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Brittany Abeldt

Wright State University - Main Campus, abeldt.2@wright.edu

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Correlations Between Quality of Life, Daily Sunlight, and Suicide Risk

Brittany Abeldt

Amber Todd, Office of Medical Education

Public Health

Scholarship in Medicine Final Report

By checking this box, I indicate that my mentor has read and reviewed my draft proposal prior to submission

Abstract

Objective: To examine associations between quality of life indices (poor mental health days and poor physical health days), suicide risk, and daily sunlight among adults living in the United States of America.

Methods: Data was collected from the archives provided by the CDC Wonder database; including The Behavioral Risk Factor Surveillance System, The North America Land Data Assimilation System, and The Web-Based Injury Statistic Query and Reporting System. The variables used were quality of life (as measured by mental health days and physical health days), suicide rates, and daily sunlight. Data was obtained for all the states in the United States, excluding Alaska and Hawaii due to lack of available data from these states. Quality of life and suicide rate data was from 2016 and daily sunlight data was from January 1st, 2001 to December

31st, 2011. Spearman's Rho Correlations were used to analyze the data because the data did not fit normality criteria.

Results: There was a statistically significant positive correlation between poor physical health days and suicide rates, $r = .303$, $p = .032$. No other correlations were found to be significant.

Key Words: Quality of life, mental health, physical health, suicide rates, daily sunlight

Introduction/Literature Review

Mental health has a significant effect on the quality of life for millions of people worldwide. The rates of depression have been increasing over the past 15 years. More than 350 million people are affected and around 800,000 people yearly have committed suicide according to the World Health Organization ¹. Along with the high prevalence rates, depression is also second in terms of causes of global disability and eleventh in causes of global burden of disease. To put this into numbers, one study calculated that the amount of money lost in productivity per year due to depression was \$36.6 billion. On an individual level, the yearly costs of health care of adults with depression on average was found to be \$2000 higher than health care costs for those without a depressive disorder ². Due to the high prevalence and disease burden of depression, various studies have been done on how to prevent and treat this disorder.

Various studies have explored the correlation between mental health, physical activity, quality of life, and life expectancy. Overall, the studies have shown that being physically inactive was related to having a decreased quality of life and shorter life expectancy ³. Physical activity has been shown to improve mental health as well as reduce the risk of premature death from conditions such as diabetes and cardiovascular disease ⁴. Inactivity was also shown to increase

the risk of developing depression, with increased physical activity protecting from depression and used as a significant treatment ⁵. Furthermore, suicide risks were found to be directly linked to changes in quality of life ¹.

Another factor that has been correlated with both mental health and physical health is sunlight. There is an increasing amount of evidence that vitamin D, which is gained mainly from sunlight, has a large role in depressive disorders and physical functioning ⁶. People with more sunlight exposure have been shown to participate in more physical activity ⁷. Higher light levels have also been associated with better mood ⁸. This relationship is most often linked to biological processes involving the ganglion cells in the eye that process information which is sent to the brain. One example of a disorder that supports the relationship between sunlight and improved mood is Seasonal Affective Disorder. In this disorder individuals express depressive symptoms in seasons with less sunlight. Due to the link found with biological processes, light therapy has been tried as a treatment option for people with depression. Beyond those with depression, daily sunlight exposure has been shown to improve mood in patients without mental health problems as well ⁹.

I looked into correlations between quality of life, as measured by mental health or physical health days, and suicide rates as well as correlations between quality of life and amounts of daily sunlight. The aim of my research question was to confirm findings from other studies that show a positive correlation between quality of life and amounts of sunlight as well as a negative correlation of quality of life with suicide rates. This confirmation could potentially lead to different approaches to treatment options that involve improving aspects of quality of life. This

could also result in better forms of preventative measures to decrease the prevalence of depression and suicide rates.

Research Questions

RQ1: Does quality of life, as measured by poor mental health or physical health days, correlate with suicide rates?

RQ2: Does quality of life, as measured by poor mental health or physical health days, correlate with amounts of daily sunlight?

Methods

Context/Protocol

This was a retrospective study using data obtained from archives of CDC Wonder. The Behavioral Risk Factor Surveillance System data was used for poor mental health days and poor physical health days. The surveys from BRFSS were taken in each state and include one year of survey data that includes the average number of mentally unhealthy days and poor physical health days reported by the respondents.

The North America Land Data Assimilation System (NLDAS) data was used for daily sunlight levels. The reported values were the daily averages of the amount of solar radiation reaching each state, in kilojoules per square meter.

The Web-Based Injury Statistic Query and Reporting System (WISQARS) data was used for suicide rates. The reported values were for the suicide rate per 100,000 individuals in each state.

Alaska and Hawaii were excluded from analysis because there was no data on these states in CDC wonder for daily sunlight levels. All other states with daily sunlight levels, poor mental health and physical health days, and suicide rate values were used for analysis.

Data Collection

The behavioral risk factor surveillance system data was used for the quality of life measures. The two factors of quality of life that were assessed were poor physical health days and poor mental health days. Poor physical health days were the average number of physically unhealthy days reported in the past 30 days. Poor mental health days were the average number of mentally unhealthy days reported in the past 30 days. The Kaiser Family Foundation State Health Facts data was used for the suicide rate measures. The data from this site was obtained from Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Web-Based Injury Statistic Query and Reporting System (WISQARS). The data used was from 2016 as it was the most recent data available from the sources. The Centers for Disease Control and Prevention North America Land Data Assimilation System (NLDAS) data was used for sunlight measures. From NLDAS an average of the data from January 1st, 2001 to December 31st, 2011 was used. I used data from these years because there was no data available past 2011. Since no recent data was available, an average was used in order to show trends in the amounts of sunlight in each state over 10 years. I looked at data from all of these sources for all of the United States, excluding Alaska and Hawaii due to lack of data for these states.

Data Analysis

I used a Spearman's Rho Correlation with a sample size of 48 to analyze my data because the data did not fit normality criteria. For each of the 48 states I had four variables. The variables

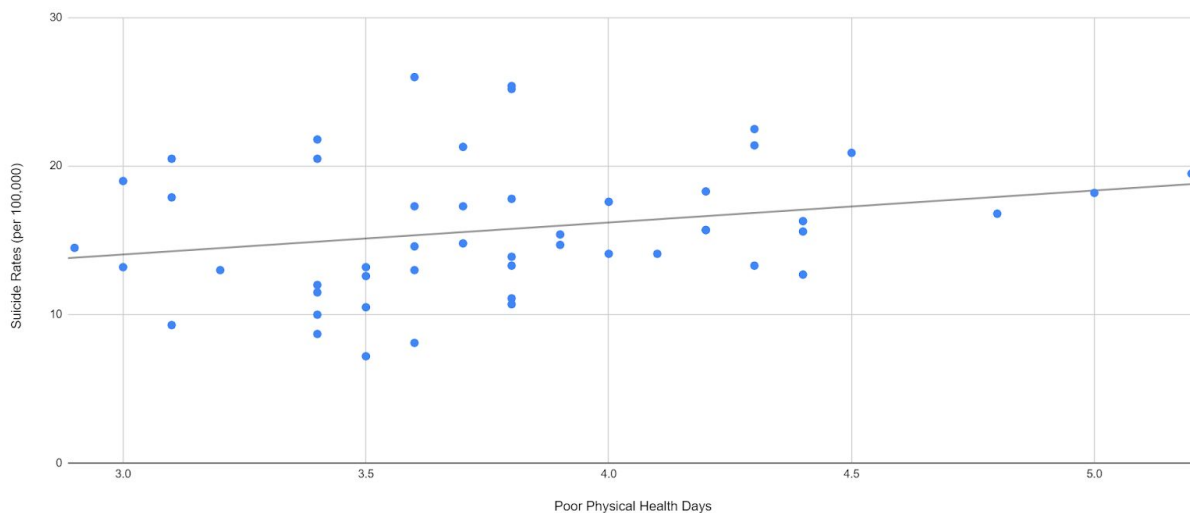
were poor mental health days, poor physical health days, suicide rates, and daily sunlight. I did two separate correlations. I correlated poor mental health days and poor physical health days with suicide rates as well as poor mental health days and poor physical health days with daily sunlight. I used the data from 2016 for poor mental health days, poor physical health days, and suicide rates. I averaged the data from January 1st, 2001 to December 31st, 2011 for the daily sunlight per state to compare trends.

Results

RQ1: Does quality of life, as measured by mental health or physical health days, correlate with suicide rates?

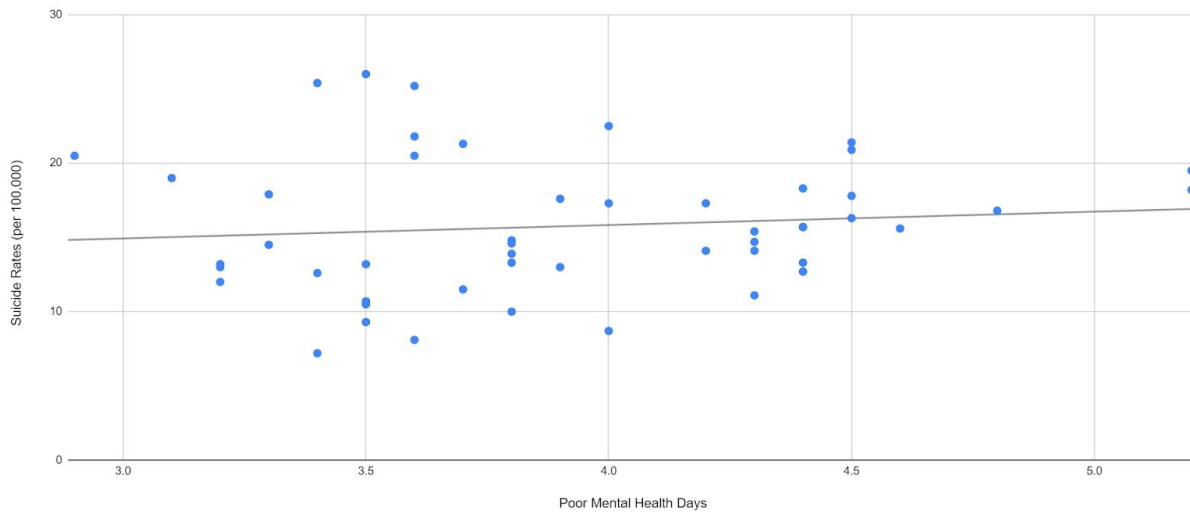
There was a statistically significant positive correlation between poor physical health days and suicide rates, $r = .303$, $p = .032$ (see Figure 1).

Figure 1. Correlation of poor physical health days and suicide rates



There was no significant correlation between poor mental health days and suicide rates, $r = .197$, $p = .169$ (see Figure 2).

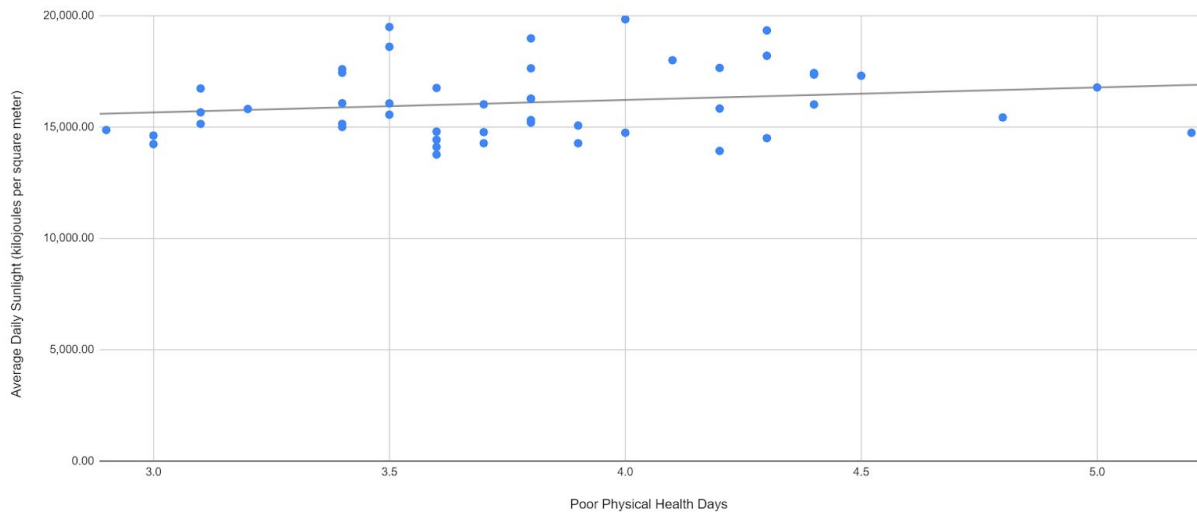
Figure 2. Correlation of poor mental health days and suicide rates



RQ2: Does quality of life, as measured by mental health or physical health days, correlate with amounts of daily sunlight?

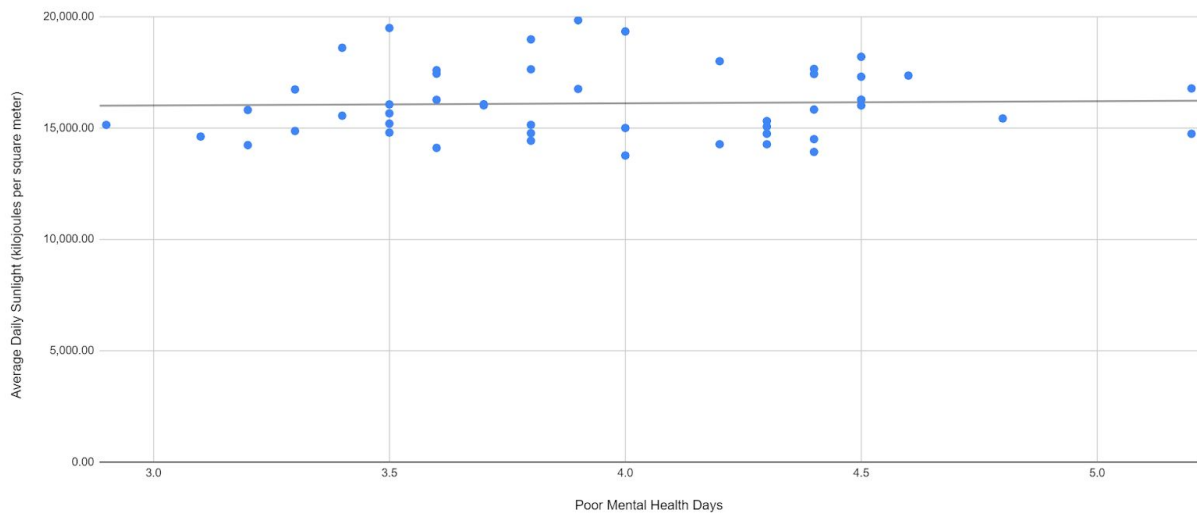
There was no significant correlation between poor physical health days and average daily sunlight, $r = .194$, $p = .186$ (see Figure 3).

Figure 3. Correlation of poor physical health days and average daily sunlight



There was no significant correlation between poor mental health days and average daily sunlight, $r = .070$, $p = .639$ (see Figure 4).

Figure 4. Correlation of poor mental health days and average daily sunlight



Discussion

The results show that there was a statistically significant correlation between quality of

life as measured by poor physical health days and suicide rates. On the other hand, there was no significant correlation found between quality of life as measured by poor mental health days and suicide rates. There was also no significant correlation found between quality of life, as measured by both poor mental health days and poor physical health days, and average daily sunlight values.

In other words, states with high numbers of reported poor physical health days also had high rates of suicide. Considering that poor physical health days may contribute to an individual's decreased activity level, this correlation is consistent with findings from previous studies that found that decreased physical activity contributed to developing depression ⁵.

Although the positive correlation found in this study is consistent with previous literature, the lack of significant correlations between the other variables were contradictory. Although this study found no significant correlations between quality of life and average daily sunlight per state, past literature has shown that increased exposure to sunlight is associated with better mood and increased physical activity ⁸. This contradiction could be due to the methods used in the studies. This study used data from archives of the CDC Wonder database to create a Spearman's Rho correlation, therefore causation could not be determined. The other studies could have used methods that prevented the interference of other variables, in order to determine direct relationships between the variables in question.

The positive correlation found in this study between poor physical health days and suicide rates could contribute to furthering education on prevention of suicide by encouraging increased physical activity on a community and individual level.

Conclusion

Although the correlation was statistically significant between poor physical health days and suicide rates, there are limitations when interpreting this data. First of all, similar to all correlation studies, causation cannot be determined. Poor physical health days cannot be determined to be directly related to increased suicide rates. There could be tertiary variables that contribute to the cause of suicide. For example, a high suicide rate could be due to lack of social support, preexisting medical conditions, lack of access to mental health care, or various other reasons.

Future directions of this study could be to conduct a retrospective cohort study or clinical trial to determine if there is a direct relationship between poor physical health days and suicide rates. If there is a direct relationship found that is consistent with the results found in other studies then further action could be taken to have a suicide treatment and prevention approach that focuses on increasing physical activity.

To conclude, the present research used a Spearman's Rho correlation to determine if there were correlations between quality of life, as measured by physical and mental health days, and suicide rates as well as quality of life and average daily sunlight levels per state. It was found that there was a statistically significant positive correlation between poor physical health days and suicide rates, but all other correlations were insignificant. The results of this study could be used to improve the future of suicide prevention and treatment.

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