County Profiles: Utilization of Mental Health services funded through Medicaid for each fiscal year in the State of New York

George Mason University

AIT-580-003 | Prof. Dr. Harry Foxwell

Snehita Moturu
George Mason University
Fairfax, Virgina
smoturu@gmu.edu

Abstract

This paper presents data of County Mental Health Profiles: 2006-2016, which is an overview of the use of mental health treatments paid for by Medicaid is given in this dataset, which was released by the New York State Office of Mental Health. It is available for each fiscal year of the local government. New York, at its center is Manhattan, a borough with a high population and one of the biggest commercial, financial, and cultural hubs on the planet. These reports include the data from Prepaid Mental Health Plans (PMHPs) as well as Community Support Program and Comprehensive Outpatient Services (COPS) add-on payments, where applicable. In order to get insights into how New York Mental Health funds being claimed for various treatments over the period of 2006-2016. Using the dataset, it helps to improve one's understanding towards the treatment of Mental health as well as the expected cost for a treatment respectively based on the number of patients and the different treatments given. Finding out the most common mental health recipients in different county helps to expand the treatment centers such that people can have more access for the treatment. It also helps to know which localities needs the awareness with regards to mental health illness. Understanding which category people are mostly affected by mental health illness helps to know the causes for the same.

Keywords -Mental health, fiscal year, recovery facilities, Treatments, community services, Medicaid utilization.

I. INTRODUCTION

An individual's unhappiness is not the cause of a mental health crisis. In short, it refers to the world in which we live: our economy, our culture, and our health care system. Most people have struggled with their mental health at some point during their lives. Mental disorders continue to affect an increasing number of people, yet the majority don't access adequate treatment despite meeting diagnostic criteria. There have been several researchers who has used different methods and materials to analyze the frequency of recovery facilities and options available for the patients. The goal of the research study was to understand how recovery is facilitated from perspective of the service recipients in alleviating recovery difficulties.

The New York State Office of Mental health provides the mental health medical service using the rate reimbursement to pay. OMH is a pioneer in

mental health education, research, and innovation. In the practice and therapy realms, we never stop setting new standards. To effectively guide all New Yorkers, our expertise informs proactive policies and initiatives. Governor Andrew Cuomo established a Medicaid Transformation Team as part of his initiatives to perform a radical redesign of the Medicaid program to produce quantifiable enhancements in health outcomes, sustained cost management, and a more effective administrative system" (MRT). The MRT established a number of work organizations to examine and provide suggestions in significant areas, such as mental health (BH). Articles and books on mental health practice, therapy, and policy that have undergone peer review. For people looking to learn more about mental health or the funding for mental health system, these publications are invaluable resources. These programs' data comes from CONCERTS (Certificate of Need Certification System). The Office of Mental Health's State-operated programs and licensed providers' program-level data are both included in CONCERTS, along with data from OMH-funded providers. Residential program addresses are not included since it would compromise people's privacy.

Rate Codes are organized by OMH into the following categories[1]:

1. Partial Hospitalization
2. Recovery Services (PMHP - Prepaid Mental Health Plan)
3. Targeted Case Management (Intensive Case Management “ICM”, BCM, SCM)
4. Home and Community Based Services Waiver (HCBS)
5. Clinic Treatment
6. Comprehensive Psychiatric Emergency Program
7. Community Residence
8. Day Treatment
9. Family Based Treatment/Teaching Family Home
10. Psychiatric Inpatient OMH
11. Assertive Community Treatment(“ACT”)
12. Continuing Day Treatment
13. Intensive Psychiatric Rehabilitation Treatment
14. Residential Treatment Facility
15. Personalized Recovery Oriented Services
16. Health Home

As per the dataset records, from the dictionary and on the basis of the general definition, it was considered that the Age Group of ADULT was categorized as the candidates or patients who are older than the age of 21 years. Whereas, the Age Group of CHILD is categorized and considered as the patients who of 18 years old and younger than that.[2] Report displays average daily impatient census and population rates of utilization by region and county of residence for psychiatric inpatient settings of New York, including : General hospitals, Private Hospitals, State Psychiatric centers and residential treatment facilities. This project is intended to research the common concern about mental health recovery options which are being available for the patients and with what ease they are available for them. This can help people get personalized care which supports them to stay well. This also helps understanding the funding criteria for the people with regards to this illness.

According to the research, there are several issues with mental diseases, such as their high prevalence and restricted access to evidence-based psychological therapies. Furthermore, the majority of persons who suffer from a mental condition do not obtain therapy, and those who do receive treatment do not always receive adequate care. The core principles include Child centered, Family focused, Community based, Multi-system, culturally competent, Least restrictive/ least intrusive. The main aim of the Medicaid services is that to keep the child at home with the aid of services; Support the child in the congregation in the least disruptive scenarios; Recognize needs essential to act; Prevent aggravation and a relatively long demand for higher-end services by identifying requirements early and acting on them. Maintain responsibility for better results and the provision of high-quality care.

[1] *New York State Office of Mental Health. (2020, March)*.DATA.NY.GOV. https://bi.omh.state.ny.us/bridges/definitions#1810

[2] *Office of Mental Health*. (2022, April). DATA.NY.GOV. https://omh.ny.gov/omhweb/tableau/county-profiles.html

II. RESEARCH QUESTIONS

This study focuses on New York counties, being the most populous city in the United States where 988 is the new crisis resource. By analyzing the county mental health profiles of New York state, this paper helps us understand and visualize the following research questions:

1. Which county has most mental health recipients?

2. Which age group is most affected by mental health issues in each county?

3. What is the most common treatment given to patients with mental health issues?

Additional to it researchers will be able to focus on preventing the occurrence of this illness by finding out the most common treatment that is given to people affected by mental illness and it also helps to know the reasons why people are getting affected.

III. LITERATURE REVIEW

A limited amount of research has been done on that examine the Mental health, but there are some studies that consider various U.S. cities.

The Mental Health Requirements Assessment Study (MHNAS) offers information on the traits of schizophrenic patients and their needs when they return to the community in research work[3] and can better guide the creation, execution, and monitoring of new mental health initiatives. The findings of this study have enhanced community service planning to decrease rehospitalizations and encourage recovery. Hospitals functioned as the descriptive and inferential sampling units in the MHNAS's two-stage cluster sampling technique. Three to five months following discharge, a follow-up telephone interview was undertaken in addition to an in-person interview with the patient, a need assessment from a key hospital employee, and a left-behind evaluation from a key hospital employee.

According to Meer, V. L. der's research[4], mental health professionals might be able to assist individuals who have complex mental health issues needs in recovering using a range of psychosocial treatments and tools. The User Centered Design Process has been used in the analysis. The UCD approach and a subjective pilot study of a cutting-edge psychosocial intervention are discussed in this paper with the goal of assisting individuals with SMI in developing a holistic sense of self. UCD has thus far been shown to be a thorough procedure with lots of possibility for refinement and change in accordance with the requirements and preferences of its users. Based on the pilot research, TiM looks to be a beneficial and optimistic ultimate result. Although there are still some implementation and design issues, service users said they liked TiM and saw results.

According to the research[5], there are several issues with mental diseases, including a high prevalence and restricted access to psychological therapies that are supported by scientific evidence. Additionally, the majority of persons who are experiencing a mental condition do not obtain therapy, and of those who do, the majority do not receive an EBPT (Evidence-based psychological therapies), much less a suitable treatment. The quantity and caliber of evidence supporting the efficacy of EBPTs in treating a variety of mental diseases contrasts puzzlingly with statistics showing a drop in their availability. The authors' view is that patients will likely profit from EBPTs the most in the upcoming years if they can find an appropriate provider, if there are more providers accessible to give EBPTs, and if governments commit more funding to them.

[3] *The New York City Mental Health Needs Assessment Study (MHNAS).* (2017, March). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6877271/pdf/MPR-27-e1606.pdf

[4] Meer, V. L. der. (2021). Targeting Personal Recovery of People With Complex Mental Health Needs: The Development of a Psychosocial Intervention Through User-Centered Design. Frontiers.https://www.frontiersin.org/articles/10.3389/fpsyt.2021.635514/full

[5] Harvey AG, Gumport NB. *HHS Public Access*. (2015). Ncbi. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4395546/pdf/nihms668106.pdf

IV. DATASET

This dataset is taken from the DATA.NY.GOV website which is the official website for the New York state. And these statistics include an overview of information about the use of mental health services paid for by Medicaid for Local Financial Years, starting with calendar year 2006 and revised yearly after that till 2016.

It consists of 11 attributes and 7,665 records of data, which includes #number of counties and Age Group categorized as ADULT and CHILD. The data for these programs is derived from Certificate of Need Certification System. Information from OMH-funded providers along with data from State-operated programs run by the Office of Mental Health are all included.

Figure.1 shows the attributes in the dataset ranging from Service Year, OMH Region Code, OMH Region Label, County Label, Age Group, Rate Code Group, Recipient Count By County, Count Of Recipients By Rate Code Group And County, Units Total, Paid Claim Total. Of All the four datatypes, this dataset consists from nominal through ordinal, and ratio, are represented in the records.

DATASET	
Attribute	**Data Type**
Service_Year	Ordinal
OMH_Region_Code	Nominal
OMH_Region_Label	Nominal
County_Label	Nominal
Age_Group	Ordinal
Rate_Code_Group	Nominal
Recipient_Count_By _County	Ratio
Count_Of_Recipients _By_Rate_Code_Gro u And_County	Ratio
Units_Total	Ratio
Paid_Claim_Total	Ratio

Table 1: Dataset with different data types

V. MATERIALS AND METHODS

The main computer language used for wrangling and cleaning up the data was Python. The apps for data exploration and interpretation were R Studio, Python, and MySQL after the data had been prepared. For graphical visualizations, Python and R were used as the essential programming languages.

The process data cleaning was the primary task. And it was done using Python programming language. It was difficult to check out for the missing and ERROR values and to exclude them as they haven't had any significance as a part if the analysis. There were a few null values and a couple of errors for the values in the dataset. I have renamed the attributes of accurate and error free analysis. Which are updated as follows Service_Year, OMH_Region_Code,OMH_Region_Label, County_Label, Age_Group, Rate_Code_Group, Recipient_Count_By_County INTEGER, Count_Of_Recipients_By_Rate_Code_Group_And _County, Units_Total, Paid_Claim_Total.

Excluded the 'Row_Created_Date_Time' attribute as it does not have any significance in the data for the analysis. Using drop function removed the duplicates. Also as mentioned earlier there were a couple of values for which the amount claimed was left as blank which has been replaced by '0'. Removed the duplicates when the type of treatment is not considered. Changed the Data types for the numeric ones as they are in the string format which is not supporting for the analysis purpose. Most of the analysis has been done using the matplotlib, and numpy in python.

As a result the occurrence of duplicate values was decreased. Analysis takes off once the data is cleaned and updated. As the attribute violations didn't have much of textual data Natural language processing has not been of much use here. Comparison between various attributes were found using Python, and R programming however SQL developer has also been used in order to extra some information and the relationships between the attributes. Below figure

Figure 1: Ways to Clean Missing data in Python

Reference: Python Data Operations. (2022). Data Flair

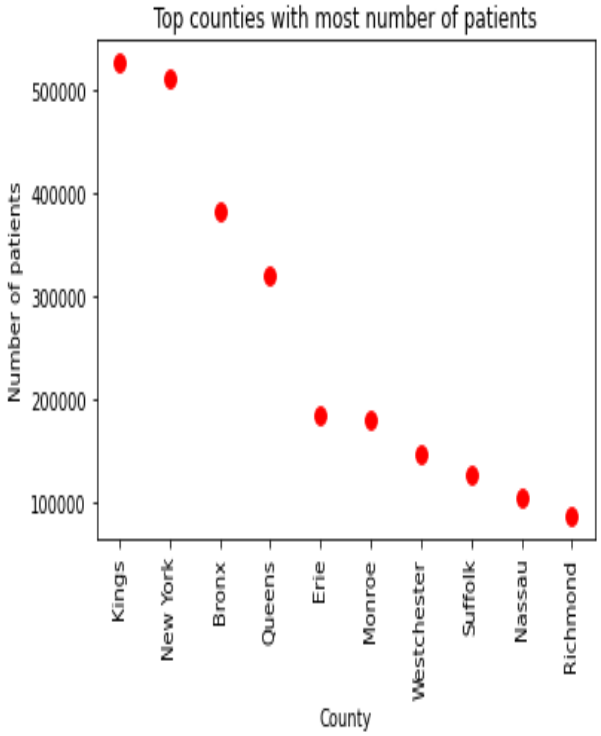
https://data-flair.training/blogs/python-data-cleansing/

VI. RESULTS

Firstly, considering the amount of people who are seeking help for the Mental health illness results in millions with respective to specific counties. Looking at the horizontal stacked bar plot it could be seen that over the period of 2006-2016 it can be clearly made out that the majority of the patients who were getting funded for their treatments are more in the Kings and the New York counties which is represented by the green and red respectively. However, the least affected was Erie consistently over that period of time. Whereas Queens has increased it's number from the year 2009-2012 and there has been a sudden drop latter. Looking at the Bronx County, it has neither increased not decreased drastically. There has been a minimal difference, but it remained almost the same throughout.

Using the scatter plot graph irrespective of other factors or vales on the basis of general analysis when checked for the correlation between the number of patients and the counties answers the first research question, which is, the county with most patients for mental health, that turned out to be the Kings and New York counties.

Figure 2: Top Counties with most number of patients



The above scatter plot shows the counties in a descending order with Richmond having the least number of patients. The other counties are closely the same and there is not much difference when compared to each other. Only the Kings, New York and the Bronx, and Queens are fare away from the others.

The below stacked bar plot was generated using python programming and it represents the relation of change between the different counties which are available and their total number of patients irrespective of age_group in the respective years from 2006-2016 and considering the top 5 counties. Which is a similar comparisons as of the above one but with a slight variation.

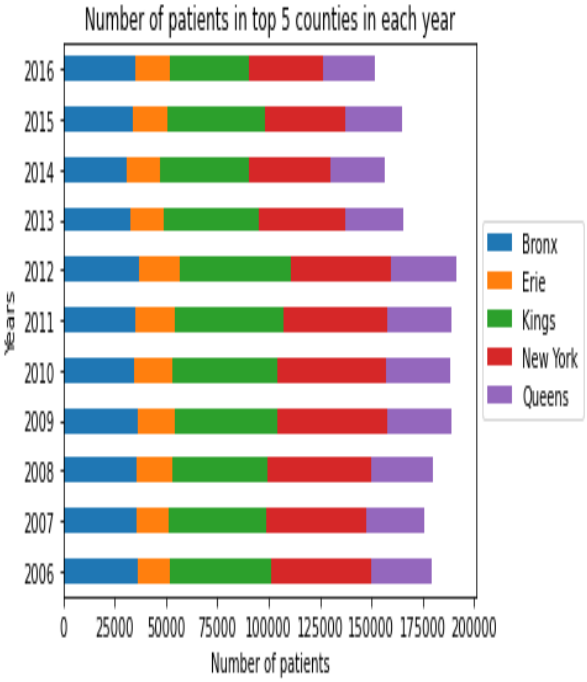


Figure 3: Number of Patients in top 5 counties in each year

Most of the analysis and the visualizations has been done using the Python programming with which the research questions were answerable. Comparing the relationship between Age_Group and the total number of patients in each Age_Group says that of the Adults and Children. The majority of the patients were the Adults which a whereas, the child is the least. Following are the values for the same:

	Age_Group	Recipient_Count_By_County
0	ADULT	26923926
1	CHILD	8030727

When in correlation with the patients in each age group corresponding to each year, it is observed that the over the period of time there has been a gradual increase in the number of patients but also that there has been no drastic change when observed the age_group. As per the earlier visualization graphs it's seen that the adult age group is the one with majority of treatments. However, in both the cases of adult and child patients got to decrease gradually. Please refer the following figure 5 to better interpretation.

The least number of adult patients are in the year of 2013 and the highest is in the year 2011 and 2008 are closely nearby.

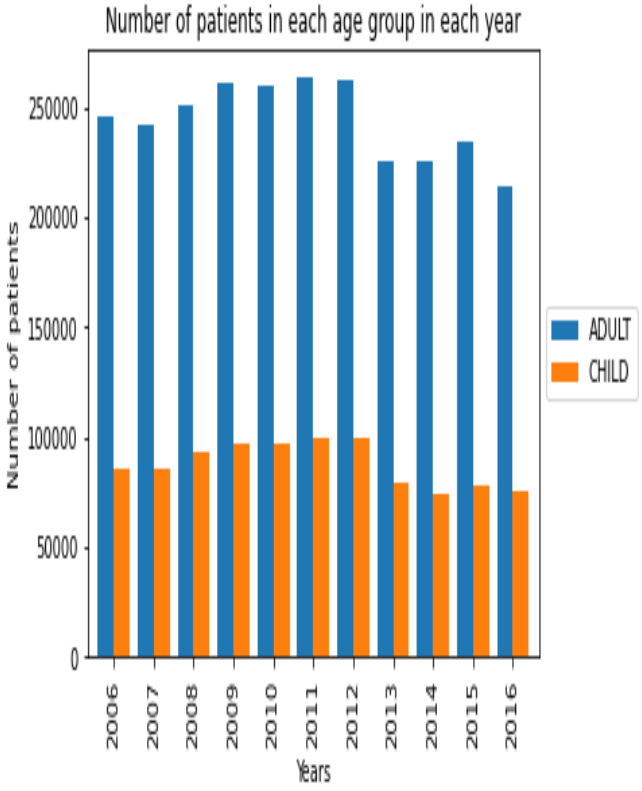


Figure 5 : Number of patients in each group corresponding to each year

To answer the second research question i;e Which age group is most affected by mental health issues in each county? And the analysis and the visualization were better in the R programming which was easy to interpret and understand. The above graph shows the adult and child variation corresponding to years but to answer the research question, the correlation has to be checked between the different counties and the age_group along with the count of patients.

There has been a difficulty in plot this graph as it wasn't easy to put all the 62 counties on a single axis and it was hard to adjust the bins which resulted in a bad visualization chart. There R has done a great job which allows us to fit how many ever values on a single axis. Below shown figure 6 is plotted using the 'ggplot' function using tidyverse library and by adjusting the element text.

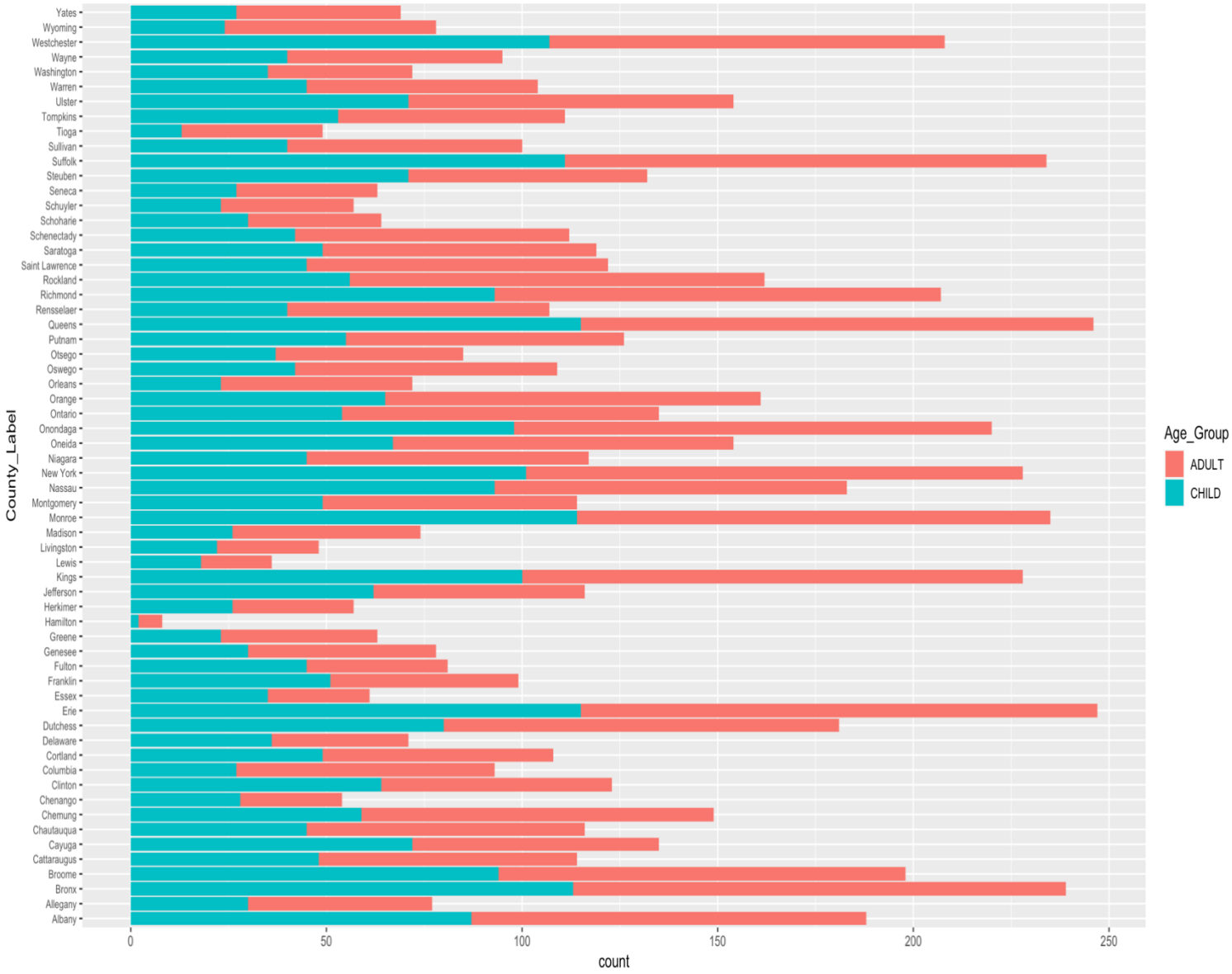


Figure 6 : Summarizing the number of patients in each age group in each county

Almost in all the counties the adult age group is having more count of patients which indeed tells us that the adults more often prone to mental health issues and they are the ones who is getting funded more by the Medicaid services. Also, this gives an edge of the research in terms of the funding criteria for the patients by the Medicaid services.
The difference here in this correlation is evident.

Though the number of patients is more in the king's county the amount claimed for the patients is more in the New York county from which it can be predicted that the cost of treatment in the New York county is greater than that of the King's County.

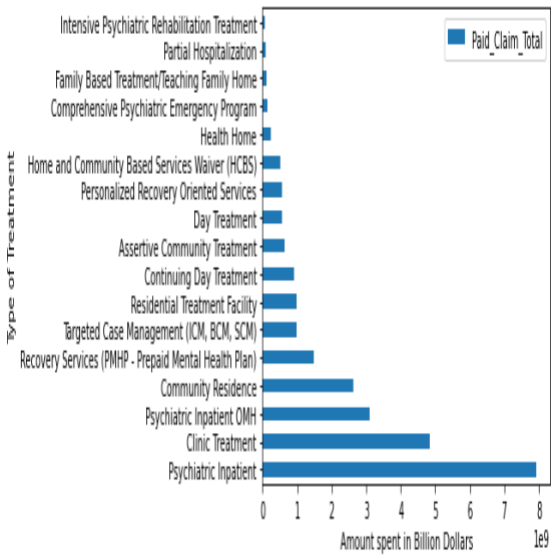


Figure 7: Costliest Treatment based on expenditure only

However, from the earlier graphs it can be seen that the clinic treatment is the most commonly opted treatment for the patients but as per the Figure 7. As above it can be predicted that though the clinic treatment is the most commonly opted one the Psychiatric Inpatient is the expensive and that is the one for which most of the funds are being claimed over the period.

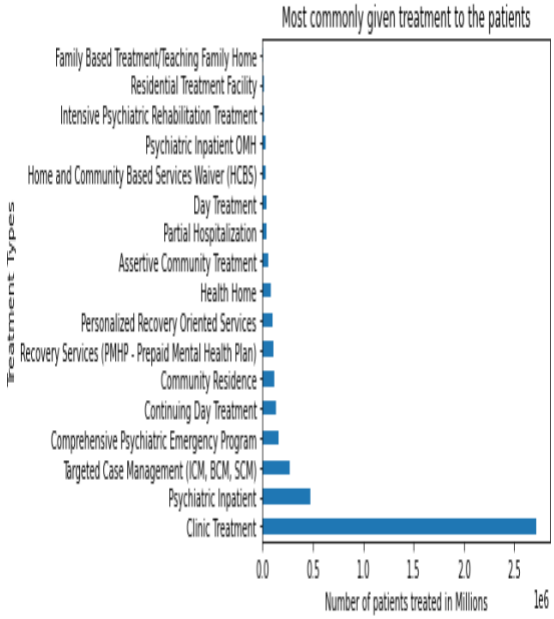


Figure 8: Most given treatment to the patients with mental health issues.

This horizontal bar graph shows us that the Clinic Treatment is the mostly opted treatment or most popular treatment. And the least given treatment is the Family based treatment/ Teaching Family home. Where comes the second most often given treatment is the psychiatric Inpatient and the rest others like Community residence, Targeted Case Management (ICM, BCM, SCM) are pretty much similarly treated methods or treatment types.

Summarizing the total number of patients that were treated in each year in the period from 2006-2016. Below is the line graph that shows us how is the change happening corresponding to the time.

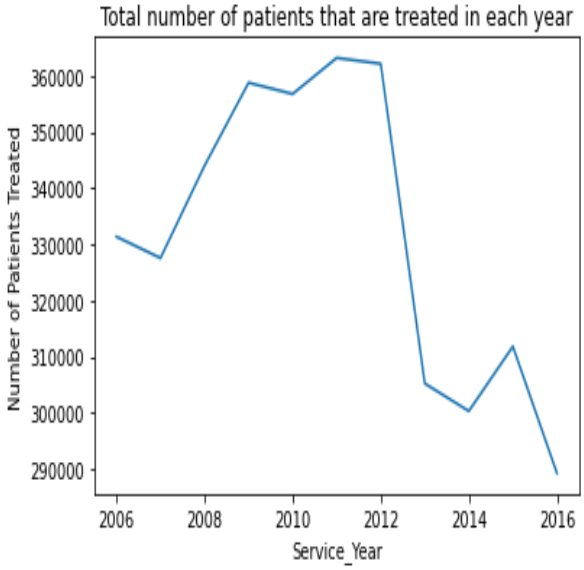


Figure 9: Total number of patients treated in each year.

It can be derived that initially there has been a slight decrease in the count of patients and then a sudden rise to peak point in the years after 2007 to 2009. With a little drops and hinges it gradually started falling down form 2012-2016. Which is a good sign indeed to anticipate that the number of patients are dropping by. However, the funding services will continue to do so as it's a government based which

works in favor for the people. Henceforth, the above line graph is the correlation between the number of patients being treated in the corresponding service year.

VII. DEMONSTRATION OF DATA USING SQL

Data interpretation using SQL is quite interesting. However, I have created a database in order to load this data of county mental health profiles from 2016-2016.

In the first, place I have created a database named 'AIT580_FINAL_PROJECT' and then created a table named 'County_Mental_Health_Profiles' with respective datatypes as shown in the figure 10. Thereafter, just to perform some basic queries I have manually inserted the first two rows of the dataset form the cleaned dataset where about 11 rows were excluded due to the incomplete data.

```
#Creation of database

CREATE DATABASE AIT580_FINAL_PROJECT;

USE AIT580_FINAL_PROJECT;
```

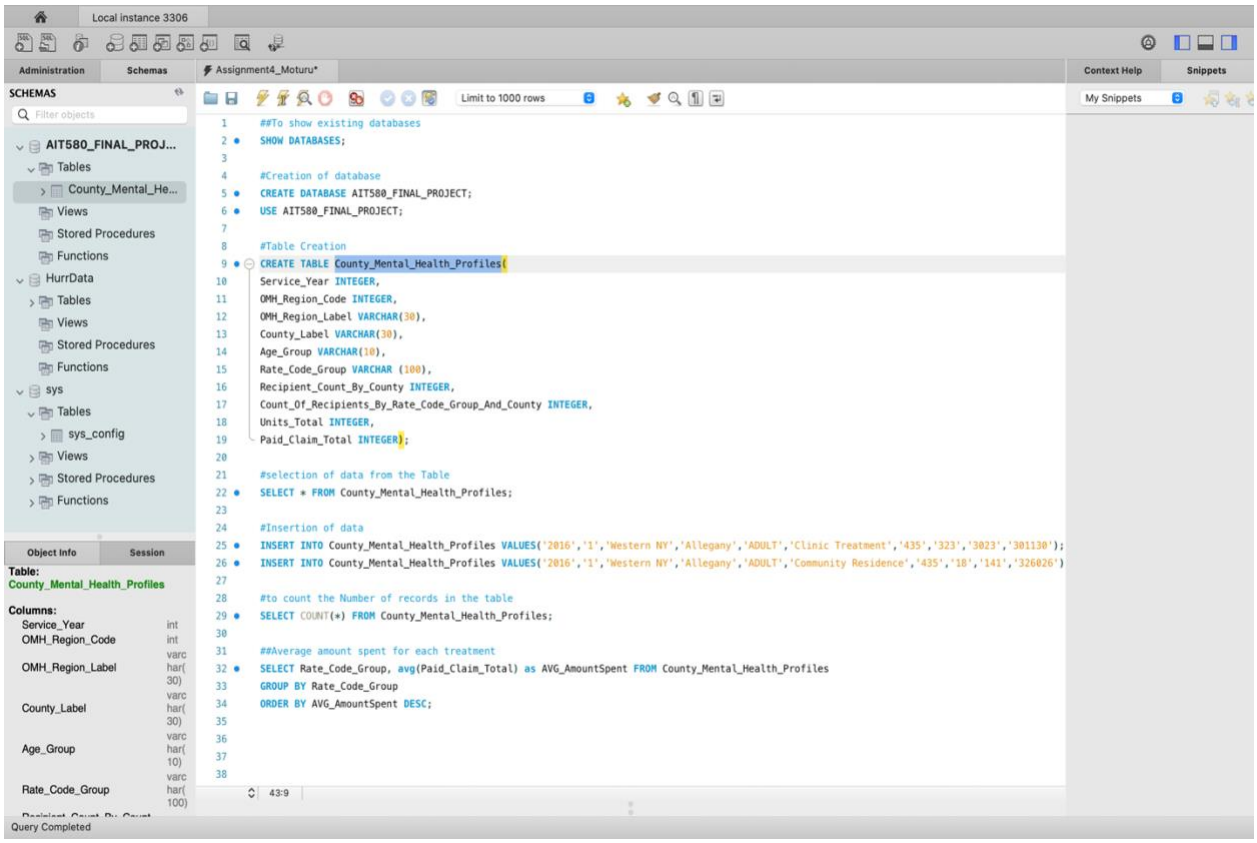


Figure 11: Loading the data into the Table.

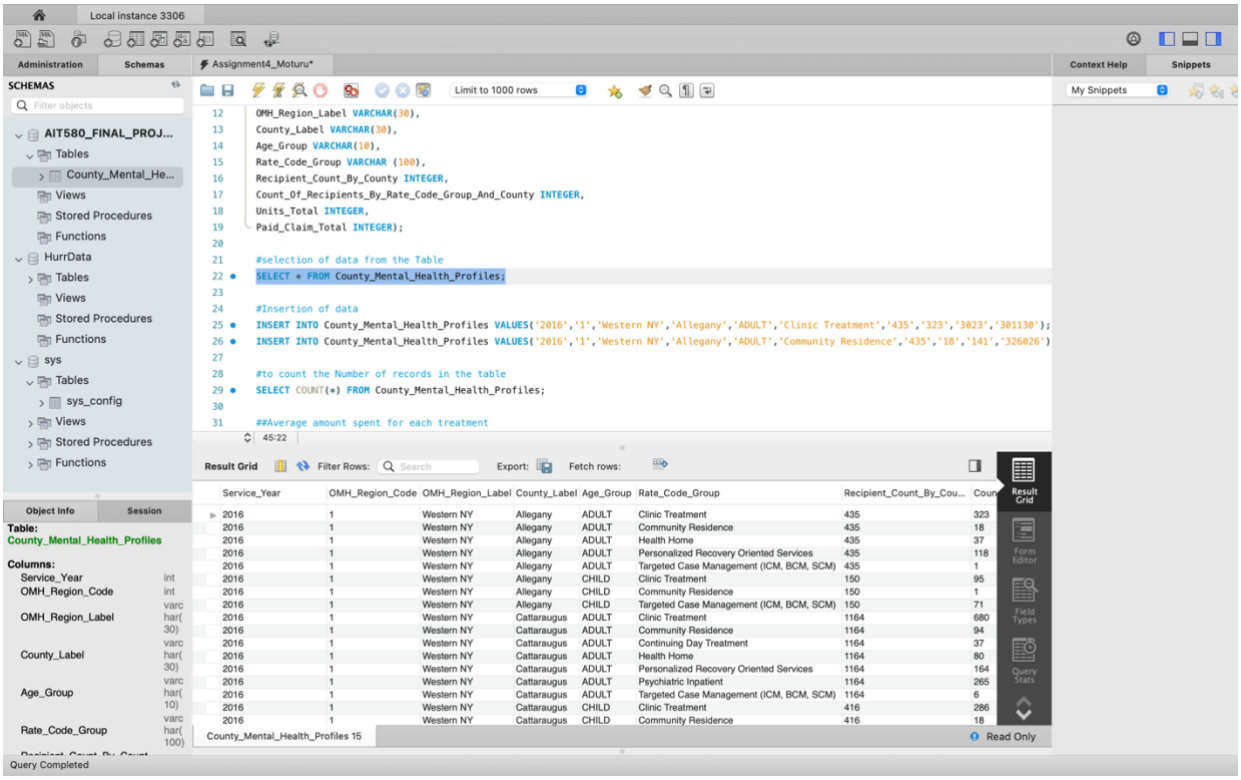


Figure10 : Creation of Database and Table

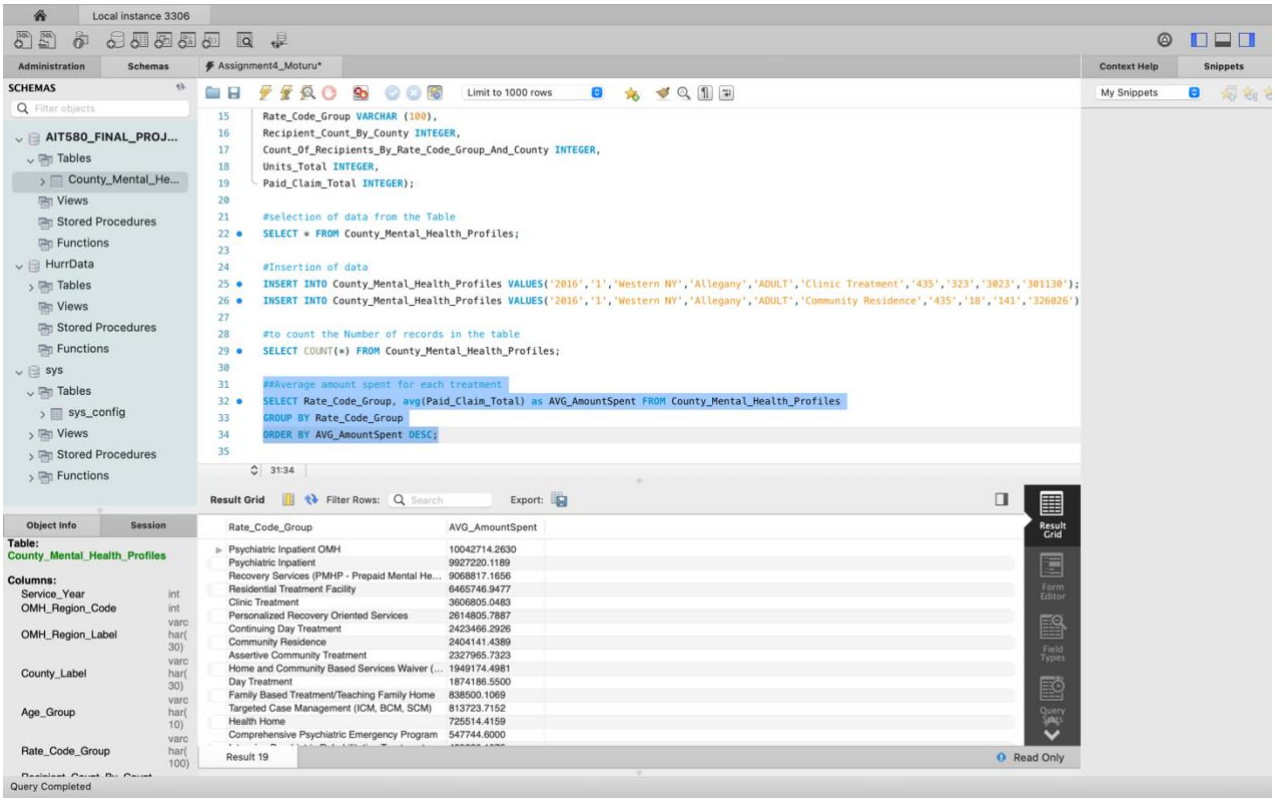


Figure12: Average amount spent on each treatment.

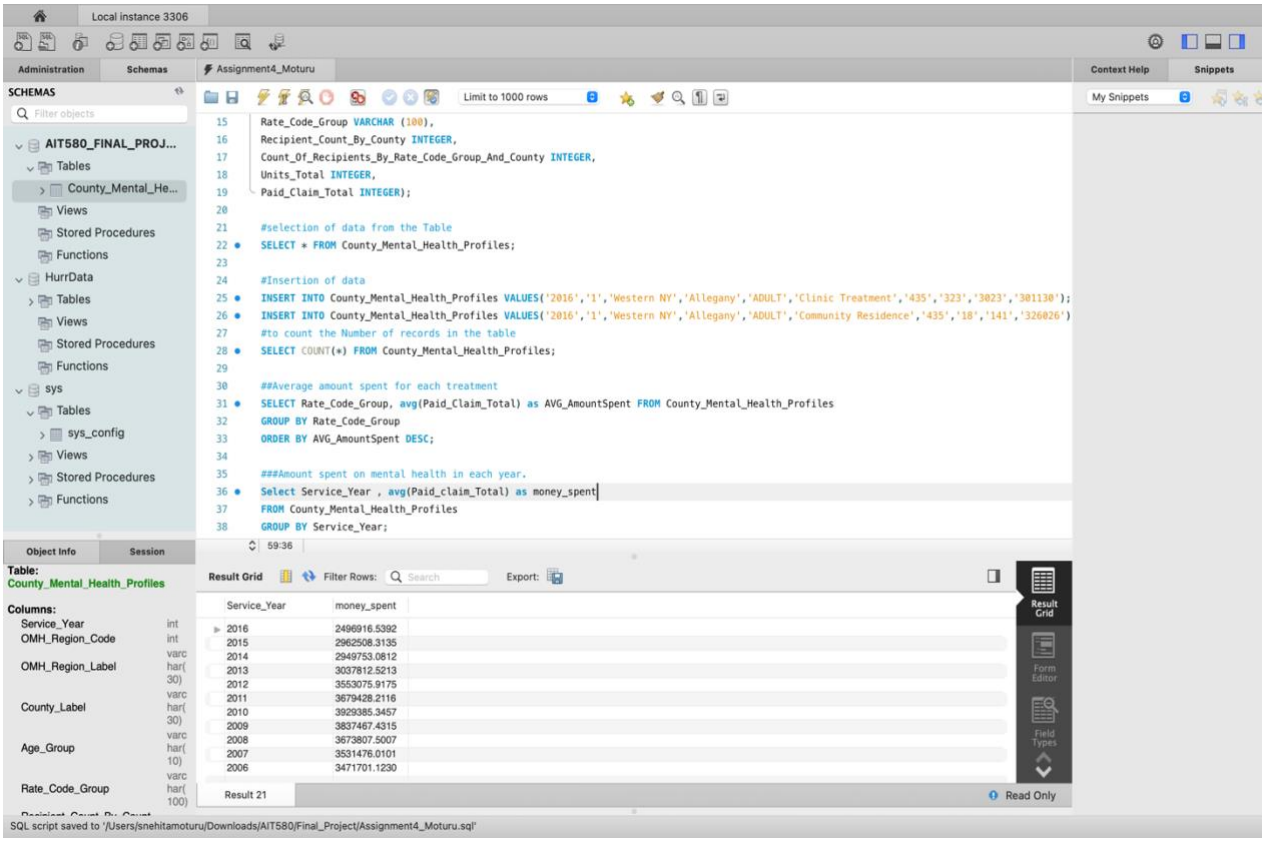


Figure13: Amount spent on Mental Health each year.

##Calculation of Amount spent on Mental health each year. This calculates the average value of the same.

VIII. CONCLUSION

Mental health is a critical issue in today's world. Which is very much evident on daily basis and on a large scale of geographic scope. As per the analysis it was crystal clear that the most of the funding was being taken by the adult age group which is the patients who are age 18 and older than that. However the trend doesn't follow the same in all the counties. Where also time plays a crucial role. While analyzing we have realized that various other factors comes into the play.

People mostly prefer the Clinic Treatment as it is less expensive than that of the Psychiatric Inpatient. For each year the amount spent for this Mental health treatment is the highest in the year 2010 which is 3,929,385.3457$. This has been derived using the SQL. With the help of the same it could also be observed that the average amount spent for each type of treatment varies and the 'Psychiatric Inpatient OMH' has the most spendings, that is on an average the amount spend for this specific treatment is $10042714.2630.

IX. FUTURE WORK

There are a lot of other factors and attributes that can be considered for better understanding and analysis purposes. Considering those can help us get more accurate results and better interpretation which will result in better insights. A couple of them are, having more detailed data regarding the Age_Goup can help us have better intuition. Future research will include studies with a wider range of counties

in the state if New York or may be considering other regions all over US, this helps us to have wider perspective of data and enhance our ability to interpret and gain insights.

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