -----
##    1.03        1.03      1.03
## -----
```

## 2nd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "2tri")

with(df4, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))

## Cross-Tabulation, Row Proportions
## CVD * evolution
## Data Frame: df4
##
##
## -----
##          evolution          cure          death          Total
## CVD
##   no          471.8 (86.2%)    75.7 (13.8%)    547.5 (100.0%)
##   yes          484.2 (76.2%)    151.0 (23.8%)    635.3 (100.0%)
## Total          956.0 (80.8%)    226.7 (19.2%)    1182.7 (100.0%)
## -----
##
## -----
## Chi.squared  df  p.value
```

```
## -----
##      18.1283      1      0
## -----
##
## -----
## Odds Ratio      Lo - 95%      Hi - 95%
## -----
##      1.94      1.43      2.63
## -----
##
## -----
## Risk Ratio      Lo - 0%      Hi - 0%
## -----
##      1.13      1.13      1.13
## -----
```

### 3rd trimester

```
df4 <- data %>%
  filter(classi_gesta_puerp == "3tri")

with(df4, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions
## CVD * evolution
## Data Frame: df4
##
## -----
##      evolution      cure      death      Total
## CVD
## no      1279.2 (89.5%)  150.6 (10.5%)  1429.8 (100.0%)
## yes      1565.4 (86.8%)  237.9 (13.2%)  1803.3 (100.0%)
## Total      2844.6 (88.0%)  388.5 (12.0%)  3233.1 (100.0%)
## -----
##
## -----
## Chi.squared      df      p.value
## -----
##      5.0783      1      0.0242
## -----
##
## -----
## Odds Ratio      Lo - 95%      Hi - 95%
## -----
##      1.29      1.04      1.60
## -----
##
## -----
## Risk Ratio      Lo - 0%      Hi - 0%
## -----
##      1.03      1.03      1.03
```

```
## -----
```

## Puerperium

```
df4 <- data %>%  
  filter(classi_gesta_puerp == "puerp")  
  
with(df4, ctable(CVD, evolution, prop="r", OR=TRUE, useNA = "no", chisq = TRUE, weights = weight))
```

```
## Cross-Tabulation, Row Proportions  
## CVD * evolution  
## Data Frame: df4  
##  
## -----  
##          evolution          cure          death          Total  
## CVD  
##   no          1009.5 (81.0%)    237.0 (19.0%)    1246.5 (100.0%)  
##   yes          709.0 (77.1%)    210.6 (22.9%)    919.6 (100.0%)  
## Total        1718.5 (79.3%)    447.5 (20.7%)    2166.1 (100.0%)  
## -----  
##  
## -----  
## Chi.squared   df   p.value  
## -----  
##    4.6463      1    0.0311  
## -----  
##  
## -----  
## Odds Ratio    Lo - 95%    Hi - 95%  
## -----  
##    1.27        1.03        1.56  
## -----  
##  
## -----  
## Risk Ratio    Lo - 0%     Hi - 0%  
## -----  
##    1.05        1.05        1.05  
## -----
```

## Time elapsed between the start of symptoms and the outcome (days) after PSM

```
d_yes <- data %>%  
  filter(CVD == "yes" & !is.na(days_symp_evol))  
d_no <- data %>%  
  filter(CVD == "no" & !is.na(days_symp_evol))  
  
# Performing weighted Student's t-tests to compare the CVD and non-CVD groups with respect to the time  
wtd.t.test(d_yes$days_symp_evol, d_no$days_symp_evol, weight = d_yes$weight, weighty = d_no$weight)
```

```
## $test
## [1] "Two Sample Weighted T-Test (Welch)"
##
## $coefficients
##      t.value      df      p.value
## 0.1099695 1063.6837985 0.9124543
##
## $additional
## Difference      Mean.x      Mean.y      Std. Err
## 0.06197113 16.09992557 16.03795444 0.56353001
```

Considering only death cases

```
df <- data[!is.na(data$days_symp_evol) & !is.na(data$CVD),]

df <- df %>%
  filter(evolution == "death")
```

```
d_yes <- df %>%
  filter(CVD == "yes" & !is.na(days_symp_evol))
d_no <- df %>%
  filter(CVD == "no" & !is.na(days_symp_evol))
```

*# Fixed the death cases, we perform a weighted Student's t-tests to compare the CVD and non-CVD groups*

```
wtd.t.test(d_yes$days_symp_evol, d_no$days_symp_evol, weight = d_yes$weight, weighty = d_no$weight)
```

```
## $test
## [1] "Two Sample Weighted T-Test (Welch)"
##
## $coefficients
##      t.value      df      p.value
## -1.2611092 209.4593902 0.2086723
##
## $additional
## Difference      Mean.x      Mean.y      Std. Err
## -1.603168 18.525606 20.128775 1.271237
```

Considering only cure cases

```
df <- data[!is.na(data$days_symp_evol) & !is.na(data$CVD),]

df <- df %>%
  filter(evolution == "cure")
```

```
d_yes <- df %>%
  filter(CVD == "yes" & !is.na(days_symp_evol))
d_no <- df %>%
  filter(CVD == "no" & !is.na(days_symp_evol))
```

```
# Fixed the cure cases, we perform a weighted Student's t-tests to compare the CVD and non-CVD groups w  
wtd.t.test(d_yes$days_symp_evol, d_no$days_symp_evol, weight = d_yes$weight, weighty = d_no$weight)
```

```
## $test  
## [1] "Two Sample Weighted T-Test (Welch)"  
##  
## $coefficients  
##      t.value      df      p.value  
## 0.3550950 844.4701387 0.7226071  
##  
## $additional  
## Difference      Mean.x      Mean.y      Std. Err  
## 0.2215881 15.5695137 15.3479256 0.6240248
```