

Mental Health Service for Youth During Pandemic in Fairfax County, VA

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1. Introduction

One of the ongoing discussions during the pandemic is how the lockdown has negatively impacted people's mental wellness. The following plot comes from the Mental Health America report "How Race Matters: What We Can Learn From Mental Health America's Screening In 2020" and it shows the increasing trend in anxiety among all races.

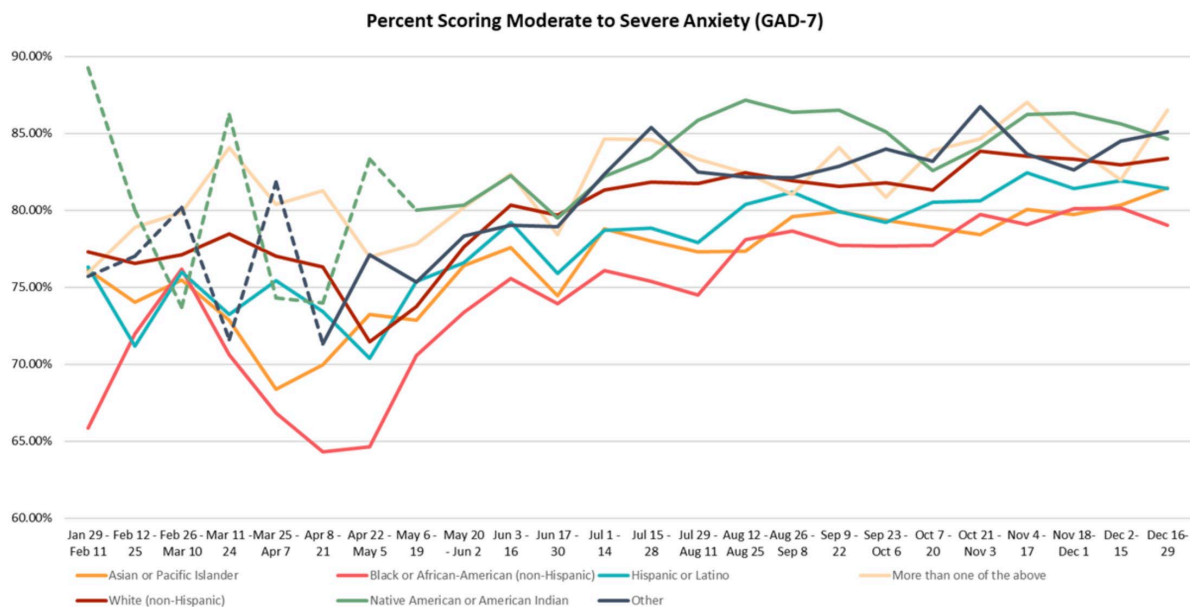


Figure 1 Percent Scoring Moderated to Severe Anxiety (GAD-7). "How Race Matters: What We Can Learn from Mental Health America's Screening in 2020."

And according to CDC Morbidity and Mortality Weekly Report, "Younger adults, racial/ethnic minorities, essential workers, and unpaid adult caregivers reported having experienced disproportionately worse mental health outcomes, increased substance use, and elevated suicidal ideation." (Czeusker) This negative impact is also shown in the youth population because of the lack of social interaction, peer support, and normal daily activities. Gertrud and Else-Marie state in their paper "A lost generation? COVID-19 and adolescent mental health" that, "Adolescents are at a vulnerable stage of development, with the majority of mental disorders emerging during adolescence...the prevalence of depressive symptoms was increasing from 2016 to 2018, and then increased somewhat more from 2018 to the numbers reported during the COVID-19 pandemic in 2020"

This motivates this project to investigate data related to mental health treatment for youth in Fairfax County and how might it relate to COVID-19 confirmed cases. This topic is

human-centered because mental health service is directly related to the mental well-being of youth. Besides looking at the mere number of COVID-19 cases, the mental health service data provides a more humane insight into how the pandemic influences the youth population. This project is important to mental health care providers and youth since this pandemic is the first time in history, and people are unaware of the different impacts brought by the pandemic. Knowing how pandemics impact the mental health services provided to youth will allow both sides of the party to better prepare the resources for future occasions.

2. Background/Related Work

2.2 Current research and statistics

CDC reports that 7.1% of children aged 3-17 have been diagnosed with anxiety and 3.2% of children with the same age range have been diagnosed with depression. This rate is pretty similar to the overall percentage of social anxiety disorder (6.8%) and major depressive disorder (6.7%) among the US population with age 18 and above. However, in the article “A National Agenda for Children’s Mental Health”, the authors claim that “Children’s mental health was inadequately funded even before the pandemic, but the problem will grow worse as COVID-19 continues to impact the psychological well-being of children and their families.”(Bartlett) Additionally, Fairfax County Times journal states that “At the pandemic’s start, there was a 31 percent increase in the proportion of mental health-related emergency department visits among adolescents (age 12-17).” (Gannavarapu) This shows that the mental health issue among youth is not less severe than adults but there is less attention and resources paid to that population.

2.1 Research Question and Hypothesis

The core research question is how the mental health service was provided to youth influenced by the pandemic in Fairfax County, VA.

The hypothesis is the pandemic has a negative impact on the number of mental health services provided to youth in Fairfax County. More specifically, there might be a negative correlation between confirmed COVID-19 cases and the number of mental health services incidence provided.

3. Methodology

3.1 Data Source

3.1.1 COVID-19 Confirmed Cases Data

The COVID confirmed cases data is obtained from Kaggle dataset “COVID-19 Data from John Hopkins University”. According to the Kaggle data description, “this is a daily updating version of COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU).” The

RAW_us_confirmed_cases.csv is selected for this project and data for Fairfax County, VA is filtered by using FIP=51059.

3.1.2 Youth Mental Health Data

The mental health services data is gathered from the report “Youth Mental Health in Fairfax County During the COVID-19 Pandemic” published in April 2021. The data presented in the report is gathered by Fairfax-Falls Church Community Services Board (CSB). There are multiple tables/charts included in the appendix section of the report and the data is aggregated on the monthly level. Five tables from the reports are used from this report:

- *Number of Youth Receiving CSB Outpatient Services by Month, FY2019 – FY2021. Source: Fairfax-Falls Church Community Services Board.*
- *Number of Youth Receiving CSB Intensive Mental Health Treatment Services by Month, FY2019 – FY2021. Source: Fairfax-Falls Church Community Services Board.*
- *Number of Youth Receiving CSB Crisis Intervention Services, by Month, FY2019 – FY2021*
- *Number Requiring Hospitalization, by Month, FY2019 – FY2021*
- *Percentage of Juvenile Court Screenings Indicating Need for Immediate Mental Health Treatment by Month, FY2019-FY2020.*

For the tables mentioned above, they include monthly data of number of youths receiving certain mental health services provided by CSB or the percentage of youth indicated as needing immediate mental health treatment by the Juvenile Court. The data from those tables span from July 2018 to February 2021. To better match the time span of the pandemic and the confirmed cases dataset, only data that falls in February 2020 and February 2021 is selected.

There is no specific term of use included in the report and no identifiable information of youth was revealed.

3.2 Data Processing and Analysis

3.2.1 Data Processing

As mentioned in section 3.1.1, COVID-19 confirmed cases for Fairfax County are selected by using FIP = 51059, and during the preliminary data exploration (A4), the difference in daily confirmed cases is calculated and plotted. Larger peaks indicate greater daily new confirmed cases.

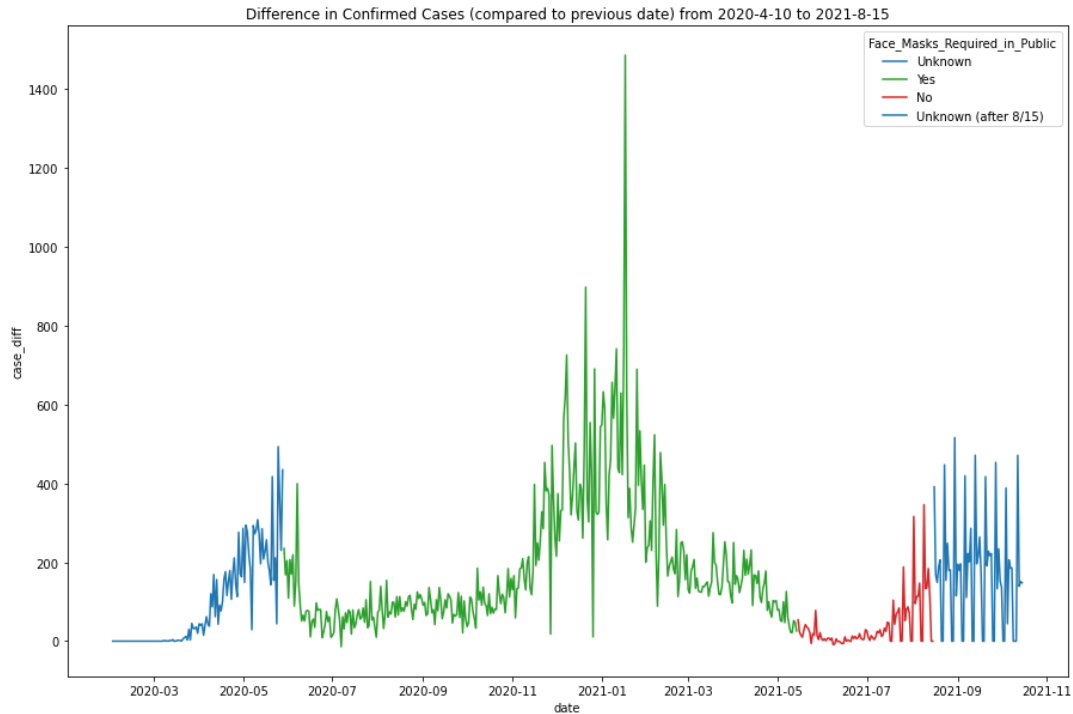


Figure 2 Difference in Confirmed Cases (Compared to Previous Date) in Fairfax County, VA from 2020-4-10 to 2021-8-15

From this plot, there are three peaks observed in daily increase confirmed cases around May 2020, January 2021, and September 2021. It shows the increase of confirmed cases was at the highest between January 2021 to March 2021 and there is a slight bounce back after removing the mask mandates in public. Lately, the increase of confirmed cases started to decrease again.

The youth mental health data from the report is manually collected into a CSV format with the first column indicating the month, and five separate columns for intensive_treatment, outpatient_services, crisis_intervention_service, requiring_hospitalization, and perc_immediate_treatment. The CSV file is then read into Python and Formatted into a Pandas data frame with the first column “month” coded into a Period object with the month as frequency.

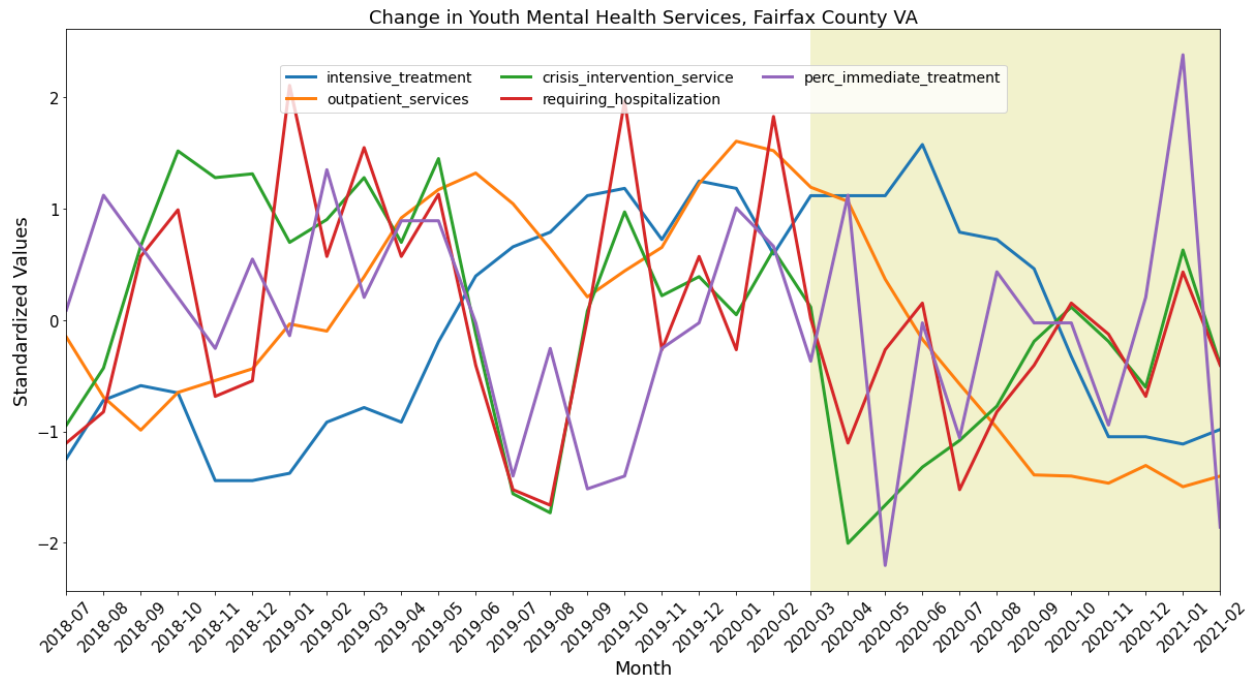


Figure 3 Change in Youth Mental Health Services, Fairfax County VA

The five columns are plotted in the line chart above with the yellow shaded area indicating the pandemic period. It can be noticed that the green line (intensive treatment) and orange line (outpatient services) show a decreasing trend in the pandemic period. This will be analyzed further in the following section.

For the confirmed case data, at the time perform the analysis, the data covers the date range from January 22, 2020, to October 31, 2021. This data comes in a pivot format, so the targeted county (Fairfax, VA) is selected first, and the table is unpivoted into columns format, so the date is listed as a column with another column showing the daily confirmed cases. Lastly, the monthly average of the confirmed cases is calculated, and conversion is made to turn the group by month into a Period object for joining purposes.

After the preprocessing of both datasets, an inner join is performed of those two datasets on the month so the only data from February 2020 to February 2021 is kept.

3.2.2 Analysis

3.2.2.1 Pairwise Correlation

Pearson's correlation is a good tool to provide an overall idea of how each numeric variable is correlated to the others. Since all variables in the combined dataset are continuous variables with meaningful trends, correlation calculation is useful here. Strong correlation indicates the two variables have the tendency to increase together or change together with the opposite trend.

Pairwise Pearson's correlations for all variables including the confirmed cases are calculated. The correlation coefficient is plotted in the heatmap below.

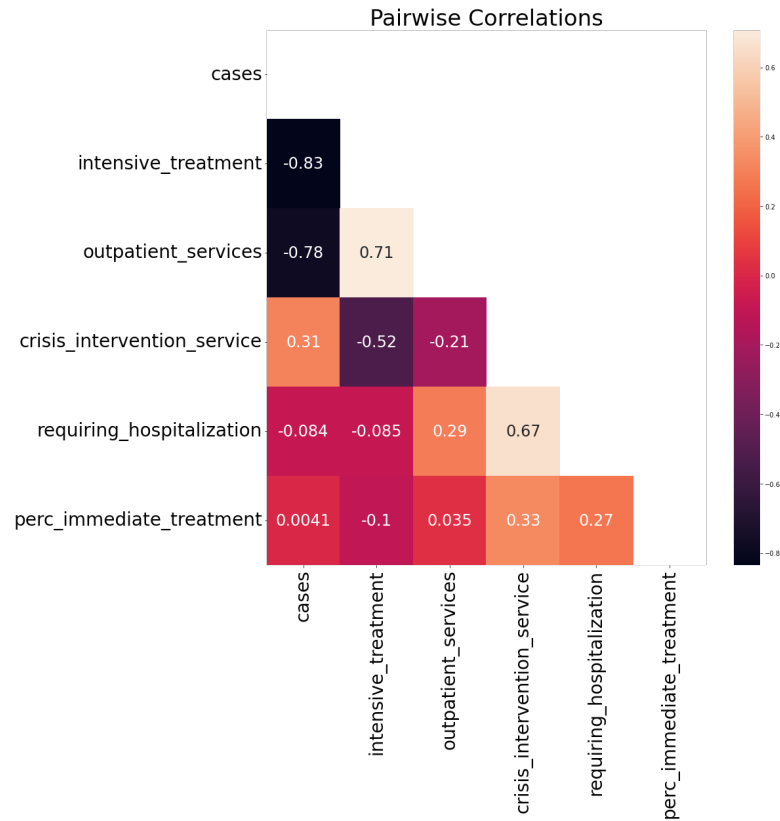


Figure 4 Pairwise Pearson's Correlation Heatmap

Darker color correlated with stronger negative correlation and lighter color correlated with stronger positive correlation. There is a strong negative correlation between confirmed cases and the number of intensive treatments provided (-0.83) as well as between confirmed cases and the number of outpatient services provided (-0.78). Those two variables are chosen to proceed to the next step for regression analysis. Notice there also exists a strong positive correlation between outpatient services and intensive treatment as well as between the number of youths requiring hospitalization and the number of crisis intervention services provided. But since the focus of this project is to discuss the relationship between COVID and mental health services, those two correlations will not be further invested.

3.2.2.2 Ordinary Least-Square Regression Analysis

OLS is chosen here because there is not much complexity in the regression model and only 13 data points are presented. Issues such as overfitting, multicollinearity, unequal weights of data will not be related.

Two OLS linear regressions are performed separately using the number of intensive treatments and number of outpatient services as the dependent variable. The regression results are shown as follows:

OLS Regression Results

Dep. Variable:

intensive_treatment

R-squared:

0.697

Model:

OLS

Adj. R-squared:

0.669

Method:

Least Squares

F-statistic:

25.29

Date:

Fri, 03 Dec 2021

Prob (F-statistic):

0.000385

Time:

10:44:53

Log-Likelihood:

-45.452

No. Observations:

13

AIC:

94.90

Df Residuals:

11

BIC:

96.03

Df Model:

1

Covariance Type:

nonrobust

coef

std err

t

P>|t|

[0.025

0.975]

cases

-0.0006

0.000

-5.029

0.000

-0.001

-0.000

const

142.0417

3.618

39.264

0.000

134.079

150.004

Omnibus:

0.171

Durbin-Watson:

0.824

Prob(Omnibus):

0.918

Jarque-Bera (JB):

0.165

Skew:

-0.178

Prob(JB):

0.921

Kurtosis:

2.578

Cond. No.

4.28e+04

OLS Regression Results

Dep. Variable:

outpatient_services

R-squared:

0.609

Model:

OLS

Adj. R-squared:

0.573

Method:

Least Squares

F-statistic:

17.11

Date:

Fri, 03 Dec 2021

Prob (F-statistic):

0.00165

Time:

10:44:53

Log-Likelihood:

-72.598

No. Observations:

13

AIC:

149.2

Df Residuals:

11

BIC:

150.3

Df Model:

1

Covariance Type:

nonrobust

coef

std err

t

P>|t|

[0.025

0.975]

cases

-0.0042

0.001

-4.137

0.002

-0.006

-0.002

const

927.6870

29.194

31.777

0.000

863.432

991.942

Omnibus:

2.797

Durbin-Watson:

0.276

Prob(Omnibus):

0.247

Jarque-Bera (JB):

1.039

Skew:

0.038

Prob(JB):

0.595

Kurtosis:

1.617

Cond. No.

4.28e+04

Figure 5 OLS Regression Analysis Results (Top) Number of intensive treatments as dependent variable; (bottom) number of outpatient services as dependent variable

4. Findings

Both regression results show statistically significant slopes of the independent variable and negative coefficients. For the regression using the number of intensive treatments as the dependent variable, the coefficient is -0.0006, and for the regression using the number of outpatient services as the dependent variable, the coefficient is -0.0042. The interpretations are that for 1 unit increase in COVID-19 confirmed cases (1 more people

get confirmed infection), there is, on average, 0.0006 unit decrease in the number of intensive treatments provided and 0.0042 unit decrease in the number of outpatient services provided. Due to the high positive correlation between the number of intensive treatments and outpatient services and no further supporting data, no interaction term is considered in the regression analysis.

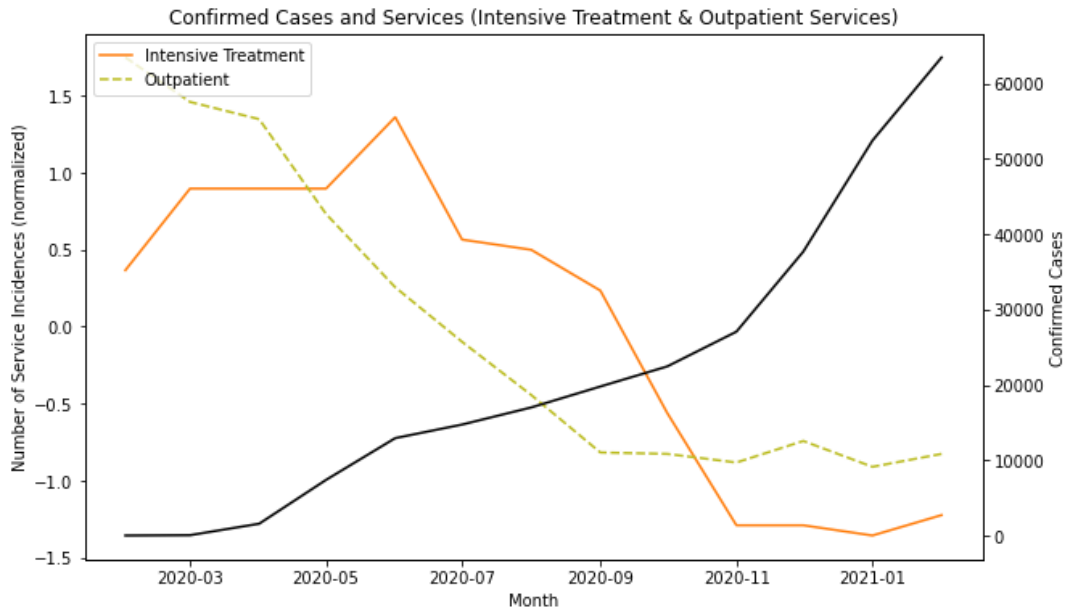


Figure 6 Confirmed Cases and Services (Intensive Treatment & Outpatient Services)

From the plot above the opposite trend of confirmed cases (black line) and intensive treatment (orange line)/outpatient services (green dash line) can be observed. The confirmed cases keep increasing since the beginning of the pandemic (March 2020) and the numbers of intensive treatments/outpatient services have an overall decreasing trend during the time window.

5. Discussion/Implications

It is not surprising to find out the number of outpatient services and intensive treatment provided to youth in Fairfax County decrease while the daily confirmed cases increase through the pandemic time. A lot of other factors might play roles in this relationship. Something not expected observed from this analysis is there are three variables not significantly correlated to COVID-19 confirmed cases: number of crisis intervention services, number of youths requiring hospitalization, and percentage of youth requiring immediate treatment. Without any further analysis to investigate the potential hidden relationship between those three variables with COVID-19 cases, it appears that the number of crisis intervention services had a sharp drop at the beginning of the pandemic but then the number gradually came back up within six months.

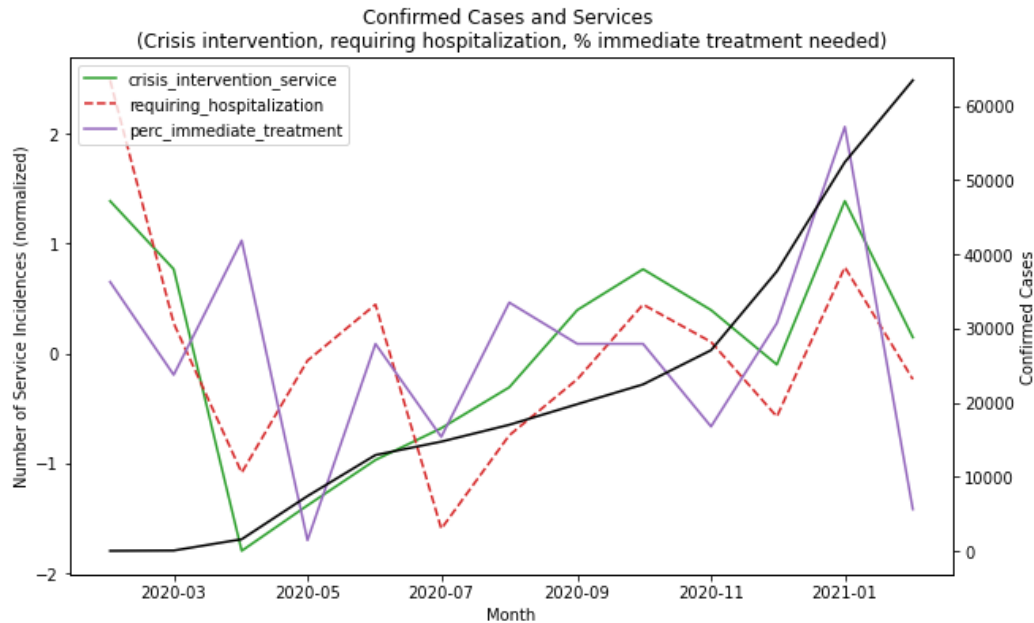


Figure 7 Confirmed Cases and Services (Crisis intervention, requiring hospitalization, % immediate treatment needed)

The other two variables, the number of youths requiring hospitalization and the percentage of youths indicated as needing immediate mental health treatment by Juvenile Court screenings, show relatively stationary trends. This is also reasonable since these two variables are more on the “recommendation” side instead of actual action needed to be performed so no health service personnel, facilities, or other physical services are involved. However, this also reflects that the need for treatment does not decrease during the COVID-19 pandemic while the actual treatment received decreases.

From a human-centered perspective, it is likely to show that some youths with mental health treatment needs cannot get proper treatments or services during the pandemic. More research and robust analyses should be performed to investigate the number of youths needing mental health help but not getting the services. Since it is hard to identify the target population, survey methods might need to be implemented to reach those youths.

6. Limitations

6.1 Unknowns and dependencies

One dependency exists in this analysis is the operation of CSB, such as the possibility of CSB being on a reduced schedule, reduced staff, or reduced service during the pandemic. Reduced service from the CSB will result in a reduced number of youths receiving the service. However, this is not super concerning in this project since there will be no causal relationship drawn from the analysis. Reducing service from the provider can also be influenced by the pandemic. Other potential dependencies can include government policy, population change, or school course load change during the pandemic. It would be ideal to obtain data on operation hours of CSB, total service provided by CSB, and any

government policy change on lockdown during the given time frame with enough granularity.

6.2 Lack of recent and granular data

Most published data on mental health online is only updated till the year 2019 and all the data is aggregated to some degree. Due to the lack of similar data from other counties or states, it is hard to conduct any parallel analysis to check the generalizability of the results or compare Fairfax County with other similar size counties.

6.3 Unclear targeting population

Data used in this project is only on outpatient services provided at the Fairfax-Falls Church Community Services Board (CSB). Given there might exist other mental health service providers in the region, the analysis results may not apply to a broader population. Additionally, there is no clear stated age range for “youth” in the report. This can also cause some trouble to identify the target population.

7. Conclusions

The analysis supports the hypothesis that the pandemic has a negative impact on the number of mental health services provided to youth in Fairfax County showing the negative correlations between confirmed COVID-19 cases and the number of intensive treatments as well as between confirmed cases and the number of outpatient services provided.

To further interpret the results from a human-centered perspective, the pandemic directly or indirectly makes it harder for youth to receive some mental health treatments which can also lead to a negative impact on their mental wellness. This can be a reminder to the mental health service provider that the current health care system might not be ready for large social lockdown, and it is important to discuss how to prepare better support and service resources to youth in any future pandemic-like events.

8. Reference

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9. Data Sources

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Youth Mental Health in Fairfax County During the COVID-19 Pandemic:

<https://www.fairfaxcounty.gov/neighborhood-community-services/sites/neighborhood-community-services/files/assets/documents/prevention/reports/youth%20mental%20health%20-%20april%202021%20final.pdf>