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A Multi-Dimensional View on Mental Distress of Alaskan Adults

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Population and Public Health

Scholarship in Medicine Proposal

By checking this box, I indicate that my mentor has read and reviewed my draft proposal prior to submission (I am in the Aug/Sept short course with Dr. Todd)

Abstract

Mental health impacts every facet of day-to-day life, and therefore it is important to determine what factors influence mental wellbeing in order to best target those areas to improve individuals' mood and health. This paper analyzes how mental distress rates in Alaskan counties are affected by environmental and societal issues such as latitude, insufficient sleep, access to healthy food, presence of severe housing issues and rates of physical inactivity. By specifically studying mental distress in Alaskan residents, the extremes of day length and population size bring a new dimension to previous research done on mental distress. The variables were derived from County Health Ranking's 2020 data for Alaskan counties. The rates of frequent mental distress between Alaska (12.01%) and Florida counties (13.64%) in 2020 were significantly different ($t = -3.671, p < .001$) indicating latitude is related to mental distress. A Pearson correlation ($r = .641, p > .001$) indicates that as the percentage of those with insufficient sleep increase, the percentage of those with frequent mental distress also increases. Percent of population with severe housing problems ($B = .118, t = 5.465, p < .001$) and percent with limited access to healthy food ($B = .052, t = 2.350, p = .027$) significantly contributed to the best fitting step wise linear regression model ($F_{2,26} = 51.957, p < .001$) model to account for the variance in the percent of frequent mental distress in Alaska counties in 2020, encompassing 80.0% of the variance in the rate of frequent mental distress.

Key Words: Alaska, mental distress, insufficient sleep, access to healthy food, housing disabilities, physical inactivity

Introduction/Literature Review

Mental health plays a pivotal role in physical health, productivity and the pursuit of happiness. Within the United States in 2014, about 20% of all adults were suffering from a mental illness.¹ Those with a serious mental illness are more likely to struggle with physical disorders, such as heart disease and diabetes, compared to those without serious mental distress.¹ This physical toll on the body and resulting decreased productivity costs the United States almost \$200 billion every year in lost wages.¹ Lastly, mental disorders are an important factor in the majority of suicides, the 10th leading cause of death in the United States.¹

Hours of sleep are inversely correlated with an individual's amount of bad mental health days.² Sullivan and Ordiah analyzed the 2012 Behavioral Risk Factor Surveillance System and found that participants with even one hour less than the ideal minimum of seven hours of sleep had a 60-80% higher odds of responding positive to depression, hopelessness, nervousness and feeling restless or fidgety on the survey.² Sleep is also affected by average day length, a drastic fluctuation throughout the year in Alaska (66°9'N) compared to Florida (27°59'N).³ Friborg et al used the Hospital Anxiety and Depression scale to compare anxiety and depression rates in subjects located in Norway (69°39'N) where day length varies more than ten hours throughout the year and Ghana (5°32'N) where day length changes less than one hour during the year.⁴ They found a correlation between depressive symptoms and changes in day length in Norway participants when comparing rates between January and August but there was no relationship observed for anxiety symptoms in Norway participants or for depressive or anxiety symptoms in Ghana participants when comparing between January and August results.⁴ However, Friborg et al did not compare rates of depressive and anxiety symptoms between Norway and Ghana participants for each of the months studied.⁴

The environment one lives in and the resources available, such as access to food, safe housing and ability to exercise can affect day-to-day functioning, and as a result, mental wellbeing. Jessiman-Perreault and McIntyre determined higher rates of mental health symptoms are present in those with higher rates of food insecurity when controlling for demographic and socioeconomic confounding variables.⁵ However, although this study was done in Canada with a similar geographic environment to Alaska, the sample population only included residents of Canada's ten provinces excluding the rural populations living in Canada's northernmost territories where extreme isolation can impact access to healthy foods.⁵ Vries et al learned from the 2015 Colombian Mental Health survey that lifetime depression and anxiety rates were not correlated with poor housing in urban environments, but in rural areas lifetime depression and anxiety rates were lowest in those living in the poorest homes.⁶ The researchers commented these unexpected results may be due to participants' perception of their socioeconomic status, which is much more apparent living in a city versus living in a rural town with limited access to others with whom to compare living situations.⁶ Hoare et al found mental health symptoms were related to screen time, especially more than two to three hours per day.⁷ However, increased screen time does not always indicate decreased exercise.⁷

In conclusion, multiple studies have analyzed the effects of different environmental and societal factors on mental health, but more research needs to be done to expand upon the current knowledge of how these variables influence mental health, specifically mental distress. By specifically studying mental distress in Alaska residents, the extremes of day length and population size in Alaska counties bring a new dimension to previous research done on the effects of latitude, insufficient sleep, limited access to healthy foods, presence of severe housing problems and sedentary lifestyle on mental distress.

Research Questions

RQ1: How does the rate of frequent mental distress in Alaska counties compare to Florida counties in 2020?

RQ2: How does the rate of frequent mental distress correlate to the percentage of insufficient sleep in Alaska counties in 2020?

RQ3: How does the rate of limited access to healthy foods, percent of population with severe housing problems and rate of physically inactive population account for the variance in the rate of frequent mental distress in Alaska counties in 2020?

Methods

Context/Protocol

Mental distress will be classified as the “percentage of adults reporting greater than or equal to 14 days of poor mental health per month”.⁸ The County Health Ranking’s data for both Alaska and Florida in 2020 uses data from 2017 that is age-adjusted to account for poorer health outcomes as citizens age.⁸

Insufficient sleep will be classified as the “percentage of adults reporting less than seven hours of sleep during a 24-hour period”.⁸ The County Health Ranking’s data for 2020 uses data from 2016.⁸

Limited access to healthy foods analyzes the percentage of both those who are low income and those who do not live close to a grocery store.⁸ In urban environments, this includes those living more than one mile from a grocery store and in rural environments the data only

considered those living more than ten miles away from a grocery store.⁸ Low income is classified as “having an annual family income of less than or equal to 200 percent of the federal poverty threshold based for the family size”.⁸ The County Health Ranking’s data for 2020 uses data from 2015.⁸

Percent with severe housing problems analyzes those with issues related to overcrowding, high housing costs, lack of kitchen facilities, and/or lack of plumbing facilities.⁸ The County Health Ranking’s data for 2020 uses data from 2012-2016.⁸

Rate of physically inactive population analyzes the percentage of those greater than 20 years old over reporting no leisure physical activity in the last month on a Behavioral Risk Factor Surveillance Survey contacting citizens on both a landline and cellular phone.⁸ The County Health Ranking’s data for 2020 uses data from 2016.⁸

Data Collection

The variables “percent with frequent mental distress”, “insufficient sleep”, “rate of limited access to healthy foods”, “percent with severe housing problems” and “rate of physically inactive population” will be collected from the County Health Rankings website’s 2020 data for Alaska counties. For each variable there will be 29 data points for each of Alaska’s counties and no data will be excluded.

Data Analysis

The first research question will analyze rates of frequent mental distress in Alaska and Florida counties in 2020 using an unpaired T test. The second research question will analyze rates of frequent mental distress and insufficient sleep in Alaska counties using a

Pearson/Spearman correlation. The third research question will analyze rates of limited access to food, percent of population with severe housing problems, rate of physically inactive population and rates of frequent mental distress using a stepwise linear regression.

Results

The rates of frequent mental distress between Alaska (12.01%) and Florida (13.64%) counties in 2020 were significantly different ($t = -3.671, p < .001$) (Table).

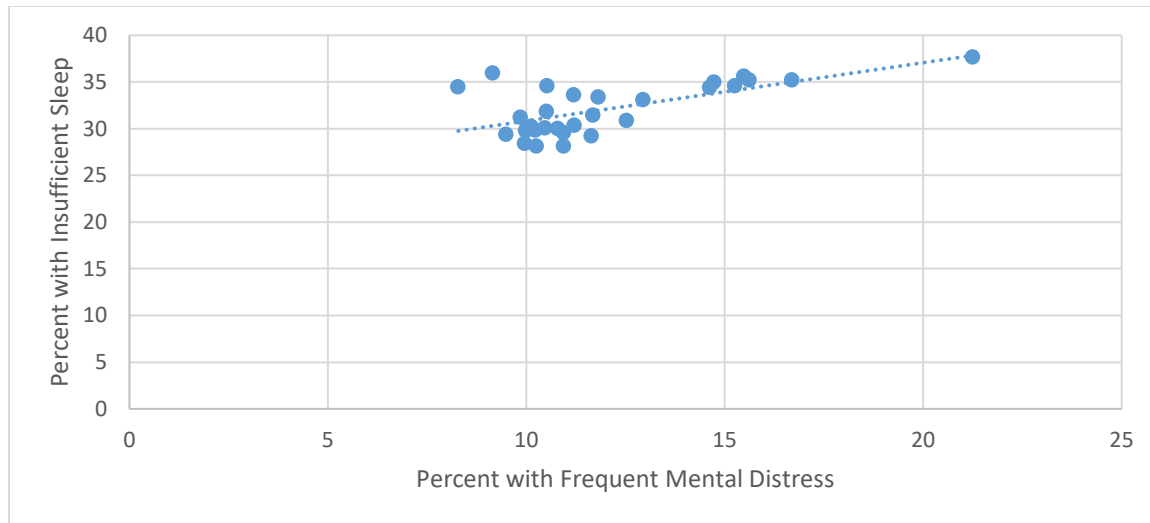
Table: Mental Distress in 2020 in Alaska and Florida

State	n	Mean	SD
Alaska	29	12.01%	2.81%
Florida	67	13.64%	1.53%

Abbreviation: SD, Standard Deviation

A Pearson correlation demonstrates a significant correlation ($r = .641, p > .001$) between the percentages of the Alaskan population with frequent mental distress and insufficient sleep. These results indicate that as the percentage of those with insufficient sleep increase, the percentage of those with frequent mental distress also increases (Figure).

Figure: Correlation Between Frequent Mental Distress and Insufficient Sleep in Alaska Counties in 2020



A step wise linear regression analysis of how percent of population with limited access to healthy foods, percent of population with severe housing problems and percent of physically inactive population account for the variance in the percent of frequent mental distress in Alaska counties in 2020 best fitting model was significant ($F_{2,26} = 51.957, p < .001$), encompassing 80.0% of the variance in the rate of frequent mental distress. Percent of population with severe housing problems ($B = .118, t = 5.465, p < .001$) and percent with limited access to healthy food ($B = .052, t = 2.350, p = .027$) significantly contributed to the model and the percent of physically inactive population did not significantly contribute to the model.

Discussion

Statistical analysis indicates there is a relationship between mental distress and latitude, insufficient sleep, limited access to healthy foods and presence of severe housing problems. Physical inactivity did not have a significant relationship with mental distress according the best fitting stepwise linear regression model.

Mental distress rates in Alaskan and Floridian counties were determined to be significantly different ($t = -3.671, p < .001$). Friborg et al found a correlation between a decrease in hours of daylight and increase in depressive symptoms in Norway.⁴ Therefore, it was hypothesized there would be a significant positive correlation between mental distress rates and distance from the equator resulting in Alaska residents having higher rates of mental distress compared to Florida residents due to larger changes in day length. However, the unpaired T test indicated an increase in rates of mental distress in Floridian versus Alaskan residents disagreeing with the findings in the Friborg et al paper.⁴ However, Friborg et al only compared rates of depression between winter and summer months in the same country and did not compare between Northern and Southern locations, as this study did, which opens data up to more variables between the sites, such as population density, living conditions, social support, etc. These results indicate there is an increased risk of developing mental distress living in Florida compared to Alaska, however more research needs to be done to determine if this data is due to day length alone.

A significant correlation ($r = .641, p > .001$) was found between the percentages of the Alaskan population with frequent mental distress and insufficient sleep. This data agrees with the Sullivan and Ordiah paper and the hypothesis there will be a significant positive correlation between the rates of mental distress and insufficient sleep.² These results highlight the importance of adequate sleep hours and its impact on mental health. Therefore, when patients are struggling with mental distress symptoms, further questioning into their sleep health should be done to determine if improving sleep habits can improve depressive symptoms before more invasive treatments, such as medications, are prescribed.

The best fit model for the stepwise linear regression was significant ($F_{2,26} = 51.957, p < .001$) and accounts for 80.0% of the variance in the rate of frequent mental distress. Only severe

housing problems ($B = .118$, $t = 5.465$, $p < .001$) and limited access to healthy food ($B = .052$, $t = 2.350$, $p = .027$) significantly contributed to the model. The results agreed with the hypothesis that as access to healthy food decreases, mental distress will increase and as the presence of severe housing issues increases, mental distress will increase as well due to the increased environmental stressors impacting the individuals' mental wellbeing. Jessiman-Perreault and McIntyre also determined higher rates of mental health symptoms are present in those with higher rates of food insecurity.⁵ Vries et al learned that lifetime depression and anxiety rates were not correlated with poor housing in urban environments, but in rural areas lifetime depression and anxiety rates were lowest in those living in the poorest homes.⁶ Because the majority of the Alaskan counties have populations less than 50,000, the stepwise analysis model disagrees with the Vries et al paper because increased severe housing problems accounts for increased rates of mental distress.⁶ However, the stepwise linear regression did not compare rates of mental distress between urban and rural areas which could account for the discrepancy. These results emphasize the importance of safe living environment and access to healthy food. Physicians should remember the imperative role social determinants of health play in the development of mental distress and look to identify and alleviate these issues first with patients.

Physical inactivity was not found to relate to mental distress according the best fitting stepwise linear regression model, disagreeing with the hypothesis and Hoare et al paper that mental distress will increase and as physical inactivity increases.⁷ Therefore, according to the results found in this study, sleep health, living conditions and access to food should be addressed in patients before tackling physical inactivity when there is concern for mental distress.

Conclusion

Although this study was able to elucidate how different environmental and societal factors affect mental distress rates, further research needs to be done to appreciate these relationships better. Using Alaskan county data for this study allowed the extremes of day length and population size in Alaska counties bring a new dimension to the understanding of mental distress, however, because Alaska only contains 29 counties the sample size was relatively small. Additionally, most counties in Alaska have populations of less than 50,000 residents possibly skewing data. Lastly, because this data is self-reported from residents there is the risk of incorrect reporting either due to imperfect memory or desire to provide a more ideal answer.

Future studies should continue analyzing the relationship between latitude and mental distress by using data from a diverse range of sources throughout the Northern and Southern hemispheres to reduce skewed data from using only one societal population. This would also determine if the results seen in this study, with higher rates of mental distress in Florida compared to Alaska, is consistent or if this relationship is due to other factors not related to latitude and day length. Comparing rates of seasonal mental distress and year-round mental distress will also further explain the impact day length has on mental health. Additionally, further analysis of the relationship between mental distress, latitude and insufficient sleep will explain how the ease of sleeping despite drastic changes in day length can affect mood. Lastly, more research should be done to continue analyzing how social determinants of health such as severe housing issues and access to food affect patient's mental health and stress.

In conclusion, this paper further expanded upon the complicated relationship of patients' environments and their mental health. It is important to remember the role outside forces can play on the internal workings of the mind when treating patients and keep analyzing these links.

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