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Impact of Treatment Length on Individuals with Substance Use Disorders in Allegheny County

Cassie DiBenedetti

Kate Rosello

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Cassie DiBenedetti[1] and Kate Rosello[1]

Faculty Advisor: Rachael Miller Neilan, Ph.D.[1]

[1]Department of Mathematics and Computer Science, Duquesne University, Pittsburgh, PA

Abstract

Auberle social services is opening the Family Healing Center (FHC), a level 3.5 treatment program in Pittsburgh, PA that provides housing and 24-hour support for families struggling with opioid addiction. We partnered with Auberle to study characteristics of individuals receiving level 3.5 treatment and to determine whether longer treatment lengths correlate with fewer adverse outcomes.

We obtained data from the Allegheny County Department of Human Services on 2,016 individuals admitted to level 3.5 treatment in 2019. The data included birth year, race, gender, admittance date, discharge date, and Children Youth and Family (CYF) incidents before and after treatment. We categorized the population into three groups based on length of treatment (<14, 14-30, and 30+ days). We applied statistical tests to determine significant demographic differences between the groups. Additionally, we measured the impact of treatment in each group by examining the change in CYF incidents before and after treatment.

Results show that the average age of individuals in each group increased with treatment length. The group that persisted in treatment 30+ days contained a higher percentage of Black/African American individuals (33%) than the other two groups (22-23%). We found that the frequency of CYF cases decreased after treatment across all groups, with the largest decrease observed in the group with 30+ days of treatment. Additionally, we observed that the frequency of CYF placements after treatment decreased as treatment length increased.

These results will help Auberle better understand characteristics of individuals served by the FHC and demonstrate the positive impact of persistence in a treatment program.

1 Background

Since the 1990s, the opioid epidemic has negatively impacted the United States. Responses to this conflict naturally focus on directly treating individuals with Substance Use Disorders (SUDs). However, there is considerably less professional attention toward restructuring family dynamics of caregivers with SUDs even when the family experiences adverse effects [1]. In 2017 alone, 2.2 million children were affected by the opioid epidemic in the United States [3]. As seen in Figure 1, the prevalence of parental alcohol or drug use as an identified condition of a child's home removal has risen 20.4% in the past two decades [4].

Among the state of Pennsylvania's child removals, 32.4% were SUD-associated in 2019, well surpassing the national average at the time [4]. The rate of opioid deaths in Allegheny County alone has continually grown over 15% from 2018-2020 [5]. This statistic coupled with the lack of support for families affected by SUDs has prompted the Pennsylvania Department of Drug and Alcohol Abuse to promote and prioritize the development of family-centered SUD treatment [6].

Auberle, a nonprofit social services organization located in Pittsburgh, Pennsylvania, has developed a driven team actively responding to this pressing request. With a mission of providing positive outcomes for strong individuals, families, and communities, Auberle's trauma-informed care programs cover a deep myriad of services, including teen youth and foster care, housing, behavioral health services, and employment services [7].

Currently, Auberle is preparing to open the Family Healing Center (FHC) in June of 2022. Located in Mount Oliver, this facility hopes to diminish the likelihood of childrens' separation from their families due to SUDs. Specifically, the FHC will admit families with a caregiver qualifying for level 3.5 treatment for opioid addiction. In Pennsylvania, level 3.5 treatment is an intense, regulated level of care without hospital admittance. Typical 3.5 treatment includes a certified recovery specialist as well as a counselor or therapist.

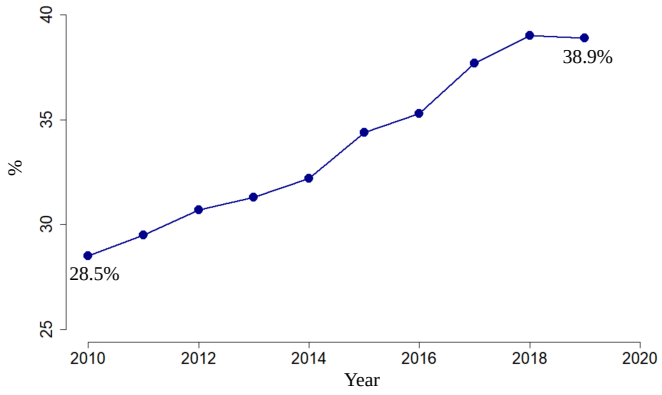

Figure 1: Growing rate of SUD-related child removals from 2010-2019 [4]

In addition to these services, the FHC will also provide a family support specialist, onsite childcare services, evidence-based parent support programs, and even transportation services for families. Auberle considers a family member as *any* individual residing in the same home as the admitted adult. Further, the FHC will consider any individual between the ages of 0 and 18 as a child. The FHC will accept up to and including 4 children for each family. Therein, these generalizations for admittance are unique facets of the FHC that remove common barriers for families in need.

As previously mentioned, the FHC aims to treat caregivers with SUDs and simultaneously strengthen family structures so children are safe remaining in their homes following treatment. In other words, the FHC would like to diminish the occurrence of Children, Youth, and Family (CYF) incidents in Southwestern Pennsylvania. Throughout this project, CYF incidents are distinguished using the following terminology:

- A **CYF case** entails an active, open case following alleged reports, claims, or alarming instances that give rise to further investigation.
- A **CYF placement** is more severe and may result in a child's removal from his or her home prior to placement into foster or relative care.

In our project, we explore the impact of level 3.5 treatment programs on both CYF cases and placements.

2 Project Objective

This study examines the demographics of individuals with SUDs who received level 3.5 treatment in Allegheny County in 2019. We divided the population into three groups based on length of time in treatment and compared demographics across these groups to identify key characteristics of those who persisted in treatment. Finally, we measured the impact of level 3.5 treatment on CYF cases and placements and evaluated how these measures differ based on treatment length.

3 Methodology

3.1 Data

We obtained data from the Allegheny County Department of Human Services on 2,016 individuals who received level 3.5 treatment in Allegheny County in 2019. This data included the following information for each individual:

- Birth year

- Race
- Gender
- Date on which the individual was admitted into treatment
- Date on which the individual was discharged from treatment

Using the data, we calculated the following information for each individual:

- Age, and
- Length of treatment (i.e., length of time between admittance and discharge dates).

Individuals in our population were categorized into one of three treatment groups based on length of treatment. The groups were defined as less than 14 days in treatment, 14 to 30 days in treatment, and more than 30 days in treatment. These categorizations were determined based on discussions with Auberle and further investigations of the data set. Specifically, treatment lengths less than 14 days were indicative of a failed treatment program. The shortest level 3.5 treatment program is 14 days, but many programs can exceed 4-6 months. Figure 2 displays the frequency of treatment lengths among our population. There is a considerable drop in number of individuals who persisted in treatment beyond 30 days, thus we opted to place these individuals into a single group.

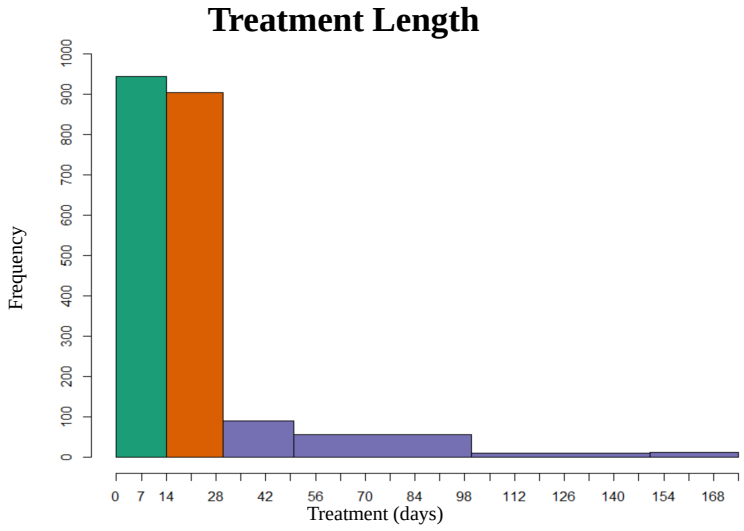

Figure 2: Histogram showing the distribution of treatment lengths within our population. The population was divided into three treatment groups based on treatment length: $<$ 14 days (green bar), 14–30 days (orange bar), 30+ days (purple bars).

3.2 Procedures

First, we applied statistical tests to determine if there were significant differences in race, gender, and age across the three treatment groups. All tests resulting in $p < 0.05$ were considered statistically significant. All statistical tests were implemented using statistical software R. [2]

Chi-squared tests were used to evaluate differences in race and gender, non-continuous variables, across the three groups. Chi-squared test values were obtained in R using the chisq.test() function and the formula

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

where E_i is the expected value and O_i is the observed value. After performing the Chi-squared tests, variables resulting in significant p-values were further analyzed. Specifically, additional Chi-squared tests were applied pairwise to the groups to determine statistical significance in race and gender. The Bonferroni correction was used in this step to account for multiple comparisons being executed. The Bonferroni corrected p-value is calculated by dividing the original p-value by the number of analyses on the dependent variable.

One-way analysis of variance (ANOVA) test was performed to evaluate differences in age, a continuous variable, across the three treatment groups. Within R, the ANOVA test was applied using the hypotheses

$$H_0 : \mu_1 = \mu_2 = \mu_3$$

$$H_1 : \text{at least one population mean is different from the rest.}$$

The F-value for the ANOVA test was obtained in R using

$$F = \frac{MSR}{MSE}$$

where MSR represents the regression mean square and MSE represents the Error Mean Square.

Second, we evaluated the impact of treatment on CYF cases by comparing the percentage of individuals with a CYF case before treatment to the percentage of individuals with a CYF cases after treatment. The same was done with CYF placements. These percentages were graphed and we compared the results across the three treatment groups.

4 Results

4.1 Demographic Summary of Population

Our population consisted of 2,016 individuals who received level 3.5 treatment in Allegheny County in 2019. We found that the majority (1,351 individuals, 67%) of this population was male (Figure 3). Furthermore, approximately 75% of the population was White (1,525 individuals) and 24% (477 individuals) was Black/African American. Less than 1% (14 individuals) of the population that were identified as Other/No Data (Figure 4). The age of individuals within our population ranged from 16 to 77 years with a mean age of 40.25 years. The highest frequency of age values was between 30-40 years (Figure 5).

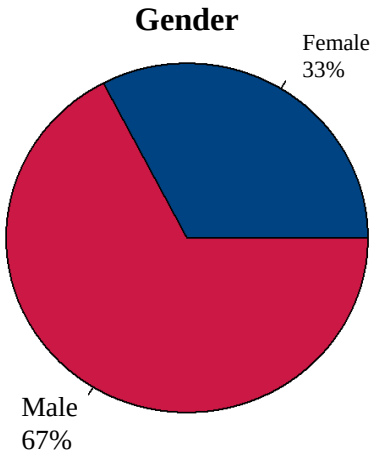

Figure 3: Pie chart summarizing the gender of individuals who received level 3.5 treatment in 2019

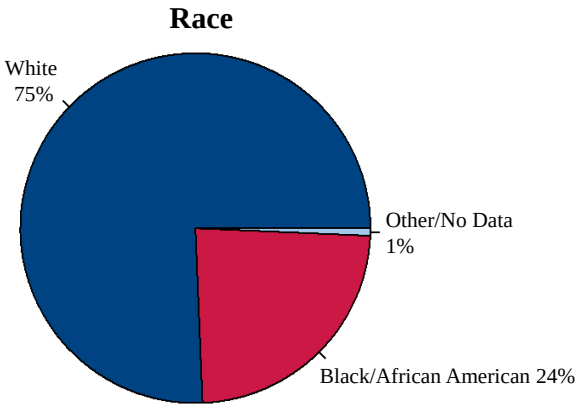

Figure 4: Pie chart summarizing the race of individuals who received level 3.5 treatment in 2019

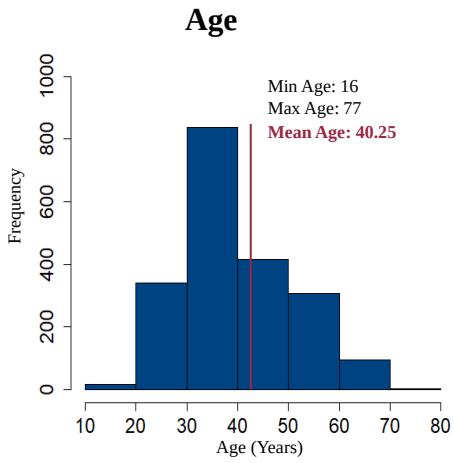

Figure 5: Histogram displaying the distribution of ages of individuals who received level 3.5 treatment in 2019

4.2 Demographic Differences across Treatment Groups

Upon dividing our population into three treatment groups, we found 945 (46.9%) individuals did not persist in treatment beyond 14 days. Additionally, we found 921 (45.68%) individuals remained in treatment between 14 to 30 days, and the remaining 150 (7.44%) spent 30 or more days in treatment.

Results from the statistical analyses of race, age, and gender across all three treatment groups are displayed in Table 1. There were statistically significant differences in race and age across the treatment groups ($p < 0.05$). Post-hoc tests revealed a significantly higher percentage of Black/African American individuals in the 30+ treatment group compared to the other two groups. Age increased as treatment length increased; therefore, on average, older individuals were more likely to remain in treatment beyond 30 days. Gender did not vary significantly across the three groups.

Variable	<14 days ($n = 945$)	14-30 days ($n = 921$)	30+ days ($n = 150$)	Significance Test	p value
Race [%]					
White	75.76	76.98	66.66	$\chi^2 = 12.034$	0.0171
Black/African American	23.17	22.58	33.33		
Other/No Data	1.06	0.43	0		
Age [mean, (sd)]	39.42 (10.16)	40.97 (11.09)	41.07 (11.27)	$F = 5.348$	0.00483
Gender [%]					
Male	66.88	66.45	71.33	$\chi^2 = 1.4066$	0.4949
Female	33.12	33.55	28.66		

Table 1: Comparison of demographics across treatment groups

4.3 Impact of Treatment on CYF Cases

We found that longer treatment lengths corresponded to decreased rates of CYF cases and placements. Figure 6 illustrates the change in the percentage of individuals with a CYF cases before and after treatment for each of the treatment groups. All treatment groups experienced a decrease in CYF cases after treatment compared to before treatment; however, the largest decrease in percentage values occurred in the 30+ days group. Among individuals who spent more than 30 days in treatment, the percentage of individuals with a CYF case after treatment dropped 2.67% (12.67% pre-treatment to 10% post-treatment).

Additional focus was placed on the subset of individuals in our population with a CYF case prior to treatment. Figure 7 shows that among these individuals, the rate of CYF cases *after* treatment decreased across all groups. Notably, the group with 30+ days in treatment experienced the smallest rate of CYF cases after treatment.

4.4 Impact of Treatment on CYF Placements

As we continued to focus on the subset of individuals in our population with a CYF case prior to treatment, we found similar results related to CYF placements. Figure 8 shows that among this subset of the population, the rate of CYF placements after treatment decreased as treatment length increased. Similar to our earlier results, the group with the lowest rate of CYF placements after treatment was the group with 30+ days in treatment.

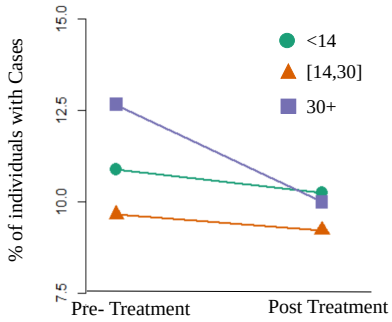

Figure 6: Percent of individuals with a documented CYF case pre and post treatment

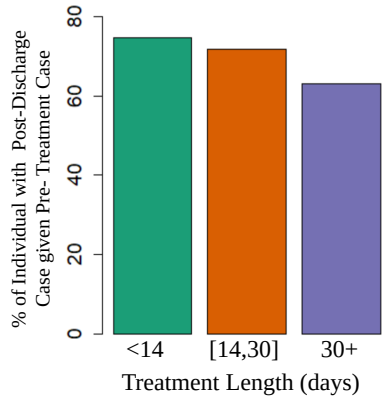

Figure 7: Percent of cases following treatment among subset of individuals with a pre-treatment CYF Case

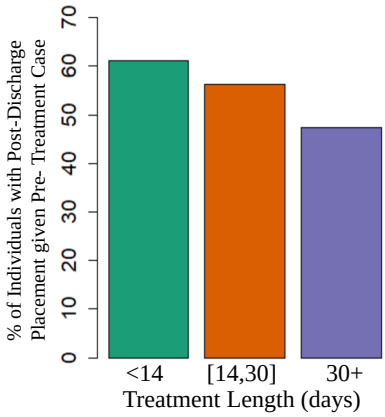

Figure 8: Percent of placements following treatment among subset of individuals with a pre-treatment CYF Case

5 Concluding Remarks

In summary, our results revealed that the individuals who used level 3.5 treatment in Allegheny County in 2019 were predominately male and predominately white. The average age of individuals in this population was 40 years. However, after analyzing the length of time these individuals spent in treatment, we found that individuals who persisted in treatment beyond 30 days are on average older and more likely to be Black/African American than those in shorter treatment programs.

Our results also revealed that individuals who persisted in treatment beyond 30 days consistently experienced fewer adverse outcomes related to CYF cases and placements. Specifically, the largest decrease in the percentage of individuals with a CYF case before versus after treatment was observed in the treatment group that persisted beyond 30 days. Further analyses focusing on only individuals with a CYF case before treatment showed reduced rates of CYF cases and placements after treatment in all groups. However, the

largest decrease was again observed in the group that persisted in treatment beyond 30 days.

A limitation of our study is that the data on each individual's CYF history was restricted to the one-year period before and after treatment. While this limitation has no impact on the outcome of this research, future work could seek the long term (>1 year) impact of level 3.5 treatment on families.

The results of this study will help Auberle better understand the demographic characteristics of individuals served by the FHC, and also demonstrate the positive impact of persistence in a treatment program.

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