

How does mental health provider presence and access relate to adolescent outcomes?

Matt Cougar Davenport, Chloe Harrah, Jhanvi Kannan, Chantan Morin Jr.

EPPS 6313.501

Dr. Muhammad Rahman

December 6, 2023

## **Research Question**

How does mental health provider presence and access relate to adolescent outcomes?

## **Abstract**

Throughout recent times, concerns persist regarding deficiencies in mental health care for American youth. Despite extensive needs assessments and recommendations, there are still plenty of shortcomings in the mental health delivery system. This study utilizes the County Health Ranking (CHR) 2021 dataset to examine the relationship between mental health provider presence and access in relation to critical adolescent outcomes—teen pregnancy, high school graduation rates, and juvenile arrests. Our hypotheses had to be rejected, with no significant relationship found between mental health provider presence and juvenile outcomes. Challenges included data quality, causation-correlation distinctions, confounding variables, and societal stigma. Despite our hypotheses failing, this research highlights the high levels of nuance in mental health outcomes, and the importance of a multi-faceted approach to real-world relationships.

## **Introduction and Background**

In an ever-evolving world, the well-being of our youth is of paramount concern for societies worldwide. Adolescence, often characterized by tumultuous physical, emotional, and psychological changes, is a pivotal period in an individual's life. It's a time when young people grapple with issues of identity, self-esteem, peer pressure, and the burgeoning responsibilities of adulthood. For many, these challenges can lead to deprecating levels of stress, anxiety, and depression, highlighting the critical need for accessible and effective mental health care services. However, despite the recognized importance of mental health care for teenagers, the glaring reality in America is that access to these services remains a significant concern, with availability varying greatly by state, by county, and by socio-economic status.

As our society has grown more cognizant of the significance of mental health, it is increasingly apparent that addressing the mental health needs of adolescents is not merely a moral obligation but also an economic and societal imperative. Failing to provide adequate mental health support for adolescents leads to significant disadvantages that could exacerbate existing inequalities in society along economic and gender-related lines. While there are presumably a multitude of variables that are affected by a lack of mental health care access, this paper has chosen to focus examining possible links with three specific outcomes that have been

shown to have a long-term negative effect on quality of life: teen pregnancy, juvenile arrests, and decreased high school graduation rates.

Adolescents facing emotional turmoil and psychological distress often resort to risky behaviors, including early sexual activity, which can result in unintended pregnancies. This, in turn, contributes to a cycle of challenges for young parents, affecting their educational opportunities and long-term economic prospects. Similarly, teenagers who do not receive the necessary support for mental health crises are more likely to engage in delinquent behavior. This behavior, often a response to untreated mental health challenges, can lead to involvement with the juvenile justice system, which carries a host of long-term consequences such as difficulties with employment, family-building, and access to secondary education. Lastly, stress, anxiety, and depression that go unaddressed can deter teenagers from completing their education or promote poor behavior that lead to the consequences of juvenile arrest as listed above. The level of access to mental health care may, in our estimation, be intimately related with these problems.

This research paper will delve into the relationship between the presence of mental health providers and these critical adolescent outcomes. By analyzing existing data, we aim to provide valuable insights into the various dimensions of this issue and its implications for teenagers, their families, and society as a whole. With a better understanding of this relationship, we would hope to inspire lawmakers, advocacy groups, and voters to place increased political emphasis and public funding toward mental health care access.

*Key Words: mental health, health care, teen pregnancy, juvenile arrest, high school graduation*

## **Summary of Results**

We hypothesized that increased mental health access would positively influence juvenile outcomes. To examine our research question, we used a number of analytical tools including Pearson's correlation coefficient, two-sample t-tests, and logistic regression to define any potential relationships and influence the variable mental health services may hold. Our findings did not support our hypothesis as no relationship amongst the variables was found.

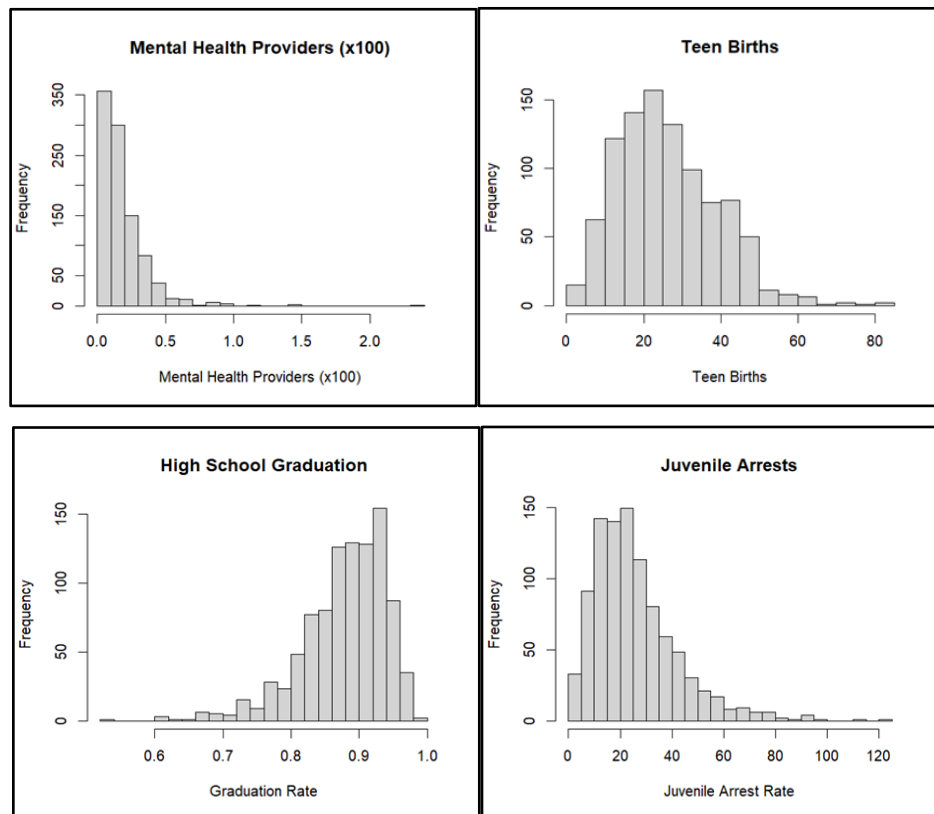
The rest of the paper is organized as follows: a data description examining our CHR data set and sample, the three hypotheses, the quantitative methodology, the data analysis and our findings, followed by a section containing our conclusion and limitations.

## **Data Description**

The source of the samples used in our methods is the County Health Ranking (CHR) 2021 dataset from the County Health Rankings and Roadmaps program. This dataset contains the health information for all 1,954 counties in the United States and the District of Columbia. The CHR uses county-level measures, and they obtain data from a variety of national and state data sources. For this research assignment, the variables of teen births, mental health providers, high school graduation, and juvenile arrests are considered. Not all counties had information on these variables, so a sample has been taken of the twenty-nine states (and D.C.) whose counties did have all necessary information. These states were Washington, Oregon, Arizona, New Mexico, Texas, Colorado, Nebraska, Alaska, Hawaii, Minnesota, Iowa, Missouri, Arkansas, Mississippi, Alabama, Wisconsin, Illinois, Florida, South Carolina, North Carolina, Virginia, West Virginia, Ohio, Pennsylvania, New Jersey, Delaware, Maryland, New York, and Rhode Island. A random sample of 963 counties (including D.C.) were taken out of these thirty states, and the same counties were used for each variable. Random samples were taken by assigning a random number to each county, sorting counties by number, and selecting the first 1,200 counties. 237 counties were removed due to lack of specific data needed.

The variable Mental Health Providers is the previous year's data (2020) on the ratio of population to mental health providers in a given county. This variable is used as an indirect measure of access to mental health facilities and resources. The mean is 0.179 and the standard deviation is 0.176. The distribution is highly skewed to the right. Teen Births is the number of births per 1,000 female population ages 15-19. According to CHR, mothers who give birth during teen years face barriers to attaining an education at or above high school completion and face additional mental and physical stress as well as chronic lack of community support. Given this, teen births may be an effect of lack of mental health access. The mean is 26.205 and the standard deviation is 12.896. The distribution is somewhat normal, excluding outliers. High School Graduation is the percentage of ninth graders that successfully graduate high school within four years. It is *not* the percentage of the population with a high school degree or equivalent. This distinction is made as the study is looking at youths specifically. Lack of mental health providers in the area may affect a youth's ability to graduate. The mean is 0.879 and the standard deviation is 0.062. The distribution is highly skewed to the left. Juvenile Arrests is the percentage of delinquency cases per 1,000 juveniles. The age of a "juvenile" may change from state to state, so keep in mind that numbers may be inflated or appear lower than they are given

that state's definition. Lack of access to mental health resources may lead to juvenile delinquency due to the youth's inability to find footing in the conventional society. The mean is 25.78 and the standard deviation is 16.464. The distribution is skewed to the right. As the random sample was further purged so that all observations had the relevant information, all variables have 963 observations.



### Hypotheses:

For our first variable, we will measure the amount of correlation between the presence of providers in an area and the rates of teen pregnancy. We hypothesize that an increased presence of providers will have a resulting association to decreased rates in teen pregnancy. We came to this conclusion based on the idea that accessibility to mental health providers can benefit teens suffering from mood dysregulation disorders such as depression and anxiety. In addition, counseling may alleviate some of the emotional impacts that occur due to problems in a teen's home life. Moreover, intervention by mental health providers may offer useful tools to help teens regulate their emotions and deal with issues that would otherwise increase their likelihood to become sexually active. Although, we have identified a few confounding factors that may impact

both presence of mental health providers and teen pregnancy. It is plausible that attitudes towards mental health services may pose a blockade, community resources such as access to sexual health education, peer influence, and family dynamics such as if the teen's mother was pregnant as a teen herself.

We will also examine the correlation between accessibility to mental health providers and high school graduation rates. We hypothesize that an increased presence of mental health providers will be correlated with increased high school graduation rates. This conclusion stems from the observation that accessibility to mental health care can positively impact teens overall positivity, motivation, and energy level. In addition, mental health aims to improve teens' emotional and social health which in turn decreases some external influences that may hinder their academic performance. Although, there are still some factors that may have unintended effects on mental health provider access and high school graduation rates. These include economic factors such as poverty, demographic factors, and lack of a support system. We will carefully analyze the data to get a better idea of the variable's correlation to mental health provider presence.

For our third variable, we hypothesize that the increased presence of and improved access to mental health providers will be associated with a lower likelihood of juvenile arrests among adolescents. This hypothesis is rooted in the belief that a stronger network of mental health services accessible to adolescents may have a positive impact on their well-being, ultimately reducing their involvement in the juvenile justice system. However, we acknowledge that while our research may reveal a significant statistical association between mental health provider presence and decreased juvenile arrests, establishing a direct causal link poses a complex challenge. Numerous confounding variables, such as socio-economic factors, family dynamics such as stigma revolving mental health, and community characteristics/political presence, can all influence the presence of mental health services and affect juvenile arrests, making it imperative that we collect as much statistical analyses as possible so we may control these potential confounders. This careful approach will allow us to dissect the relationship between mental health services and juvenile arrests, enabling us to make more informed inferences regarding causation while acknowledging the complexities of the underlying situation at hand.

### **Quantitative Methodology**

In testing our first hypothesis concerning the correlation between the presence of mental health providers and decreased teen pregnancy rates, we have opted for a dual-methodological approach, incorporating both Pearson's correlation coefficient and two-sample t-tests. While Pearson's correlation coefficient is adept at gauging linear relationships between continuous variables, our utilization of two-sample t-tests provides a complementary perspective, allowing us to formally test differences in means between areas with varying degrees of mental health provider presence. By incorporating both Pearson's correlation and t-tests, we aim to provide a comprehensive evaluation of the relationship between mental health provider presence and teen pregnancy rates.

For our second hypothesis, examining the correlation between accessibility to mental health providers and high school graduation rates, we once again turn to Pearson's correlation coefficient and two-sample t-tests. This method, as in the case of our first hypothesis, allows us to explore linear relationships. We believe that enhanced accessibility to mental health care positively influences adolescents' overall well-being, motivation, and energy levels, potentially contributing to increased high school graduation rates. By combining Pearson's correlation and two-sample t-tests in our methodology, we aim to ensure a thorough and nuanced examination of the multifaceted relationship between mental health provider accessibility and the outcome of high school graduation rates.

Shifting to our third hypothesis, exploring the association between the presence of mental health providers and the likelihood of juvenile arrests, we will continue to utilize the Pearson's correlation coefficient and two-sample t-tests. This method is well-suited for our investigation in exploring linear relationships, as we believe that the increased presence of mental health providers and access to it will lead to a lower likelihood of juvenile arrests. By using Pearson's correlation and two-sample t-tests in our methodology, our objective is to conduct a comprehensive analysis of the relationship between the accessibility of mental health services and the incidence of juvenile arrests.

To address identified confounding variables across all hypotheses, we incorporate multiple simple linear regression analyses. This method enables the inclusion of these variables as covariates in our models, enhancing the internal validity of our findings by isolating the unique impact of mental health provider presence and access on teen pregnancy, high school graduation, and juvenile arrests. In summary, our chosen quantitative methods align with the

specific nature of each hypothesis, providing a tailored and rigorous approach to address our research questions.

### **Data Analysis & Findings**

For our first hypothesis comparing the correlation of the presence of mental health providers and decreased teen pregnancy rates, we utilized the Welch Two Sample t-test in R. This test revealed a highly significant difference in means between "Mental Health Presence" and "Teen Birth Rates". The results read as ( $t = -62.67$ ,  $df = 962.36$ ,  $p\text{-value} < 2.2e-16$ ). The negative t-value indicates that "Mental Health Presence" has a significantly lower mean (0.1783801) compared to "Teen Birth Rates" (26.1940917). The 95 percent confidence interval further substantiates this difference, ranging from -26.83036 to -25.20107. These results suggest a substantial and statistically significant distinction between the two groups, affirming that their means are not equal.

In addition to the t-test, the correlation coefficient of -0.1335057, computed using R, provides further insights into the relationship between the variables. The negative sign indicates a weak negative correlation, suggesting that as the values of one variable increase, the values of the other tend to decrease, albeit modestly. While statistically significant due to the large sample size, the magnitude of the correlation coefficient (-0.1335057) indicates a weak linear relationship. Combining these findings, it appears that "Mental Health Presence" and "Teen Birth Rates" exhibit a substantial difference in means, supported by the t-test, and a weak negative correlation.

We repeated these tests for our second hypothesis as well, which examines the correlation between accessibility to mental health providers and high school graduation rates. The results of the t-test indicate a highly significant distinction ( $t = -116.78$ ,  $df = 1200.7$ ,  $p\text{-value} < 2.2e-16$ ) between "Mental Health Presence" and "High School Graduation Data." The negative t-value signals that the mean of "Mental Health Presence" (0.1783801) is significantly lower than the mean of "High School Graduation Data" (0.8788210). The 95 percent confidence interval reinforces this difference, ranging from -0.7122090 to -0.6886728.

In tandem with the t-test, the correlation coefficient of -0.3272435 offers additional insights into the relationship between "Mental Health Presence" and "High School Graduation Data." The negative correlation coefficient suggests a moderate negative linear relationship, indicating that as the values of "Mental Health Presence" increase, the values of "High School

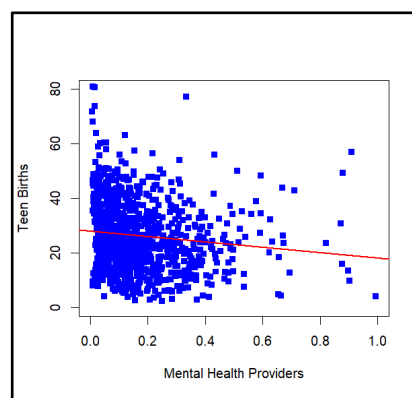


Graduation Data" tend to decrease. Combining these statistical findings, it becomes evident that "Mental Health Presence" and "High School Graduation Data" exhibit a substantial difference in means along with a moderate negative correlation.

With our third hypothesis comparing the association between the presence of mental health providers and the likelihood of juvenile arrests, we continue to use the Pearson's correlation coefficient and two-sample t-tests that we used previously. The results of the Welch Two Sample t-test revealed a highly significant distinction between "Juvenile Arrests" and "Mental Health Accessibility" ( $t = 48.185$ ,  $df = 961.22$ ,  $p\text{-value} < 2.2e-16$ ). The positive t-value indicates that the mean of "Juvenile Arrests" (25.7563) is significantly higher than the mean of "Mental Health Accessibility" (0.1784). The 95 percent confidence interval further supports this difference, ranging from 24.5362 to 26.6196.

In conjunction with the t-test, we attempted to examine the correlation between "Juvenile Arrests" and "Mental Health Accessibility" using Pearson's correlation coefficient. However, the correlation coefficient was reported as N/A, potentially due to the wide array of values presented in the data. While the absence of a correlation coefficient limits our ability to assess the linear relationship between the two variables, the findings from the t-test underscore the statistical significance of the differences observed. In summary, our analysis indicates a significant disparity in means between "Juvenile Arrests" and "Mental Health Accessibility," emphasizing the need for further investigation into the complex interplay between juvenile arrests and access to mental health resources.

To address identified confounding variables across all hypotheses, we used multiple simple linear regression models. Our first model shows the correlation between mental health providers and the teen birth rate in a given county:

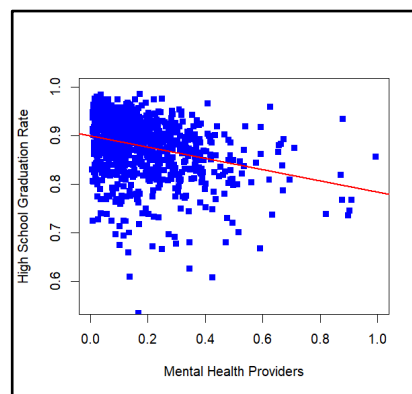


$$Y = -9.8x + 27.9$$

Residual standard error: 12.77 on 961 degrees of freedom  
Multiple R-squared: 0.01782, Adjusted R-squared: 0.0168  
F-statistic: 17.44 on 1 and 961 DF, p-value: 3.236e-05

The linear regression model shows a coefficient of -9.8 with a 27.9 intercept. Though the best-fit line shows a general trend downward, the graph is very clustered, and no accurate prediction can be made from the correlation. This is proven more by the R-squared and the degrees of freedom given for the standard error. A 0.0168 R-squared means the best-fit line is incredibly inaccurate, something that remains true for the other regression models. There is no measurable effect mental health provider access in a county has on births attributed to teens.

Our second model shows the correlation between mental health providers and the high school graduation rate in a given county:

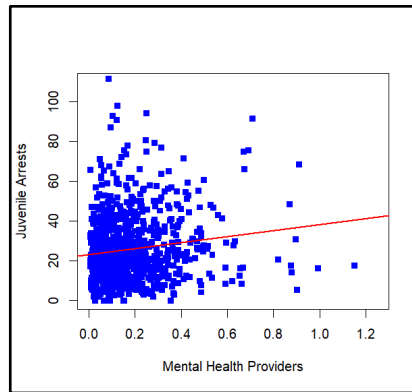


$$y = -0.12x + 0.90$$

Residual standard error: 0.05888 on 961 degrees of freedom  
Multiple R-squared: 0.1071, Adjusted R-squared: 0.1062  
F-statistic: 115.3 on 1 and 961 DF, p-value: < 2.2e-16

The equation for the model has a coefficient of -0.12 and an intercept of .90. The model shows a slight trend down, however, the R-square of 0.1062 proves that the line is not accurate to the model. Therefore, no accurate predictions can be made. Access to mental health providers in a county does not seem to have any measurable effect on the high school graduation rate of that county.

Our third regression model shows the correlation between juvenile arrests and mental health providers in the county:



$$y = 15.1x + 23.1$$

Residual standard error: 16.26 on 960 degrees of freedom  
 Multiple R-squared: 0.02579, Adjusted R-squared: 0.02478  
 F-statistic: 25.42 on 1 and 960 DF, p-value: 5.523e-07

The equation for the model has a coefficient of 15.1 and an intercept of 23.1. The best-fit line shows a general positive trend. However, due to the nature of the plot and the extremely low R-squared of 0.02478, the line cannot be seen as an accurate prediction of the regression model. Thus, access to mental health providers does not influence the juvenile arrest rates in a county.

## Conclusion

Throughout the course of this study our goal was to evaluate the correlation amongst the presence of mental health providers and factors contributing to negative life quality within adolescents. Specifically, we wanted to know whether the presence of mental health providers correlates with teen pregnancy, juvenile arrest, and high school graduation rates within the United States. Adolescent years are a time of questioning self-identity while facing additional societal pressures that may lead to several mental health issues such as anxiety and depression. Thus, this assertion led us to believe that the intervention of mental health services may alleviate some of the mental distress that teens are experiencing. Resultantly, we thought that access to mental health care would decrease the likelihood of struggling teens to engage in risky behavior and promote self-improvement. We hypothesized that an increased presence of mental health providers correlates to lower rates of teen pregnancy and juvenile arrests. Additionally, we hypothesized that an increase in mental health providers would correlate with increased high school graduation rates.

Our data was taken from the County Health Ranking 2021 data set, and we utilized data from 963 counties for our sample population. To evaluate the correlation amongst the variables we enlisted several forms of analysis. To summarize, to measure the first hypothesis of increased

mental health providers and a correlation to increased teen pregnancy, we employed Pearson's correlation coefficient and two-sample t-tests. This allowed us to judge linear relationships while also viewing differences in means for various areas with differing mental health provider presence. The second hypothesis required an additional use of Pearson's correlation coefficient as well. However, for the third hypothesis evaluating the correlation between mental health providers and juvenile rates we utilized logistic regression which was chosen because of its benefits in determining the existence of any relationship and the potential influence mental health provider access may hold.

Counter to our intuitions, none of our hypotheses are supported by the data we found. There are many possible reasons for this. First, our general hypotheses, that access to mental health care facilities would result in better juvenile outcomes and that a lack of access to mental health care facilities would result in worse juvenile outcomes, may have been overly simplistic and rooted in our ideas of how the world *should* work, and not in how it *actually* works. Ideally, all groups would use mental health care facilities if provided access to them, and mental health care facilities would place themselves near at-risk populations. However, this likely doesn't reflect the economic reality. It may be that mental health care facility location has nothing to do with what would be best for society but is rather a purely economic question of supply and demand. While it may be the case that teens who suffer teen pregnancy, low high school graduation rates, and juvenile detention could benefit from mental health care, that doesn't follow logically that these teens will create a demand for such services. It may be that trying to quantify demand for mental health care facilities would have to encompass a much larger array of variables than we attempted (such as anxiety, depression, personality disorders, etc.), or be purely based on economic, political, or social variables.

### **Limitations**

There were a few conceptual variables that may have influenced the outcome of our hypothesis. These include a stigma surrounding the utilization of mental health services and a potential lack of motivation from providers to provide opportunities for under-served communities. While we cannot establish that these factors influenced our results, it is plausible that these pose challenges to adolescents reaching adequate mental health services. Additional potential confounding variables not in our data include socio-economic status, family dynamics, and community characteristics, which could have muddled our efforts to link changes in

outcomes solely to mental health interventions. Through our analysis we omitted the confounding variables by utilizing logistic regression which in turn resulted in a bias that influenced our results. This created the assumption that everyone has equal financial opportunity and access to mental health services. In actuality, adolescents may not be able access mental health care for a number of reasons including socio-economic factors. Our findings regarding external validity do support that this information may be applicable to other contexts. We did not find a relationship amongst mental health provider presence and positive impacts on juvenile outcomes. Thus, future research and policymaking should not focus solely on mental health care provider access in aims to improve the lives of at-risk adolescents.

In addition to these considerations, there was the additional challenge of data availability and quality. Data related to mental health provider presence and access, as well as adolescent outcomes, is not consistently collected or reported, making it difficult to obtain a completely accurate dataset. Variations in data collection methods exist across different regions and we are forced to rely on the data of those who chose to partake in the 2021 County Health Findings. This lack of standardized data can limit the accuracy and generalizability of our findings, and it may be the case that imperfect collection of data affected our results.

## References

*Explore health rankings: Rankings Data & Documentation*. County Health Rankings & Roadmaps. (n.d.). <http://www.countyhealthrankings.org/explore-health-rankings/rankings-data-documentation>