

Trends of comorbid mental health conditions, 2019-2021

Seattle Children's Hospital Capstone Group

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```
# Load relevant packages
library(tidyverse) # whole bunch of useful packages
library(knitr)      # pretty print
library(lubridate)  # date formatting
library(ggplot2)    # data visualization

# Load relevant local scripts
source("../R/preprocessing.R") # Pre-processing
source("../R/describe-data.R") # Describing overall details of PHIS data
source("../R/summarize-growth.R") # Summarize and present trends
source("../R/model-growth.R")
source("../R/compare-growth.R")

# Load data
phis_raw <- read_csv(file = "../data/mh_subs_uw.csv") # Ensure this is the right directory
nrow(phis_raw) # 106,793 rows
names(phis_raw)

# Preprocess data
phis <- preprocessing(phis_raw)
```

Overall (Substance-related)

```
#####
#### ALL PATIENTS ####
#####

nrow(phis) # 106,693 rows

# Describe data
tab_all <- describe_data(phis)$subgroup_table # Subgroups have sufficient size

## Visualize and summarize trends over time
res_all <- summarize_growth(phis)

# # Plot of hospital counts
# res_all$plots$hosp_counts_by_year
#
```

```

# # Plots of percent growth
# res_all$plots$counts_by_year + labs(title = "Substance-related visits")
# res_all$plots$counts_by_qtr + labs(title = "Substance-related visits")
#
# # Table of percent growth
# res_all$tables$counts_by_year

```

Any Mental Health

```

#####
#### ANY MENTAL HEATH ####
#####

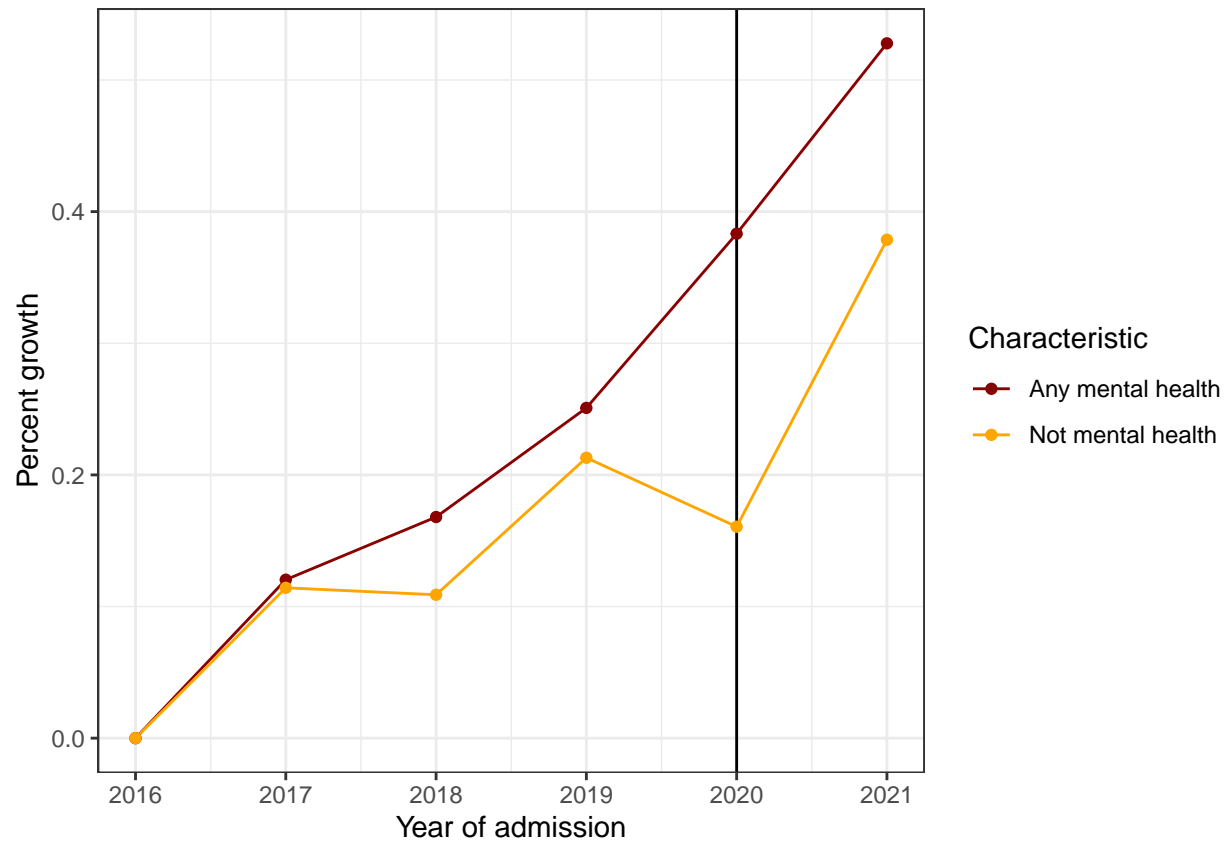
# Describe data
tab_mh <- describe_data(phs, group_by = "MH_ANY")$subgroup_table # Subgroups have sufficient size

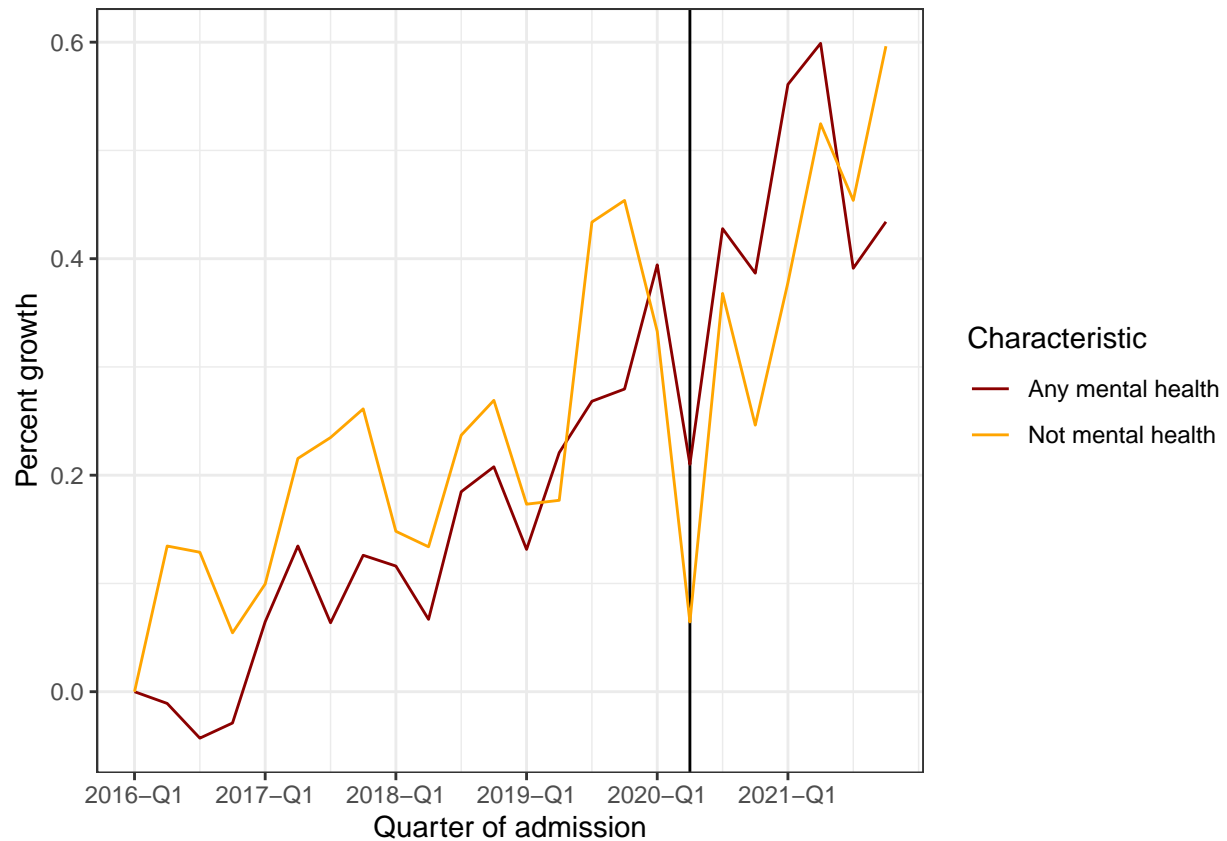
## Plot trends
# Patients with condition
res_mh <- summarize_growth(subset(phs, MH_ANY == 1))
name1 = "Any mental health"

# Patients without condition
res_nmh <- summarize_growth(subset(phs, MH_ANY == 0))
name2 = "Not mental health"

# Compare growths
compare_growth(res_mh$tables, res_nmh$tables, name1, name2)

```





Depressive Disorders

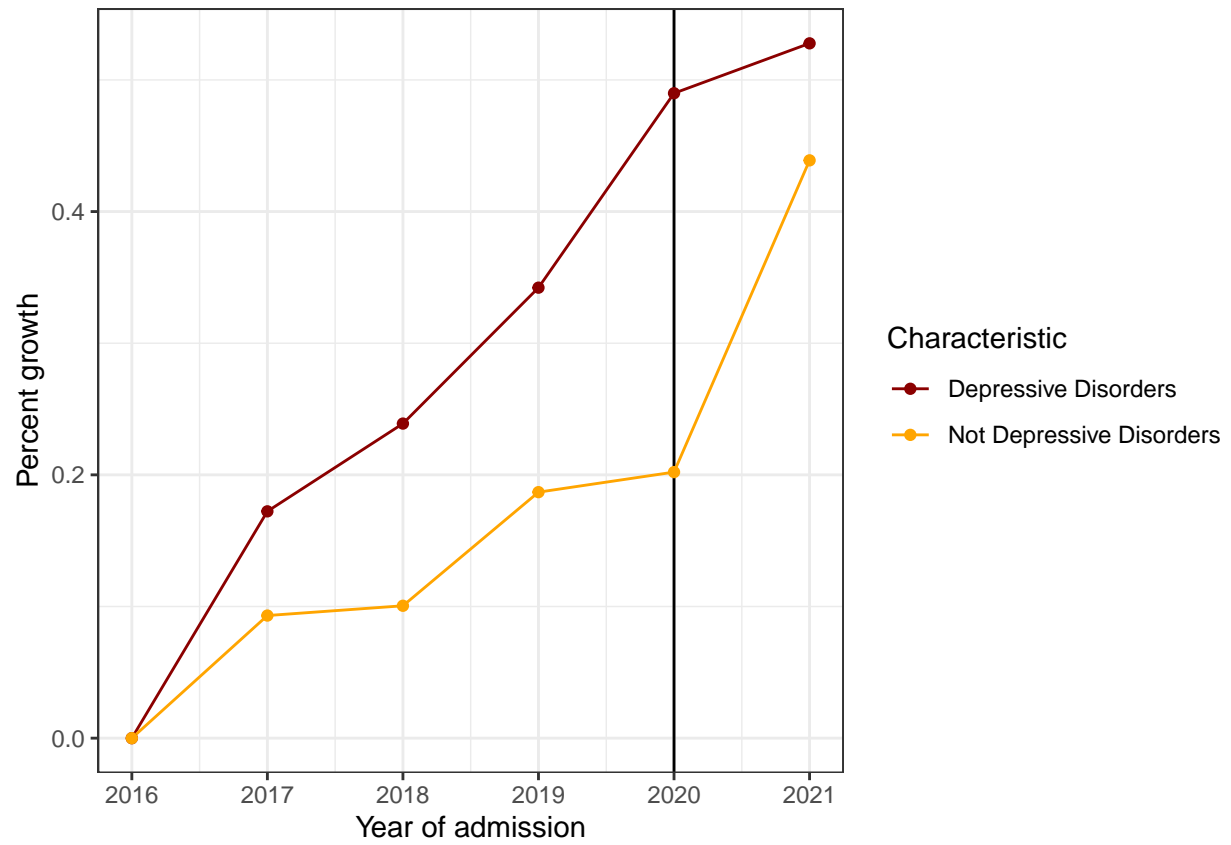
```
#####
#### MENTAL HEATH 7 ####
#####

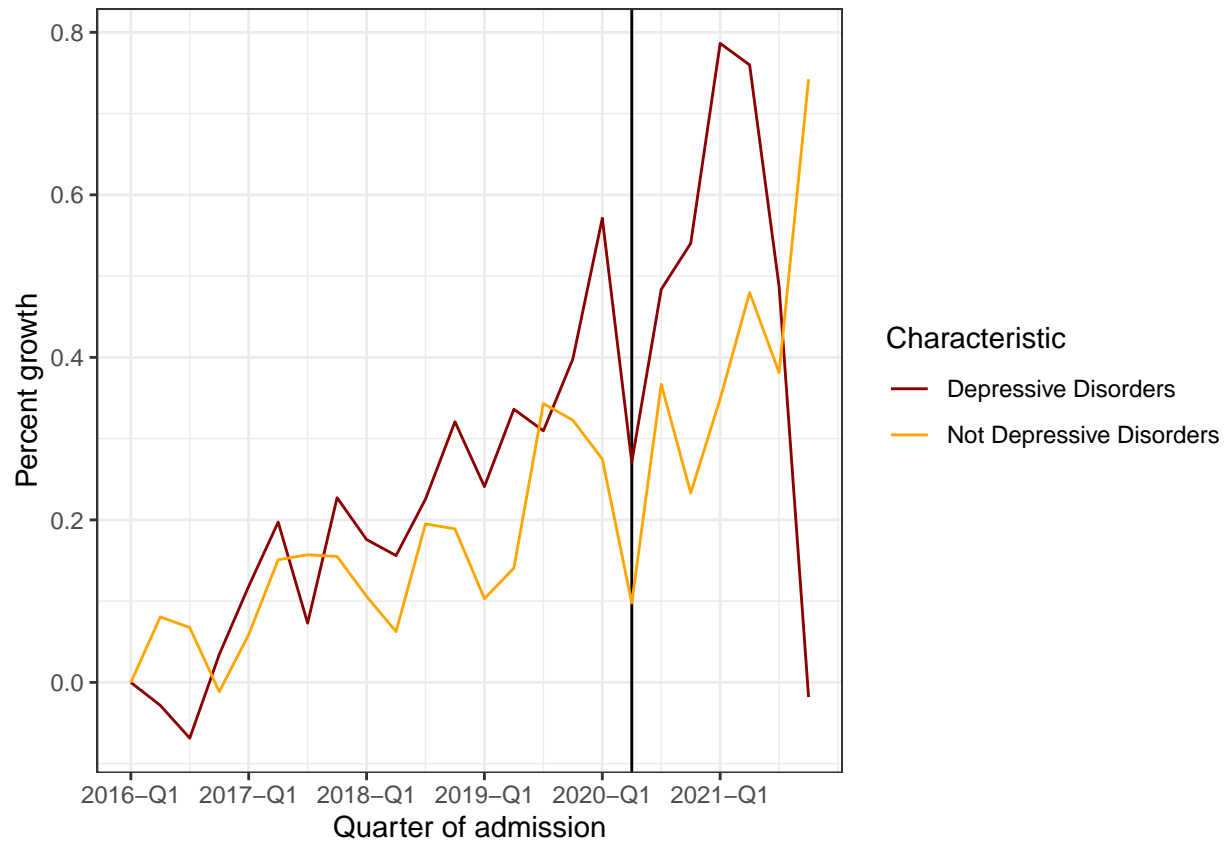
# Describe data
tab_mh7 <- describe_data(phis, group_by = "mh_7")$subgroup_table # 11 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh7 <- summarize_growth(subset(phis, mh_7 == 1))
name1 = "Depressive Disorders"

# Patients without condition
res_nmh7 <- summarize_growth(subset(phis, mh_7 == 0))
name2 = "Not Depressive Disorders"

# Compare growths
compare_growth(res_mh7$stables, res_nmh7$stables, name1, name2)
```





Suicide or Self-Injury

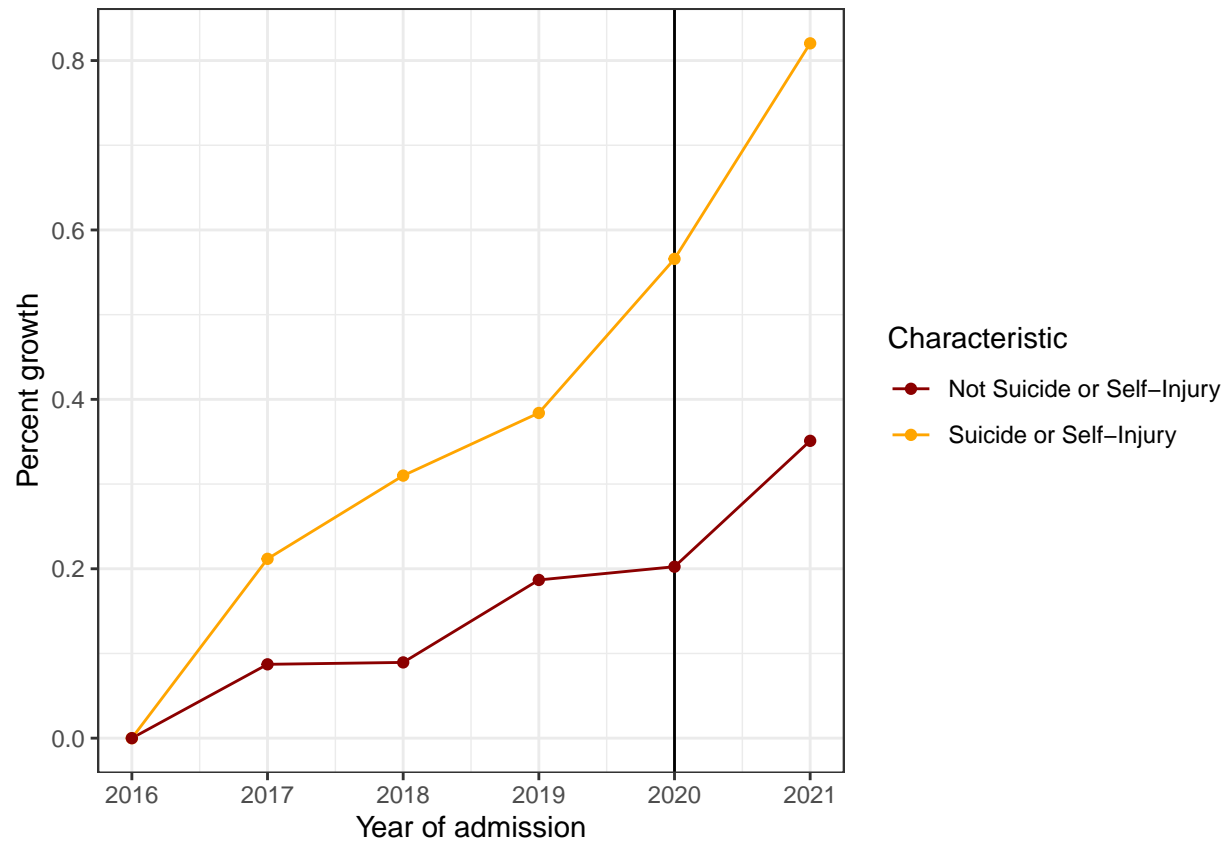
```
#####
#### MENTAL HEATH 29 ####
#####

# Describe data
tab_mh29 <- describe_data(phs, group_by = "mh_29")$subgroup_table # 13 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh29 <- summarize_growth(subset(phs, mh_29 == 1))
name1 = "Suicide or Self-Injury"

# Patients without condition
res_nmh29 <- summarize_growth(subset(phs, mh_29 == 0))
name2 = "Not Suicide or Self-Injury"

# Compare growths
compare_growth(res_mh29$tables, res_nmh29$tables, name1, name2)
```





Substance Use Disorder

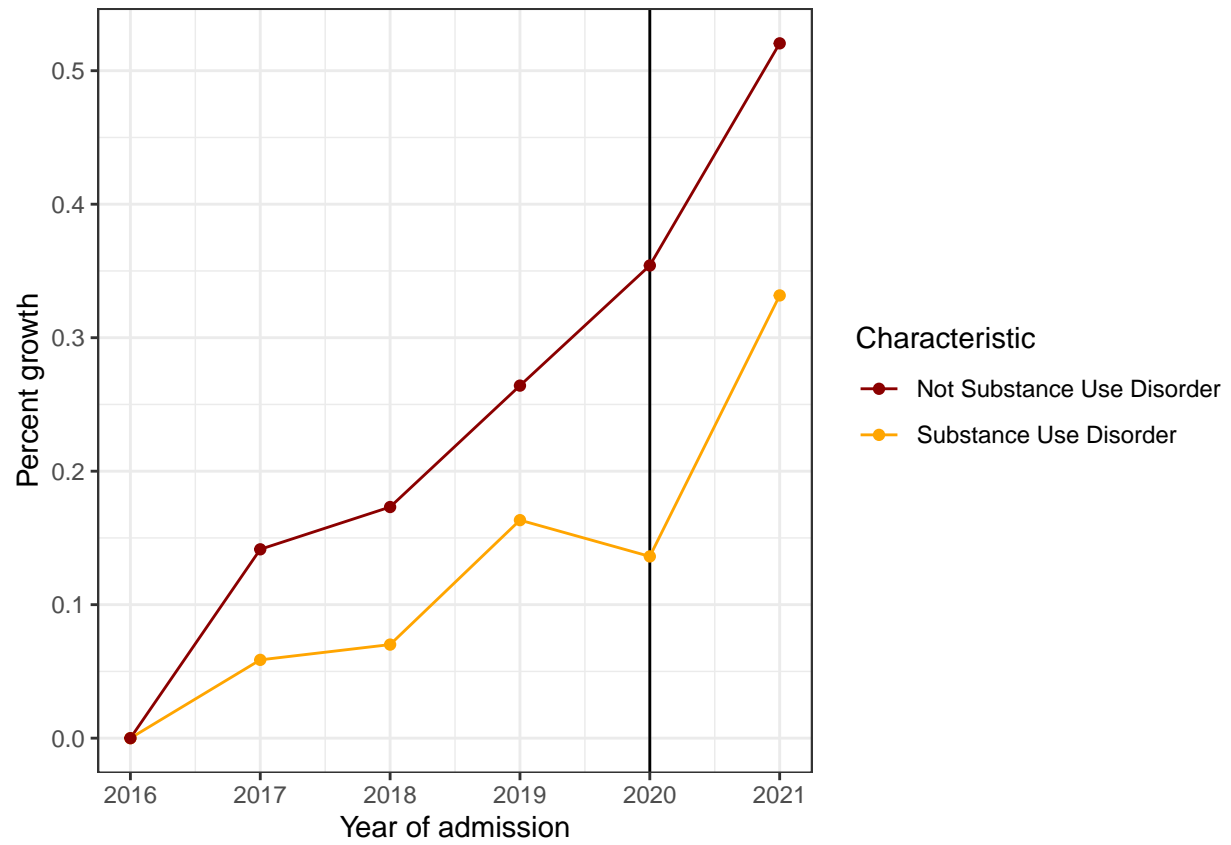
```
#####
#### DEPENDENCE ####
#####

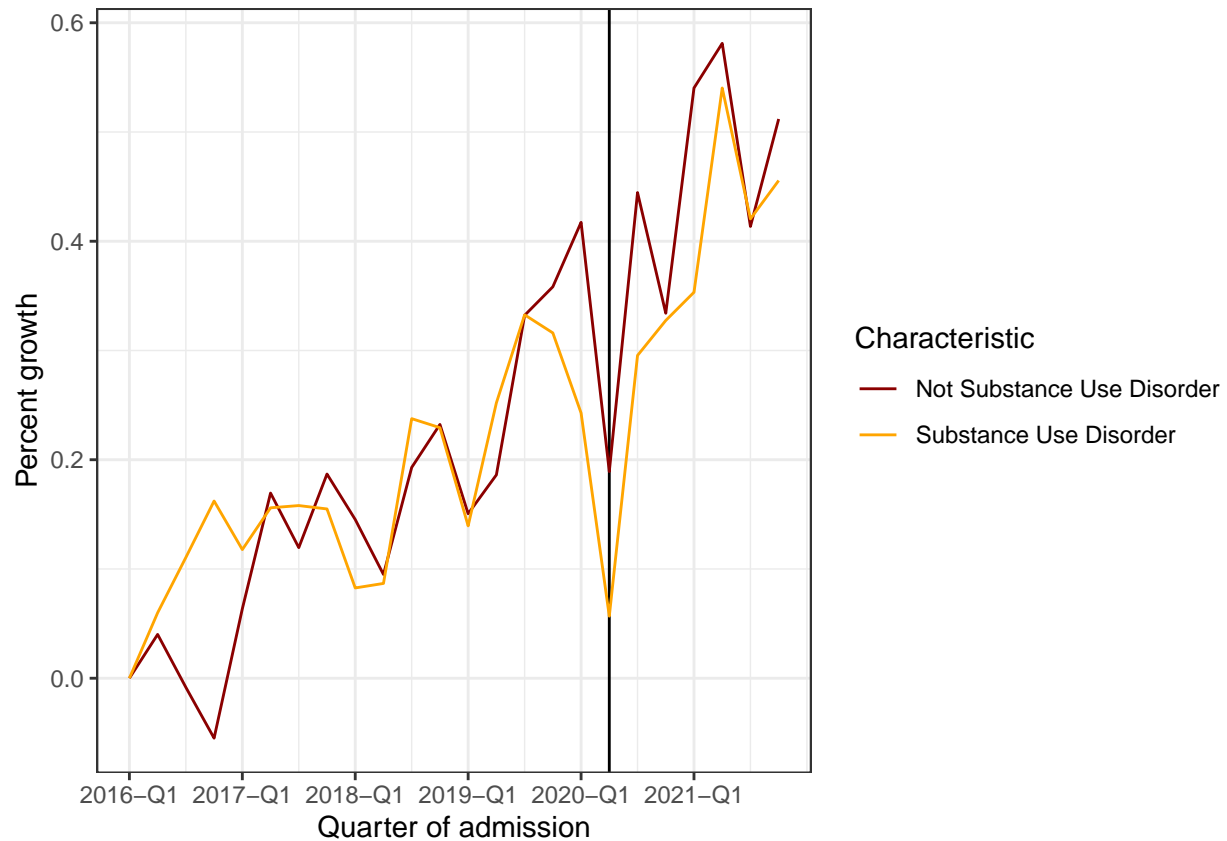
# Describe data
tab_sud <- describe_data(phis, group_by = "dependence")$subgroup_table # 26 subsamples are smaller than

## Plot trends
# Patients with condition
res_sud <- summarize_growth(subset(phis, dependence == 1))
name1 = "Substance Use Disorder"

# Patients without condition
res_nsud <- summarize_growth(subset(phis, dependence == 0))
name2 = "Not Substance Use Disorder"

# Compare growths
compare_growth(res_sud$tables, res_nsud$tables, name1, name2)
```



Anxiety Disorders

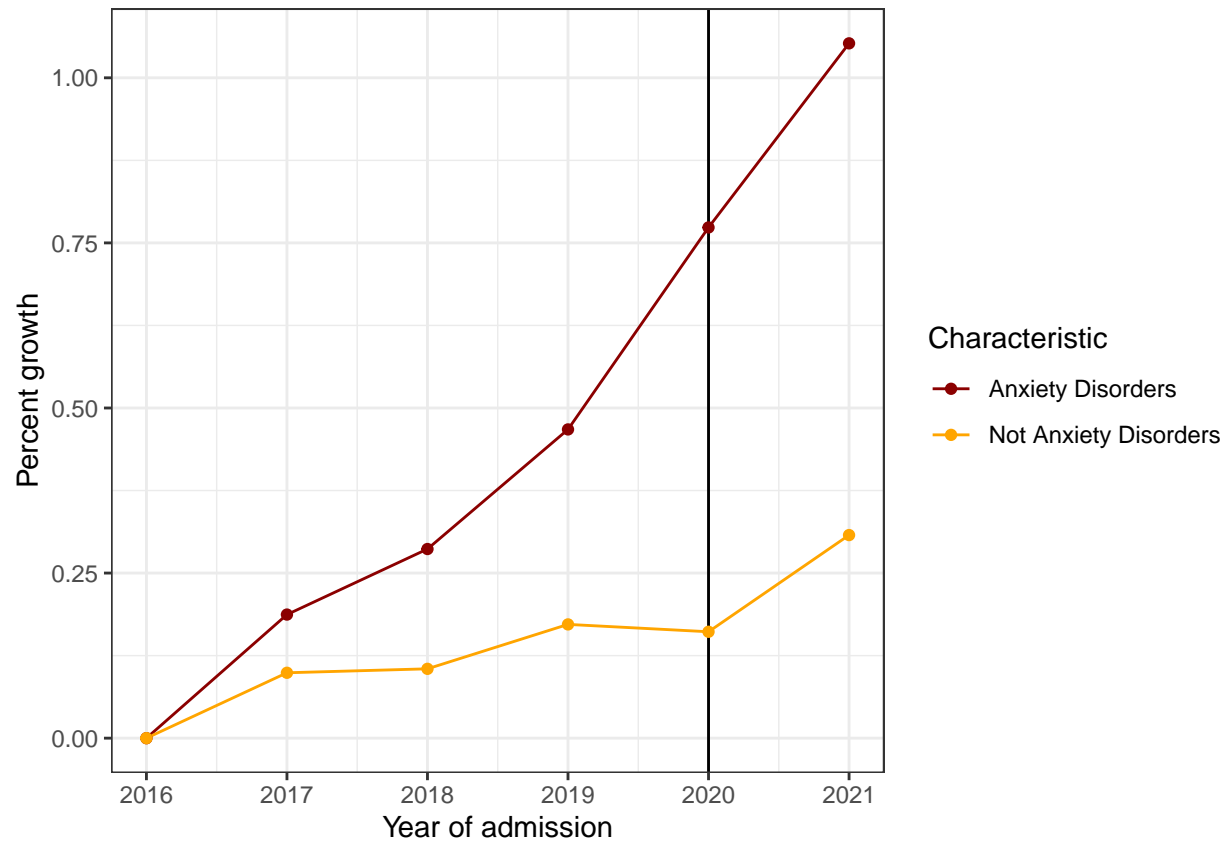
```
#####
#### MENTAL HEATH 29 ####
#####

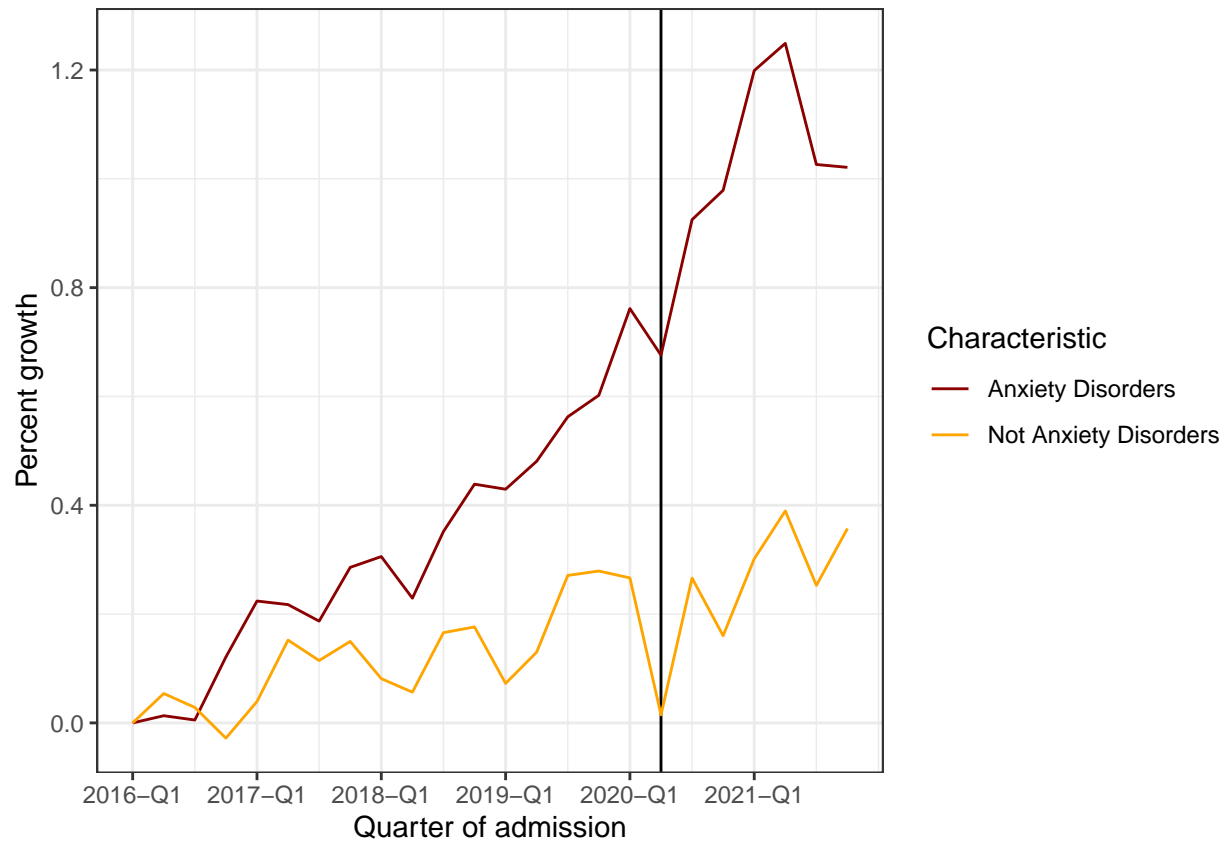
# Describe data
tab_mh3 <- describe_data(phs, group_by = "mh_3")$subgroup_table # 15 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh3 <- summarize_growth(subset(phs, mh_3 == 1))
name1 = "Anxiety Disorders"

# Patients without condition
res_nmh3 <- summarize_growth(subset(phs, mh_3 == 0))
name2 = "Not Anxiety Disorders"

# Compare growths
compare_growth(res_mh3$tables, res_nmh3$tables, name1, name2)
```





ADHD

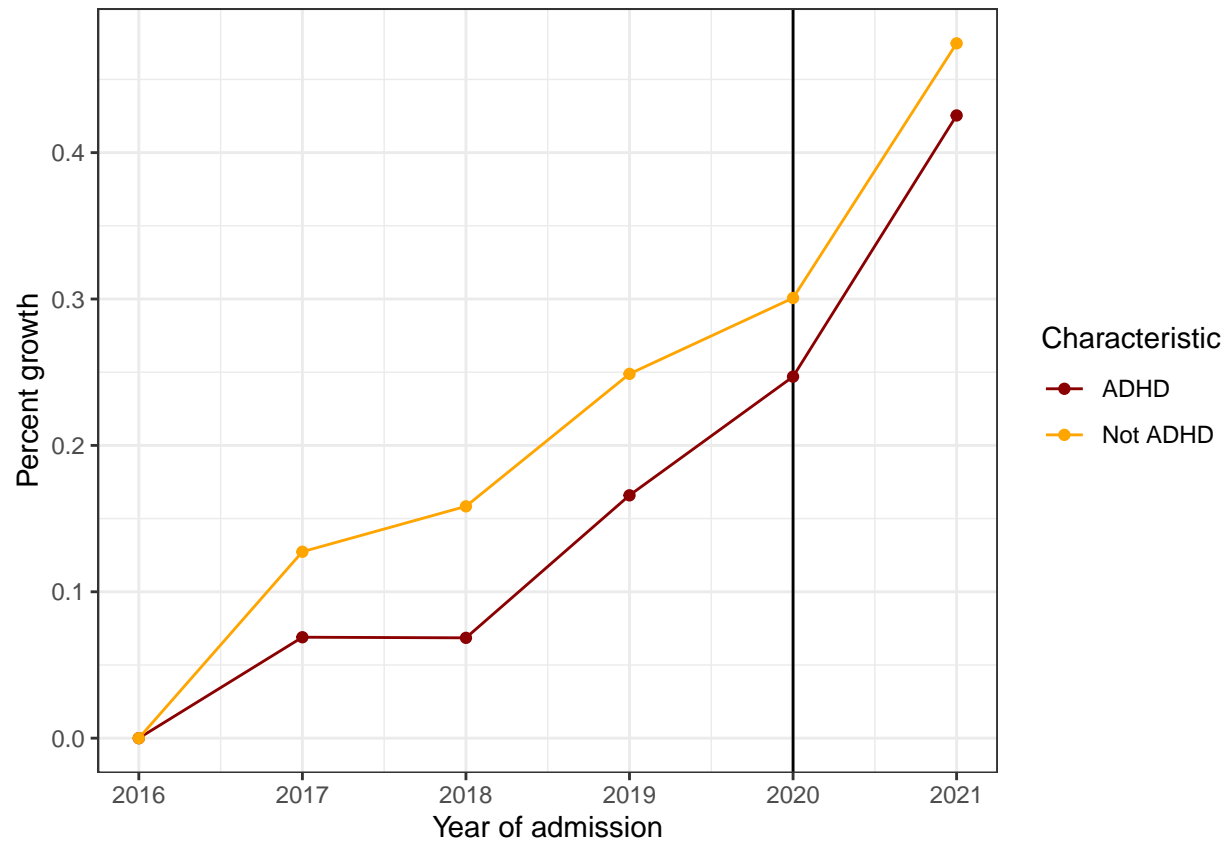
```
#####
#### MENTAL HEATH 2 ####
#####

# Describe data
tab_mh2 <- describe_data(phs, group_by = "mh_2")$subgroup_table # 51 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh2 <- summarize_growth(subset(phs, mh_2 == 1))
name1 = "ADHD"

# Patients without condition
res_nmh2 <- summarize_growth(subset(phs, mh_2 == 0))
name2 = "Not ADHD"

# Compare growths
compare_growth(res_mh2$tables, res_nmh2$tables, name1, name2)
```





Trauma and Stressor Related

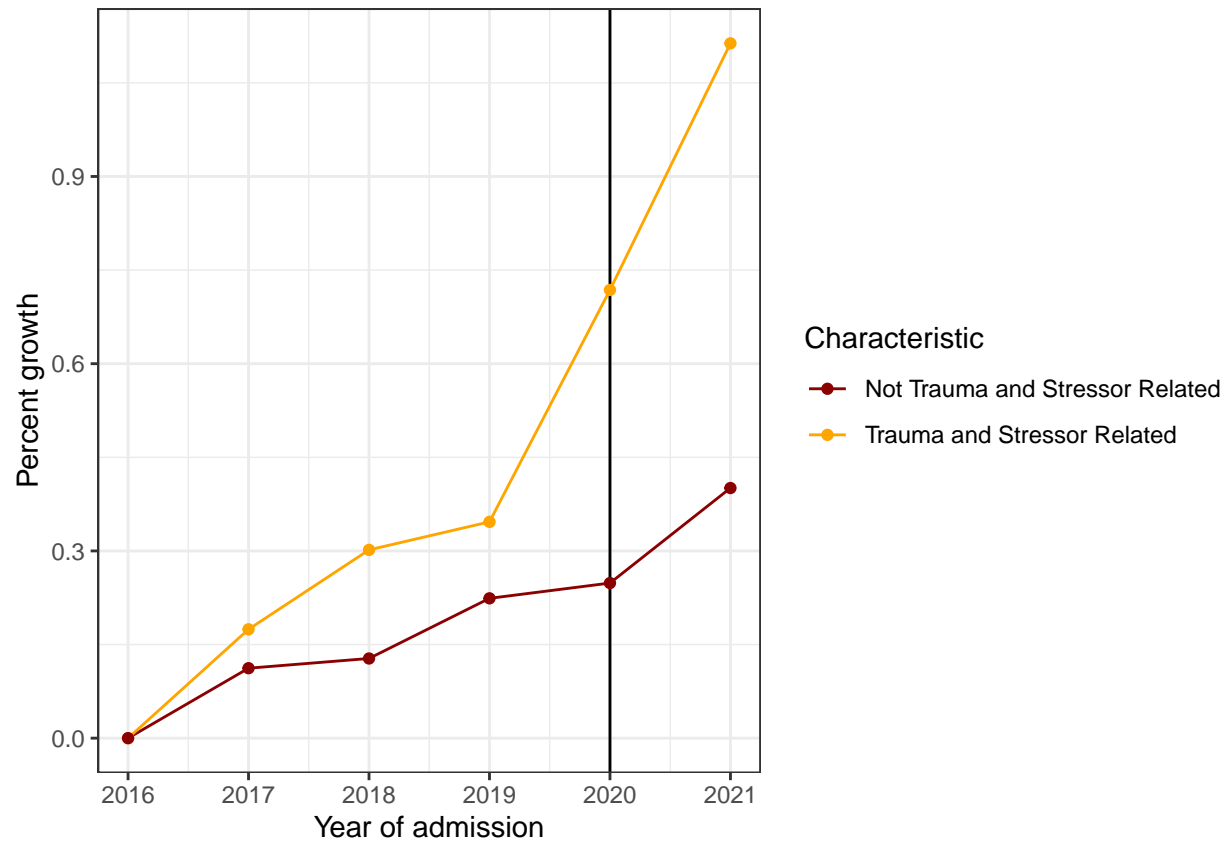
```
#####
#### MENTAL HEATH 30 ####
#####

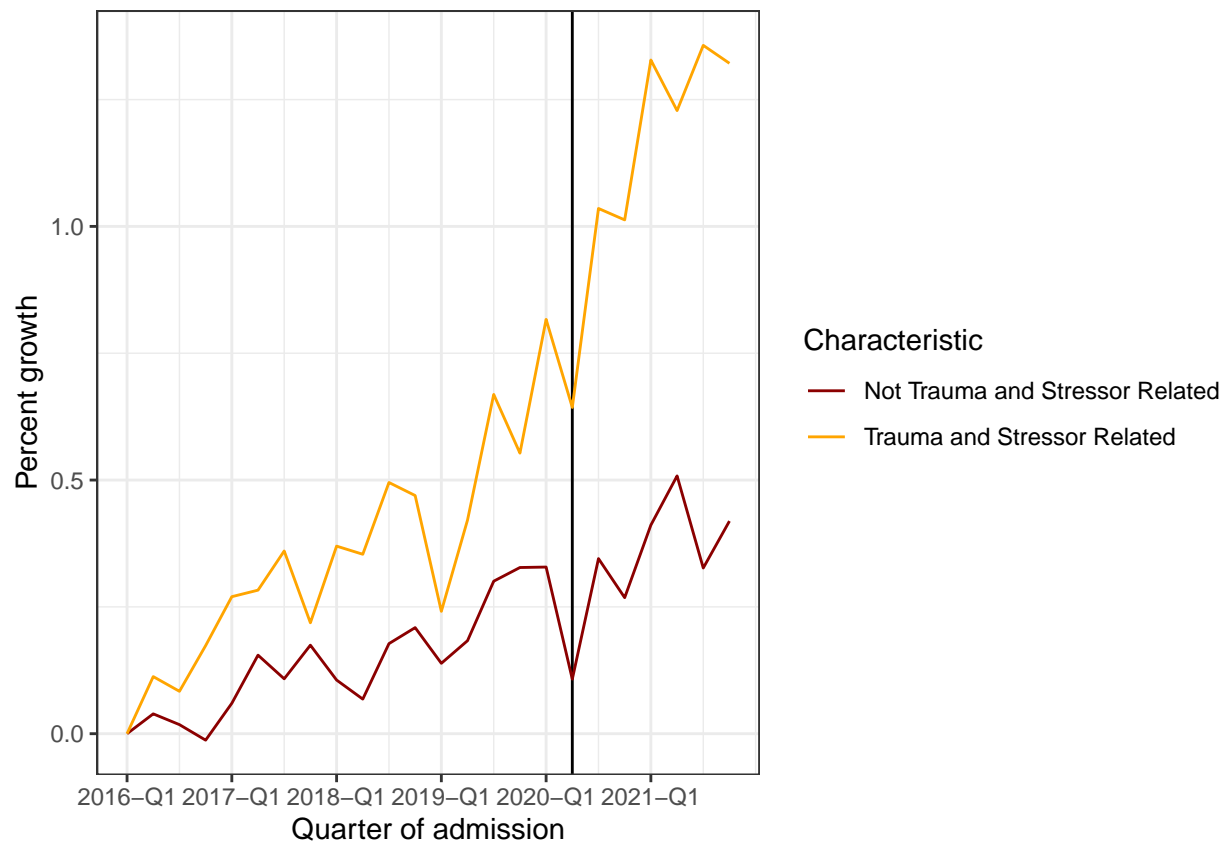
# Describe data
tab_mh30 <- describe_data(phs, group_by = "mh_30")$subgroup_table # 99 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh30 <- summarize_growth(subset(phs, mh_30 == 1))
name1 = "Trauma and Stressor Related"

# Patients without condition
res_nmh30 <- summarize_growth(subset(phs, mh_30 == 0))
name2 = "Not Trauma and Stressor Related"

# Compare growths
compare_growth(res_mh30$tables, res_nmh30$tables, name1, name2)
```





Compare the top 6 mental health conditions within substance-related visits

```
## Extract information from results
```

```
# Get time values
```

```
quarters <- res_mh7$tables$counts_by_qtr$ADMIT_QTR_IDX
nquarters <- length(quarters)
```

```
years <- res_mh7$tables$counts_by_year$ADMIT_YEAR
nyears <- length(years)
```

```
npairs <- 12
```

```
## Growth by quarter
```

```
growth_qtr_mh7 = res_mh7$tables$counts_by_qtr$percentgrowth
```

```
growth_qtr_nmh7 = res_nmh7$tables$counts_by_qtr$percentgrowth
```

```
# 29
```

```
growth_qtr_mh29 = res_mh29$tables$counts_by_qtr$percentgrowth
```

```
growth_qtr_nmh29 = res_nmh29$tables$counts_by_qtr$percentgrowth
```

```
# SUD
```

```
growth_qtr_sud = res_sud$tables$counts_by_qtr$percentgrowth
```

```
growth_qtr_nsud = res_nsud$tables$counts_by_qtr$percentgrowth
```

```
# 3
```

```
growth_qtr_mh3 = res_mh3$tables$counts_by_qtr$percentgrowth
```

```
growth_qtr_nmh3 = res_nmh3$tables$counts_by_qtr$percentgrowth
```

```
# 2
```

```
growth_qtr_mh2 = res_mh2$tables$counts_by_qtr$percentgrowth
```



```

growth_qtr_nmh2 = res_nmh2$tables$counts_by_qtr$percentgrowth
# 30
growth_qtr_mh30 = res_mh30$tables$counts_by_qtr$percentgrowth
growth_qtr_nmh30 = res_nmh30$tables$counts_by_qtr$percentgrowth

qtr_growths <- c(growth_qtr_mh7, growth_qtr_nmh7,
                growth_qtr_mh29, growth_qtr_nmh29,
                growth_qtr_sud, growth_qtr_nsud,
                growth_qtr_mh3, growth_qtr_nmh3,
                growth_qtr_mh2, growth_qtr_nmh2,
                growth_qtr_mh30, growth_qtr_nmh30)

dat_qtr <- data.frame(
  times = rep(quarters, npairs),
  growth = qtr_growths,
  Condition = c(rep("Depressive", 2*nquarters),
                rep("Self-injury", 2*nquarters),
                rep("SUD", 2*nquarters),
                rep("Anxiety", 2*nquarters),
                rep("ADHD", 2*nquarters),
                rep("Trauma/Stress", 2*nquarters)),
  Characteristic = rep(c(rep("With condition", nquarters),
                          rep("Without condition", nquarters)), 6))

```

```

## Growth by year
growth_year_mh7 = res_mh7$tables$counts_by_year$percentgrowth
growth_year_nmh7 = res_nmh7$tables$counts_by_year$percentgrowth
# 29
growth_year_mh29 = res_mh29$tables$counts_by_year$percentgrowth
growth_year_nmh29 = res_nmh29$tables$counts_by_year$percentgrowth
# SUD
growth_year_sud = res_sud$tables$counts_by_year$percentgrowth
growth_year_nsud = res_nsud$tables$counts_by_year$percentgrowth
# 3
growth_year_mh3 = res_mh3$tables$counts_by_year$percentgrowth
growth_year_nmh3 = res_nmh3$tables$counts_by_year$percentgrowth
# 2
growth_year_mh2 = res_mh2$tables$counts_by_year$percentgrowth
growth_year_nmh2 = res_nmh2$tables$counts_by_year$percentgrowth
# 30
growth_year_mh30 = res_mh30$tables$counts_by_year$percentgrowth
growth_year_nmh30 = res_nmh30$tables$counts_by_year$percentgrowth

year_growths <- c(growth_year_mh7, growth_year_nmh7,
                 growth_year_mh29, growth_year_nmh29,
                 growth_year_sud, growth_year_nsud,
                 growth_year_mh3, growth_year_nmh3,
                 growth_year_mh2, growth_year_nmh2,
                 growth_year_mh30, growth_year_nmh30)

dat_year <- data.frame(
  times = rep(years, npairs),
  growth = year_growths,

```

```

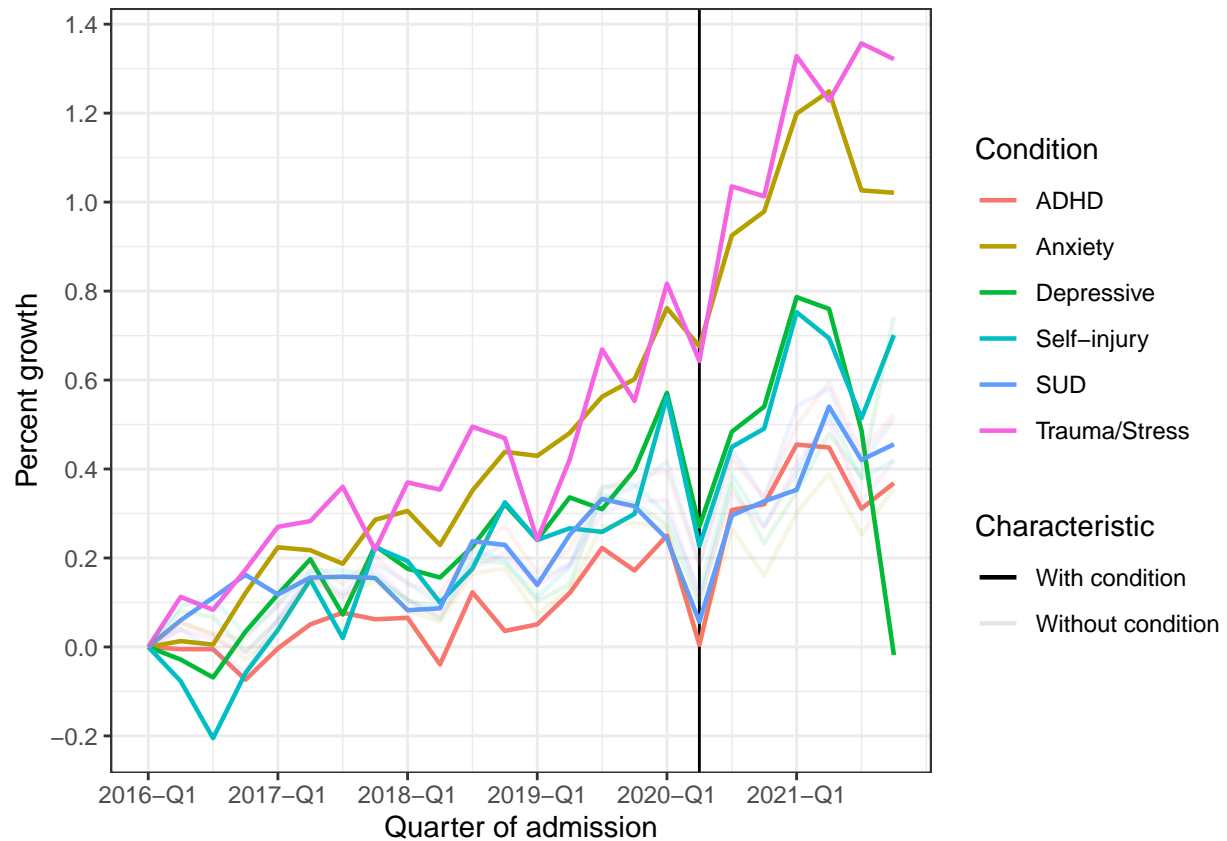
Condition = c(rep("Depressive", 2*nyears),
              rep("Self-injury", 2*nyears),
              rep("SUD", 2*nyears),
              rep("Anxiety", 2*nyears),
              rep("ADHD", 2*nyears),
              rep("Trauma/Stress", 2*nyears)),
Characteristic = rep(c(rep("With condition", nyears),
                        rep("Without condition", nyears)), 6))

```

```

## TOP 6 CONDITIONS
dat_qtr %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color = Condition,
             alpha = Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=18, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.8) +
  # geom_smooth(se=FALSE) +
  # Label axes
  labs(x="Quarter of admission", y="Percent growth") +
  scale_x_continuous(breaks = seq(1,24,by=4),
                    labels = paste0(2016:2021,"-Q1")) +
  scale_y_continuous(breaks = seq(-.2,1.6,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_alpha_discrete(range = c(1,.1)) +
  # Modify theme
  theme_bw()

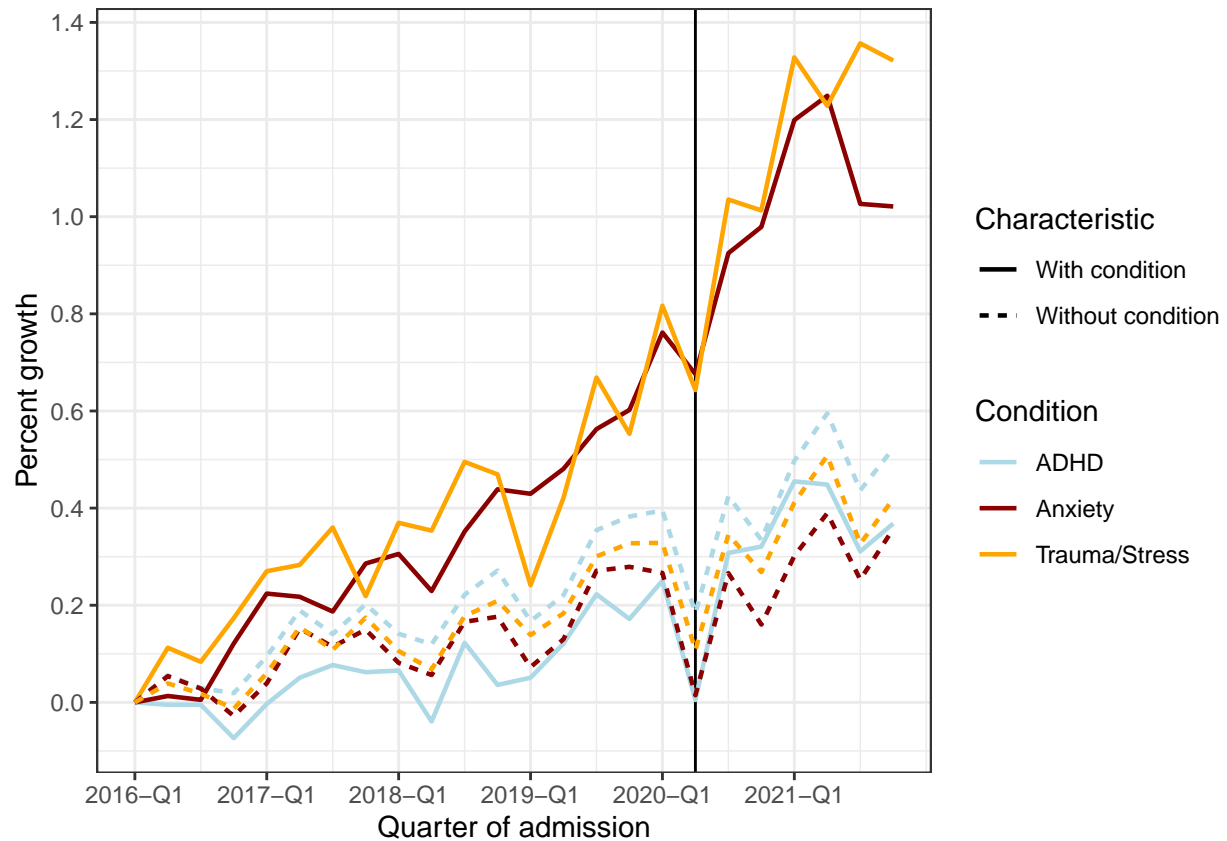
```



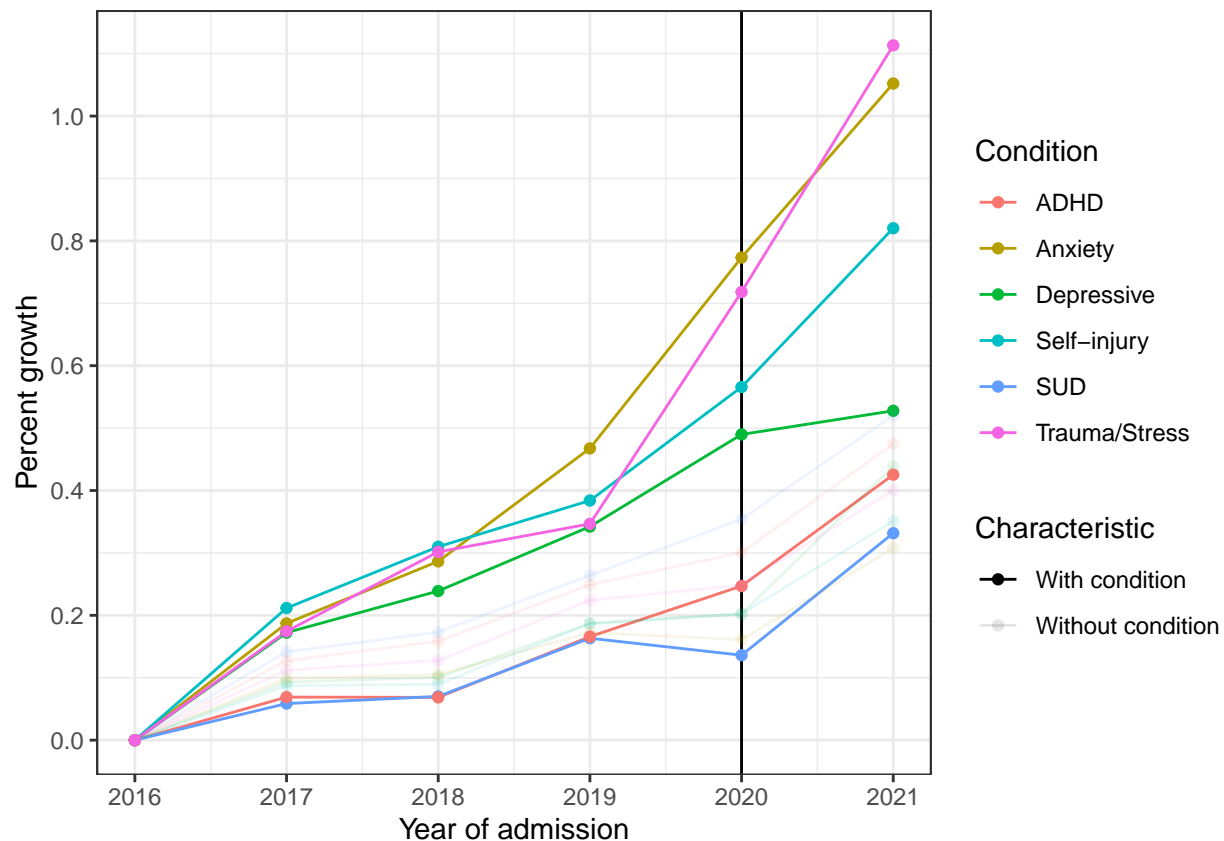
```
## TOP 3 CONDITIONS
dat_qtr %>% filter(Condition %in% c("Depressive", "Self-injury", "SUD")) %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color=Condition,
             lty=Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=18, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.8) +
  # Label axes
  labs(x="Quarter of admission", y="Percent growth") +
  scale_x_continuous(breaks = seq(1,24,by=4),
                    labels = paste0(2016:2021,"-Q1")) +
  scale_y_continuous(breaks = seq(-.2,1.6,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_color_manual(values=c("lightblue", "darkred", "orange")) +
  # Modify theme
  theme_bw()
```



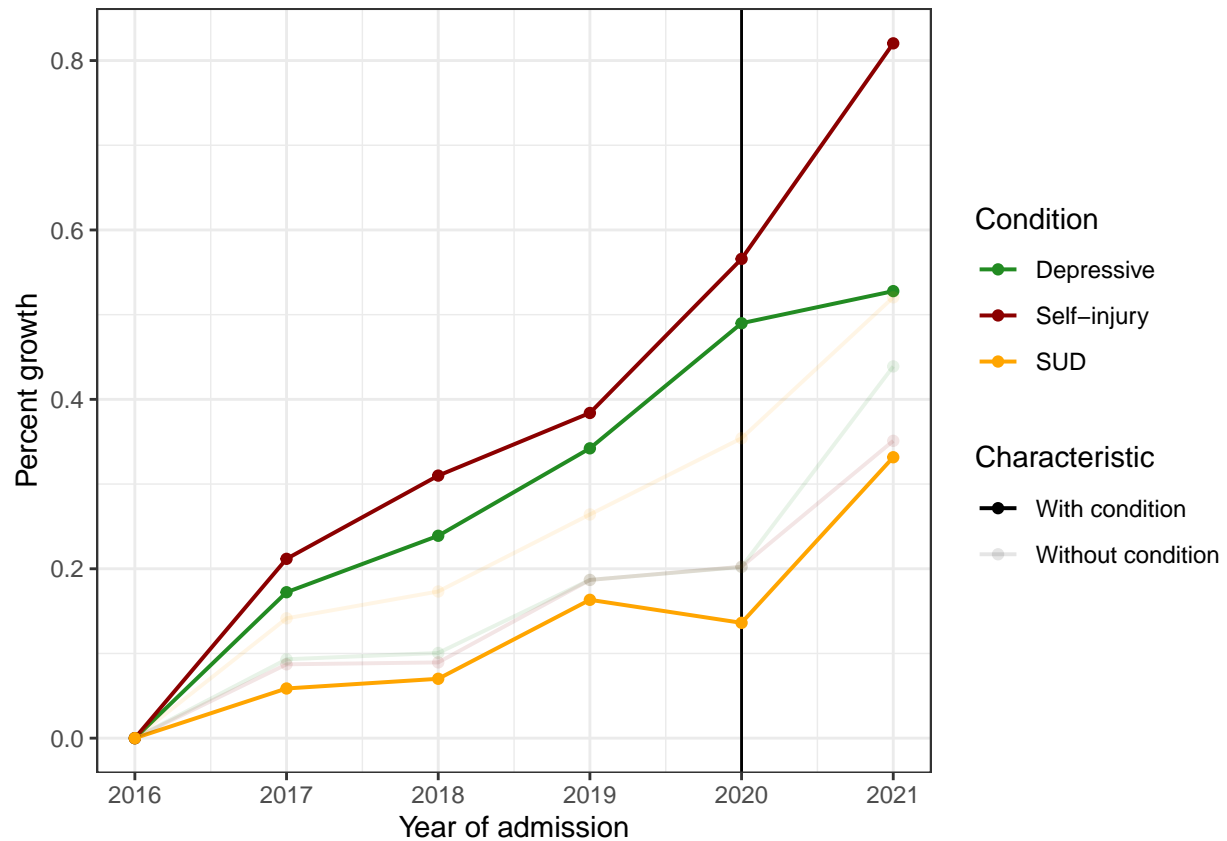
```
## TOP 4-6 CONDITIONS
dat_qtr %>% filter(! Condition %in% c("Depressive", "Self-injury", "SUD")) %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color=Condition,
             lty=Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=18, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.8) +
  # Label axes
  labs(x="Quarter of admission", y="Percent growth") +
  scale_x_continuous(breaks = seq(1,24,by=4),
                     labels = paste0(2016:2021,"-Q1")) +
  scale_y_continuous(breaks = seq(-.2,1.6,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_color_manual(values=c("lightblue", "darkred", "orange")) +
  # Modify theme
  theme_bw()
```



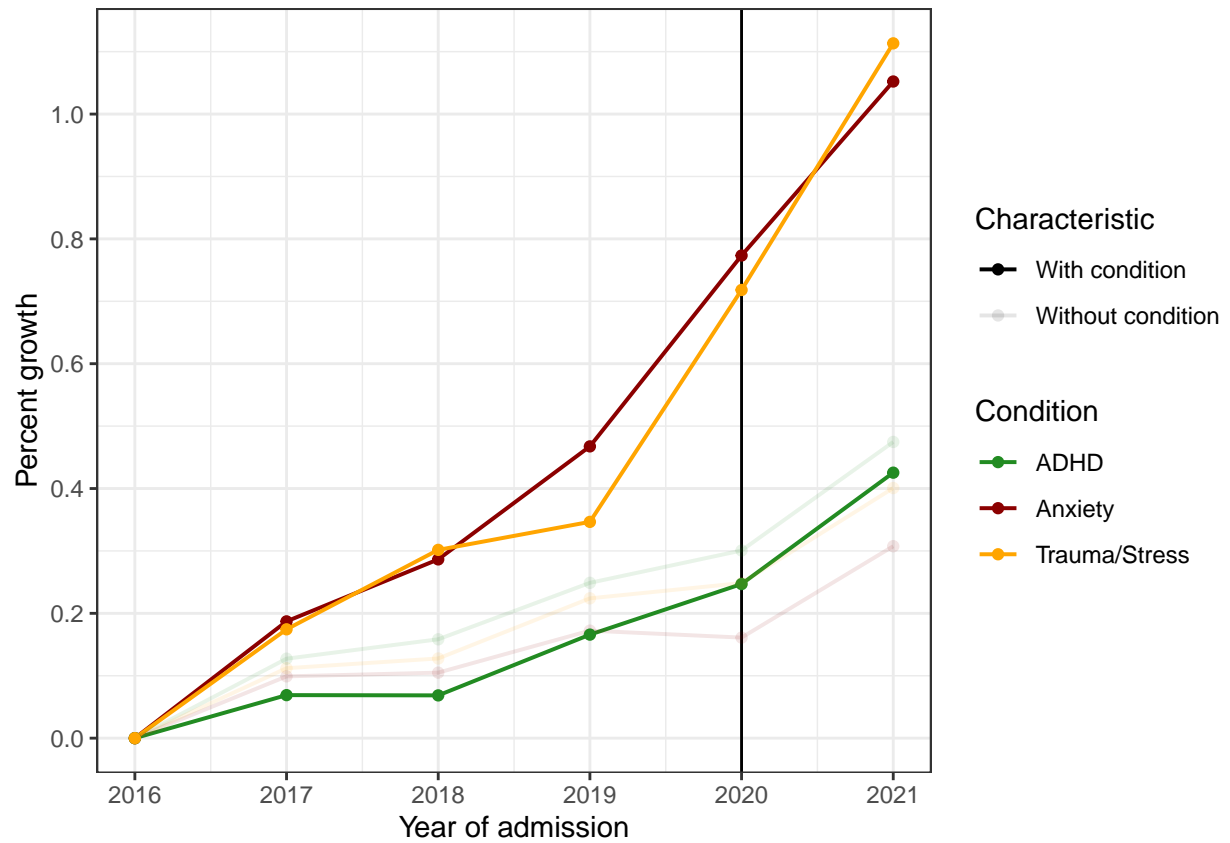
```
## TOP 6 CONDITIONS
dat_year %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color = Condition,
             alpha = Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=2020, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.5) +
  geom_point() +
  # Label axes
  labs(x="Year of admission", y="Percent growth") +
  scale_y_continuous(breaks = seq(0,1.1,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_alpha_discrete(range = c(1,.1)) +
  # Modify theme
  theme_bw()
```



```
## TOP 3 CONDITIONS
dat_year %>% filter(Condition %in% c("Depressive", "Self-injury", "SUD")) %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color = Condition,
             alpha = Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=2020, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.7) +
  geom_point() +
  # Label axes
  labs(x="Year of admission", y="Percent growth") +
  scale_y_continuous(breaks = seq(0,1.1,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_alpha_discrete(range = c(1,.1)) +
  scale_color_manual(values=c("forestgreen", "darkred", "orange")) +
  # Modify theme
  theme_bw()
```



```
## TOP 4-6 CONDITIONS
dat_year %>% filter(! Condition %in% c("Depressive", "Self-injury", "SUD")) %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color = Condition,
             alpha = Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=2020, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.7) +
  geom_point() +
  # Label axes
  labs(x="Year of admission", y="Percent growth") +
  scale_y_continuous(breaks = seq(0,1.1,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_alpha_discrete(range = c(1,.1)) +
  scale_color_manual(values=c("forestgreen", "darkred", "orange")) +
  # Modify theme
  theme_bw()
```



End of report. Code appendix begins on the next page.

Code Appendix

```
# clear environment
rm(list=ls())
# setup options
knitr::opts_chunk$set(results='hide', warning=FALSE, message=FALSE)
options(knitr.kable.NA = '-', digits = 2)
# Load relevant packages
library(tidyverse) # whole bunch of useful packages
library(knitr)      # pretty print
library(lubridate)  # date formatting
library(ggplot2)    # data visualization

# Load relevant local scripts
source("../R/preprocessing.R") # Pre-processing
source("../R/describe-data.R") # Describing overall details of PHIS data
source("../R/summarize-growth.R") # Summarize and present trends
source("../R/model-growth.R")
source("../R/compare-growth.R")

# Load data
phis_raw <- read_csv(file = "../data/mh_subs_uw.csv") # Ensure this is the right directory
nrow(phis_raw) # 106,793 rows
names(phis_raw)

# Preprocess data
phis <- preprocessing(phis_raw)

#####
#### ALL PATIENTS ####
#####

nrow(phis) # 106,693 rows

# Describe data
tab_all <- describe_data(phis)$subgroup_table # Subgroups have sufficient size

## Visualize and summarize trends over time
res_all <- summarize_growth(phis)

# # Plot of hospital counts
# res_all$plots$hosp_counts_by_year
#
# # Plots of percent growth
# res_all$plots$counts_by_year + labs(title = "Substance-related visits")
# res_all$plots$counts_by_qtr + labs(title = "Substance-related visits")
#
# # Table of percent growth
# res_all$tables$counts_by_year

#####
#### ANY MENTAL HEATLH ####
#####
```

```

# Describe data
tab_mh <- describe_data(phs, group_by = "MH_ANY")$subgroup_table # Subgroups have sufficient size

## Plot trends
# Patients with condition
res_mh <- summarize_growth(subset(phs, MH_ANY == 1))
name1 = "Any mental health"

# Patients without condition
res_nmh <- summarize_growth(subset(phs, MH_ANY == 0))
name2 = "Not mental health"

# Compare growths
compare_growth(res_mh$tables, res_nmh$tables, name1, name2)

#####
#### MENTAL HEATH 7 ####
#####

# Describe data
tab_mh7 <- describe_data(phs, group_by = "mh_7")$subgroup_table # 11 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh7 <- summarize_growth(subset(phs, mh_7 == 1))
name1 = "Depressive Disorders"

# Patients without condition
res_nmh7 <- summarize_growth(subset(phs, mh_7 == 0))
name2 = "Not Depressive Disorders"

# Compare growths
compare_growth(res_mh7$tables, res_nmh7$tables, name1, name2)

#####
#### MENTAL HEATH 29 ####
#####

# Describe data
tab_mh29 <- describe_data(phs, group_by = "mh_29")$subgroup_table # 13 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh29 <- summarize_growth(subset(phs, mh_29 == 1))
name1 = "Suicide or Self-Injury"

# Patients without condition
res_nmh29 <- summarize_growth(subset(phs, mh_29 == 0))
name2 = "Not Suicide or Self-Injury"

# Compare growths
compare_growth(res_mh29$tables, res_nmh29$tables, name1, name2)
#####

```

```

#### DEPENDENCE ####
#####

# Describe data
tab_sud <- describe_data(phs, group_by = "dependence")$subgroup_table # 26 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_sud <- summarize_growth(subset(phs, dependence == 1))
name1 = "Substance Use Disorder"

# Patients without condition
res_nsud <- summarize_growth(subset(phs, dependence == 0))
name2 = "Not Substance Use Disorder"

# Compare growths
compare_growth(res_sud$tables, res_nsud$tables, name1, name2)

#####
#### MENTAL HEALTH 29 ####
#####

# Describe data
tab_mh3 <- describe_data(phs, group_by = "mh_3")$subgroup_table # 15 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh3 <- summarize_growth(subset(phs, mh_3 == 1))
name1 = "Anxiety Disorders"

# Patients without condition
res_nmh3 <- summarize_growth(subset(phs, mh_3 == 0))
name2 = "Not Anxiety Disorders"

# Compare growths
compare_growth(res_mh3$tables, res_nmh3$tables, name1, name2)

#####
#### MENTAL HEALTH 2 ####
#####

# Describe data
tab_mh2 <- describe_data(phs, group_by = "mh_2")$subgroup_table # 51 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh2 <- summarize_growth(subset(phs, mh_2 == 1))
name1 = "ADHD"

# Patients without condition
res_nmh2 <- summarize_growth(subset(phs, mh_2 == 0))
name2 = "Not ADHD"

```

```

# Compare growths
compare_growth(res_mh2$tables, res_nmh2$tables, name1, name2)

#####
#### MENTAL HEATLH 30 ####
#####

# Describe data
tab_mh30 <- describe_data(phis, group_by = "mh_30")$subgroup_table # 99 subsamples are smaller than 30

## Plot trends
# Patients with condition
res_mh30 <- summarize_growth(subset(phis, mh_30 == 1))
name1 = "Trauma and Stressor Related"

# Patients without condition
res_nmh30 <- summarize_growth(subset(phis, mh_30 == 0))
name2 = "Not Trauma and Stressor Related"

# Compare growths
compare_growth(res_mh30$tables, res_nmh30$tables, name1, name2)

## Extract information from results

# Get time values
quarters <- res_mh7$tables$counts_by_qtr$ADMIT_QTR_IDX
nquarters <- length(quarters)

years <- res_mh7$tables$counts_by_year$ADMIT_YEAR
nyears <- length(years)

npairs <- 12
## Growth by quarter
growth_qtr_mh7 = res_mh7$tables$counts_by_qtr$percentgrowth
growth_qtr_nmh7 = res_nmh7$tables$counts_by_qtr$percentgrowth
# 29
growth_qtr_mh29 = res_mh29$tables$counts_by_qtr$percentgrowth
growth_qtr_nmh29 = res_nmh29$tables$counts_by_qtr$percentgrowth
# SUD
growth_qtr_sud = res_sud$tables$counts_by_qtr$percentgrowth
growth_qtr_nsud = res_nsud$tables$counts_by_qtr$percentgrowth
# 3
growth_qtr_mh3 = res_mh3$tables$counts_by_qtr$percentgrowth
growth_qtr_nmh3 = res_nmh3$tables$counts_by_qtr$percentgrowth
# 2
growth_qtr_mh2 = res_mh2$tables$counts_by_qtr$percentgrowth
growth_qtr_nmh2 = res_nmh2$tables$counts_by_qtr$percentgrowth
# 30
growth_qtr_mh30 = res_mh30$tables$counts_by_qtr$percentgrowth
growth_qtr_nmh30 = res_nmh30$tables$counts_by_qtr$percentgrowth

qtr_growths <- c(growth_qtr_mh7, growth_qtr_nmh7,
                 growth_qtr_mh29, growth_qtr_nmh29,

```

```

        growth_qtr_sud, growth_qtr_nsud,
        growth_qtr_mh3, growth_qtr_nmh3,
        growth_qtr_mh2, growth_qtr_nmh2,
        growth_qtr_mh30, growth_qtr_nmh30)

dat_qtr <- data.frame(
  times = rep(quarters, npairs),
  growth = qtr_growths,
  Condition = c(rep("Depressive", 2*nquarters),
                 rep("Self-injury", 2*nquarters),
                 rep("SUD", 2*nquarters),
                 rep("Anxiety", 2*nquarters),
                 rep("ADHD", 2*nquarters),
                 rep("Trauma/Stress", 2*nquarters)),
  Characteristic = rep(c(rep("With condition", nquarters),
                           rep("Without condition", nquarters)), 6))

## Growth by year
growth_year_mh7 = res_mh7$tables$counts_by_year$percentgrowth
growth_year_nmh7 = res_nmh7$tables$counts_by_year$percentgrowth
# 29
growth_year_mh29 = res_mh29$tables$counts_by_year$percentgrowth
growth_year_nmh29 = res_nmh29$tables$counts_by_year$percentgrowth
# SUD
growth_year_sud = res_sud$tables$counts_by_year$percentgrowth
growth_year_nsud = res_nsud$tables$counts_by_year$percentgrowth
# 3
growth_year_mh3 = res_mh3$tables$counts_by_year$percentgrowth
growth_year_nmh3 = res_nmh3$tables$counts_by_year$percentgrowth
# 2
growth_year_mh2 = res_mh2$tables$counts_by_year$percentgrowth
growth_year_nmh2 = res_nmh2$tables$counts_by_year$percentgrowth
# 30
growth_year_mh30 = res_mh30$tables$counts_by_year$percentgrowth
growth_year_nmh30 = res_nmh30$tables$counts_by_year$percentgrowth

year_growths <- c(growth_year_mh7, growth_year_nmh7,
                  growth_year_mh29, growth_year_nmh29,
                  growth_year_sud, growth_year_nsud,
                  growth_year_mh3, growth_year_nmh3,
                  growth_year_mh2, growth_year_nmh2,
                  growth_year_mh30, growth_year_nmh30)

dat_year <- data.frame(
  times = rep(years, npairs),
  growth = year_growths,
  Condition = c(rep("Depressive", 2*nyears),
                 rep("Self-injury", 2*nyears),
                 rep("SUD", 2*nyears),
                 rep("Anxiety", 2*nyears),
                 rep("ADHD", 2*nyears),
                 rep("Trauma/Stress", 2*nyears)),
  Characteristic = rep(c(rep("With condition", nyyears),
                           rep("Without condition", nyyears)), 6))

```

```

## TOP 6 CONDITIONS
dat_qtr %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color = Condition,
             alpha = Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=18, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.8) +
  # geom_smooth(se=FALSE) +
  # Label axes
  labs(x="Quarter of admission", y="Percent growth") +
  scale_x_continuous(breaks = seq(1,24,by=4),
                    labels = paste0(2016:2021,"-Q1")) +
  scale_y_continuous(breaks = seq(-.2,1.6,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_alpha_discrete(range = c(1,.1)) +
  # Modify theme
  theme_bw()

## TOP 3 CONDITIONS
dat_qtr %>% filter(Condition %in% c("Depressive", "Self-injury", "SUD")) %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color=Condition,
             lty=Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=18, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.8) +
  # Label axes
  labs(x="Quarter of admission", y="Percent growth") +
  scale_x_continuous(breaks = seq(1,24,by=4),
                    labels = paste0(2016:2021,"-Q1")) +
  scale_y_continuous(breaks = seq(-.2,1.6,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_color_manual(values=c("lightblue", "darkred", "orange")) +
  # Modify theme
  theme_bw()

## TOP 4-6 CONDITIONS
dat_qtr %>% filter(! Condition %in% c("Depressive", "Self-injury", "SUD")) %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color=Condition,
             lty=Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=18, color="black", lwd=0.5) +
  # Visualize trends in percent growth

```

```

geom_line(lwd=0.8) +
# Label axes
labs(x="Quarter of admission", y="Percent growth") +
scale_x_continuous(breaks = seq(1,24,by=4),
                    labels = paste0(2016:2021,"-Q1")) +
scale_y_continuous(breaks = seq(-.2,1.6,by=0.2)) +
# Add legend
theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
scale_color_manual(values=c("lightblue", "darkred", "orange")) +
# Modify theme
theme_bw()

## TOP 6 CONDITIONS
dat_year %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color = Condition,
             alpha = Characteristic)) +
# Add line for onset of COVID
geom_vline(xintercept=2020, color="black", lwd=0.5) +
# Visualize trends in percent growth
geom_line(lwd=0.5) +
geom_point() +
# Label axes
labs(x="Year of admission", y="Percent growth") +
scale_y_continuous(breaks = seq(0,1.1,by=0.2)) +
# Add legend
theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
scale_alpha_discrete(range = c(1,.1)) +
# Modify theme
theme_bw()

## TOP 3 CONDITIONS
dat_year %>% filter(Condition %in% c("Depressive", "Self-injury", "SUD")) %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color = Condition,
             alpha = Characteristic)) +
# Add line for onset of COVID
geom_vline(xintercept=2020, color="black", lwd=0.5) +
# Visualize trends in percent growth
geom_line(lwd=0.7) +
geom_point() +
# Label axes
labs(x="Year of admission", y="Percent growth") +
scale_y_continuous(breaks = seq(0,1.1,by=0.2)) +
# Add legend
theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
scale_alpha_discrete(range = c(1,.1)) +
scale_color_manual(values=c("forestgreen", "darkred", "orange")) +
# Modify theme
theme_bw()

```

```

## TOP 4-6 CONDITIONS
dat_year %>% filter(! Condition %in% c("Depressive", "Self-injury", "SUD")) %>%
  ggplot(aes(x=times, y=growth,
             group = paste(Characteristic, Condition),
             color = Condition,
             alpha = Characteristic)) +
  # Add line for onset of COVID
  geom_vline(xintercept=2020, color="black", lwd=0.5) +
  # Visualize trends in percent growth
  geom_line(lwd=0.7) +
  geom_point() +
  # Label axes
  labs(x="Year of admission", y="Percent growth") +
  scale_y_continuous(breaks = seq(0,1.1,by=0.2)) +
  # Add legend
  theme(legend.position="inside", legend.position.inside=c(.15, .8)) +
  scale_alpha_discrete(range = c(1,.1)) +
  scale_color_manual(values=c("forestgreen", "darkred", "orange")) +
  # Modify theme
  theme_bw()

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End of document.