Associations between Social Determinants of Health and Frequency of Poor Mental Health Days: A cross-sectional analysis of 2017 BRFSS

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Abstract

Background

Frequency of poor mental health days (FPMHD) has shown to be related to individual factors such as socioeconomic status (SES), race, and lived environment. Additionally, social determinants of health (SDOH) have shown to directly influence factors related to premature death. Therefore, our objective was to examine the relationship between frequent (14+) poor mental health days and SDOH.

Methods

We conducted a cross-sectional analysis of the 2017 Behavioral Risk Factor Surveillance System (BRFSS) to extract data regarding poor mental health days and the SDOH module. We extracted sociodemographic variables to use as controls and constructed logistic regression models to determine associations, via odds ratios, between SDOH and FPMHD. We visualized overall state-levels of FPMHD via a heatmap.

Results

We found statistically significant associations between all SDOH variables in both the binary and multivariable regression models. States with the highest reported rates of experiencing 0 poor mental health days were South Dakota, (70.99%), Hawaii (69.08%), and Nevada (68.70%), while Oregon (58.7%), Utah (59.65%), and Arkansas (59.84%), had the lowest frequency. Further, West Virginia, Oklahoma, and Mississippi, had the highest mean PMHDs reporting at least 1 per month.

Conclusions

Our study highlights the impact of SDOH on mental health, revealing differences in frequency of poor mental health days based on access to resources. We also found variations in the FPMHD by states which coincided with the states having the greatest shortages of mental health practitioners. Expanded mental health care through improved medical coverage for mental health services, and community-based centers for mental health, may improve the mental health of individuals experiencing increased domains of SDOH.

Key words: mental health, social determinants of health, frequency of poor mental health days, BRFSS

Introduction

Mental health and the prevalence of mental health disorders are an ongoing health concern among adults in the US.[1] According to the *World Health Organization* (WHO), mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with normal life stresses, work productively, and contributes to his or her community.[2] Despite the importance of mental health on individual wellness, mental health disorders remain long-lasting predictors of sickness absence, reduced productivity, work disability, and early retirement.[3,4] In 2020, there were an estimated 52.9 million adults aged 18 or older in the US with a diagnosed mental illness, representing 21.0% of the US adult population.[5] The most common included depressive disorders, anxiety disorders, and mood disorders.[6] Furthermore, mental health disorders ranked seventh as a leading cause of disability-adjusted life years (DALY) with 125.3 million DALYs in 2019.[7] The overall burden of illness among mental health disorders is substantial and studies continue to show increased mental health needs among US adults. The frequency of poor mental health days (FPMHD), is a measure of the average number of mentally unhealthy days reported in the past 30 days.[8] FPMHD has been shown to be related to individual level factors such as sex, socioeconomic status (SES), race and living conditions such as rural versus urban environments.[9,10]

Socially determined conditions in which individuals live, work, grow, and age — termed the social determinants of health (SDOH) — were first introduced by Michael Marmot and play a significant role in morbidity.[11] SDOH consist of five domains: economic stability, healthcare access and quality, education access and quality, social and community context, and neighborhood and built environment.[12] SDOH have been found to directly influence factors related to premature death.[13] SES, a components of the economic stability domain of SDOH, has been shown to have effects on physical health and lifestyle — a mediator of psychological health.[14] With regard to mental health, SES has been shown to be one of the greatest predictors of poorer outcomes when comparing individuals of lower SES to those of higher SES.[15,16]Allen et al., applied a multi-level life course approach to SDOH to highlight its role in mental health and mental health disorders.[9] They found that poor and disadvantaged populations are most affected by mental disorders.[9] An additional finding was that cumulative stress, gender, race, and physical health serve as mechanisms through which the impacts of SDOH multiply across the lifespan.[9]

Among caregivers, women reported significantly more unhealthy days, both mentally and physically, than men.[17] Race has also been found to have negative effects on physical health, but more so on mental health.[18] Most notably, racial/ethnic minorities often suffer from poor mental health outcomes due to multiple factors including inaccessibility of high quality mental health care services, cultural stigma surrounding mental health care, and overall lack of awareness about mental health.[19] Additionally socioeconomic status plays a big role in wellness and access to activities and resources that can serve to boost mental health.[20] Meyer *et al.*, suggested higher SES was associated with higher levels of physical activity due to lower neighborhood safety fears and therefore associated with better mental and self-rated health.[20] That same study also found in individuals with higher SES had higher self-rated health; racial/ethnic minorities also had a lower SES compared to Whites.[20] Further, one study investigating mental health in children and adolescents revealed that children of low SES and increased number of stressful life situations had more mental health issues.[16] These individual factors, among others can be

influential determinants in one's overall health. Additionally, the built and lived environment — another component of SDOH — is an important indicator of mental health.

Neighborhood differences such as living in poor or resource-deprived neighborhoods have been associated with greater risk of poor mental health versus living in more affluent neighborhoods.[21,22] Importantly, barriers to care exist in large urban areas as well as rural areas.[10] Research has shown substantial growth in high-poverty urban neighborhoods that are primarily occupied by communities of color.[23,24] Similar to how geographic isolation can limit rural residents' access to high-quality care, economic segregation in urban areas creates similar barriers.[10] These barriers such as low social capital or social segregation serve to effectively cut poor urban communities off from high-quality care that is nearby, but still inaccessible.[25,26] Regarding rural communities, many of them are not homogenous and thus, some rural areas of America experience better health outcomes compared to urban areas.[27] However, regionally, differences in rural community health outcomes persist. Individuals residing in the rural South experience higher mortality rates compared to both their urban counterparts and other populations living in other rural regions across the US.[28] Rural areas also tend to have a lower supply of all healthcare professionals, including mental health professionals and services compared to urban environments.[29,30] Therefore, assessing the disparities in mental health outcomes regionally and among sociodemographic factors may inform recommendations at the individual and population level.

Given the factors associated with poor mental health, assessing potential disparities and identifying the most affected groups might highlight important predictors of mental health outcomes. Additionally, assessing ongoing disparities in mental and physical health outcomes geographically, may reveal targeted areas to improve mental health across the US. Therefore, our primary objective was to examine the relationship between frequent (14+) poor mental health days and SDOH by race, age group, SES, and sex using the 2017 Behavioral Risk Factor Surveillance System (BRFSS) data. Secondarily, we also determined which states had the highest rates of FPMHD and the average number of poor mental health days by state.

Methods

For our investigation, we used the 2017 BRFSS — the nation's premier telephone survey system for health — dataset.[31] BRFSS is the largest health survey system in the world collecting data in all 50 states, the District of Columbia and 3 U.S. territories.[31] Through their data collection of more than 400,000 adult interviews yearly, BRFSS is a tool for assistance in the targeting and creation of health promotional activities. BRFSS has a wide range of sponsors including the Center for Disease Control (CDC) National Center for Chronic Disease Prevention and Health Promotion and multiple federal agencies.[31] BRFSS is a publicly available dataset containing no identifying participant information and thus does not meet the requirements of human subjects research.

Eligibility

For our outcomes of interest, all respondents who answered the survey question "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" were included. Any

respondent who answered, “don’t know/not sure”, “refused”, or had a missing response was excluded.

Outcome measures

Poor mental health days: The frequency of poor mental health days was determined by each participant's response to the following question: “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Respondents would give a number of days “1-30” or answer “none”. We chose to dichotomize responses into 1-13 or 14+ to represent less frequent/less than half of the days in the month and more frequent/more than half of the days in the month as measures of frequency of poor mental health days.

SDOH: We used the BRFSS SDOH module — consisting of 7 questions exploring the SDOH domains (neighborhood safety, housing security, food insecurity, financial stability, stress, and number of children in the household) to assess differences in FPMHD. To examine neighborhood safety, we assessed the survey question “How safe from crime do you consider your neighborhood to be?” For housing stability, we assessed the question “In the last 12 months, how many times have you moved from one home to another?” Food insecurity was examined by respondents’ answers to the following statement and question: “The food that I bought just didn’t last, and I didn’t have money to get more.” Was that often, sometimes, or never true for you in the last 12 months?” Financial stability was assessed through the survey questions “In general, how do your finances usually work out at the end of the month?” and “Do you find that you usually: end up with some money left over, have enough money to make ends meet, or do not have enough money to make ends meet?” For stress, we used the question “Within the last 30 days, how often have you felt this kind of stress?” All respondents who answered “don’t know/not sure” or “refused” were excluded from all outcomes of interest.

***Sociodemographic variables*:** Sociodemographic variables extracted from BRFSS included: race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Asian, Non-Hispanic American Indian/Alaskan Native, Hispanic, Non-Hispanic Other), age (18-24, 25-34, 35-44, 45-54, 55-64, 65 or older), biological sex (male or female), education level (less than high school, high school graduate or GED, some college, college graduate or higher), annual household income (less than $10,000; $10,000-$14,999; $15,000-19,999; $20,000-24,999; $25,000-$34,999; $35,000-49,999; $50,000-74,999; $75,000 or more), and insurance (private insurance, Medicaid, Medicare, military, IHS/Tribal, or other insurance).

Statistical Analysis

We reported sample size (n) and weighted frequencies (N) and percentages for demographic variables by the average number of poor mental health days experienced. We then used bivariate and multivariable logistic regressions models to determine associations, via odds ratios (OR) and adjusted odds ratios (AOR), between SDOH and FPMHD—controlling for age, race/ethnicity, sex, SES (income and education level), and insurance. Next, we visualized the overall state-level rates of FPMHD by creating a heatmap, and additional heatmaps showing rates of FPMHD among those experiencing domains of SDOH. Ethical approval has not been necessary for this project since BRFSS is a publicly available dataset. The dataset is funded by the CDC, has no

individually identifiable information. Statistical analysis was conducted in Stata 16.1 (StataCorp LLC., College Station, TX). Alpha was set at 0.05 for all analyses.

Results

The 2017 BRFSS survey had an overall response rate of 44.9%. The number of individuals meeting inclusion criteria in our sample (n) was 442,540 which represents a population estimate (N) of 251,591,753. Of the included respondents, 49,725 (12.42%) reported experiencing poor mental health days.

Sociodemographics

Our sample primarily consisted of White individuals (n=339,444, 63.15%; Table 1), followed by Hispanic individuals (n=36,471, 16.77%), and Black individuals (n=35,446, 11.64%). Participants aged 65 years or older made up 20.35% (n=154,622) of our sample followed by those aged 25-34 years (46,660, 17.44%). There were slightly more female participants (n=246,714, 51.28%) compared to males (n=195,826, 48.72%). Participants who attended some college or technical school made up 31.11% (n=122,746) of our sample while those who did not graduate high school made up 13.39% (n=31,393). The most frequently reported income category for participants was $75,000 or more (n=121,970, 34.1%) while the least reported was $10,000-14,999 (n=18,863, 5.11%). Majority of our sample reported having some type of insurance (n=405,953; 87.98%).

Sociodemographics and Poor Mental Health Days

Groups reporting the highest percentage (14+) of PMHD per month were AI/AN (18.71 %; Table 1), 'other race' (18.29%), and Black (13.17%). Individuals aged 18-24 years had the highest percentage reported for 14+ PMHD per month (16.45%) with those aged 65 years or older reporting the lowest percentage (7.90%). Additionally, females reported a higher percentage of 14+ PMHD compared to males at 14.34% and 10.4%, respectively. The highest percentage of 14+ PMHD per month reported for education level were those that did not graduate high school (17.45%) followed by those that graduated high school but did not attend college or technical school (13.80%) and those that attended some college or technical school but did not graduate (13.46%). Income groups reporting the highest percentage of 14+ PMHD per month were less than $10,000 (25.65%), $10,000 to $14,999 (23.36%), and $15,000 to $19,999 (18.38%).

Table 1. Demographics of individuals by frequency of poor mental health days using 2017 BRFSS data (sample [n] = 442540, population estimate [N] = 251591753).

Demographic variable	No. (%)^a	0 PMHD (%)	1-13 PMHD (%)	14+ PMHD (%)	Design based X2 Value, P	Mean (SD) PMHD among those with 1+
Race/Ethnicity						
White, non-Hispanic	339444 (63.15)	63.89	23.56	12.56		11.15 (11.27)
Black, non-Hispanic	35446 (11.64)	64.09	22.73	13.17		11.61 (8.69)
Asian, non-Hispanic	9846 (5.38)	68.28	24.01	7.71	21.29,	8.6 (5.61)
AI/AN, non-Hispanic	8287 (1.00)	59.93	21.36	18.71	< .0001	13.72 (15.36)
Hispanic	36471 (16.77)	67.19	21.03	11.78		11.39 (7.6)
Other, non-Hispanic	13046 (2.07)	58.28	23.43	18.29		13.16 (13.27)
Age						
18-24	25860 (12.52)	49.11	34.44	16.45		10.42 (6.76)
25-34	46660 (17.44)	57.51	28.91	13.59		10.63 (8.29)
35-44	51440 (16.34)	62.47	24.68	12.86	325.39,	10.84 (9.29)
45-54	68915 (16.66)	65.12	21.84	13.04	< .0001	11.79 (11.18)
55-64	95043 (16.69)	68.56	18.81	12.63		12.48 (13.15)
65 or older	154622 (20.35)	77.99	14.11	7.897		11.47 (14.71)
Sex						
Male	195826 (48.72)	69.59	20.01	10.4	482.67,	11.05 (9.82)
Female	246714 (51.28)	59.75	25.91	14.34	< .0001	11.31 (10.73)
Educational attainment						
Did not graduate high school	31393 (13.39)	63.99	18.56	17.45		14.4 (8.55)
Graduated high school	120123 (27.95)	65.24	20.95	13.8	178.87,	12.33 (10.59)
Some college or technical school	122746 (31.11)	61.88	24.66	13.46	< .0001	11.28 (9.73)
Graduated college or technical school	166711 (27.55)	66.99	25.61	7.4		8.17 (10.3)
Income						
less than $10,000	17743 (5.86)	51.15	23.19	25.65		15.41 (10.55)
10,000 to <15,000	18863 (5.11)	52.68	23.97	23.36		14.68 (11.35)
15,000 to < 20,000	27104 (7.6)	59.26	22.35	18.38		13.48 (11)
20,000 to < 25,000	33598 (9.21)	61.21	22.43	16.36	156.83,	12.8 (10.79)
25,000 to <35,000	39162 (10.35)	63.2	23.74	13.06	< .0001	11.3 (10.47)
35,000 to <50,000	52524 (13.17)	65.37	23.35	11.28		10.58 (10.35)
50,000 to <75,000	59096 (14.61)	65.02	24.46	10.51		9.93 (10.02)
75,000 or more	121970 (34.1)	68.67	24.27	7.053		8.27 (8.55)
Insurance status						
No	34952 (12.02)	62.2	22.03	15.77	52.52,	12.69 (9.22)
Yes	405953 (87.98)	64.85	23.19	11.96	< .0001	10.98 (10.49)

A. Percents are weighted to estimate population statistics. Survey weights were provided by BRFSS.

Table 2. Association of having FPMHD based on whether individuals experienced SDOH.

SDOH Variable	OR	AOR^A
Neighborhood unsafe	2.86 (2.45-3.34)	2.01 (1.68-2.41)
Food runs out at the end of month	3.69 (3.34-4.08)	2.27 (2-2.58)
Could not afford balanced meals	4.03 (3.66-4.43)	2.62 (2.33-2.95)
Have enough money at the end of month	4.85 (4.33-5.43)	3.32 (2.88-3.82)
Feels stressed	16.12 (14.54-17.88)	12.94 (11.53-14.52)
Unstable Housing	2.96 (2.45-3.59)	1.83 (1.46-2.31)
Could not afford to pay bills	4.47 (4.01-4.98)	2.98 (2.61-3.41)

*Referent groups are those not experiencing SDOH. Adjusted models controlled for race/ethnicity, age, income, education, and insurance status. Full results of the adjusted model presented in the supplement.

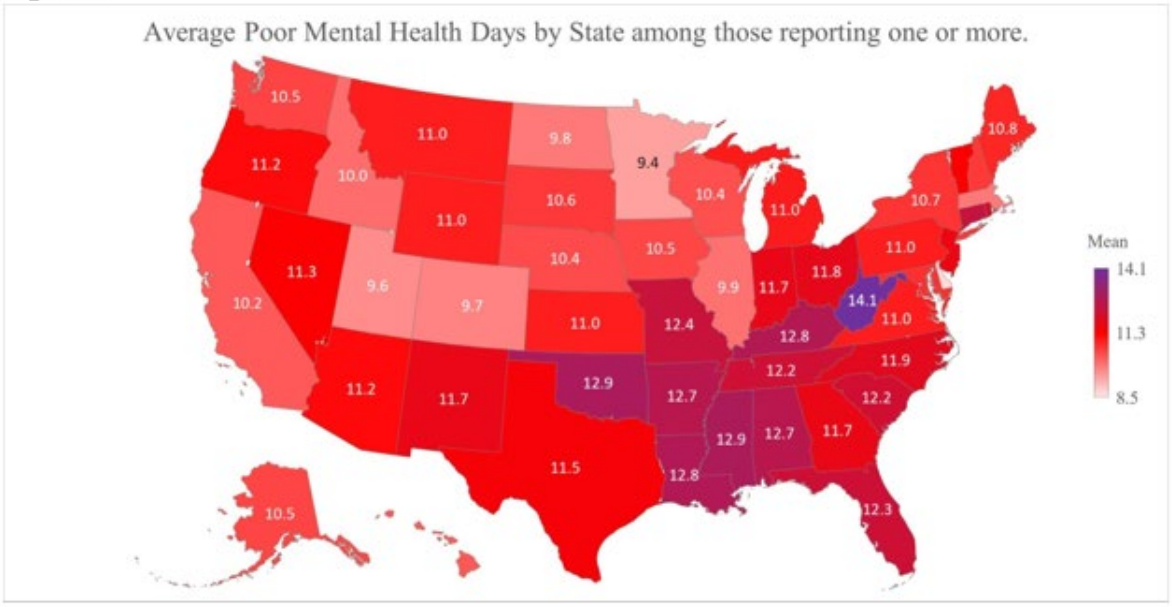
SDOH and Poor Mental Health Days

The analysis revealed that individuals who experienced SDOH were more likely to have FPMHD compared to those who did not experience SDOH. Specifically, individuals who reported living in an unsafe neighborhood had 2.86 times greater odds of having FPMHD (95% CI: 2.45-3.34), which decreased to 2.01 (95% CI: 1.68-2.41) after adjusting for race/ethnicity, age, income, education, and insurance status. Similarly, individuals who reported running out of food at the end of the month had a 2.27 (95% CI: 2.00-2.58) times greater adjusted odds of having FPMHD. Individuals who reported not being able to afford balanced meals and not having enough money at the end of the month also had a significantly higher odds of having FPMHD (AOR: 2.62; 95% CI: 2.33-2.95, and 3.32; 95% CI: 2.88-3.82, respectively) compared to individuals not experiencing these domains. Similar results were found among those with unstable housing and inability to pay bills. The association between feeling stressed and FPMHD was the strongest among all the SDOH variables examined—with the adjusted model estimating an AOR of 12.94 (95% CI: 11.53-14.52). The full multivariable regression results are included in supplement 1.

Poor Mental Health Days by State

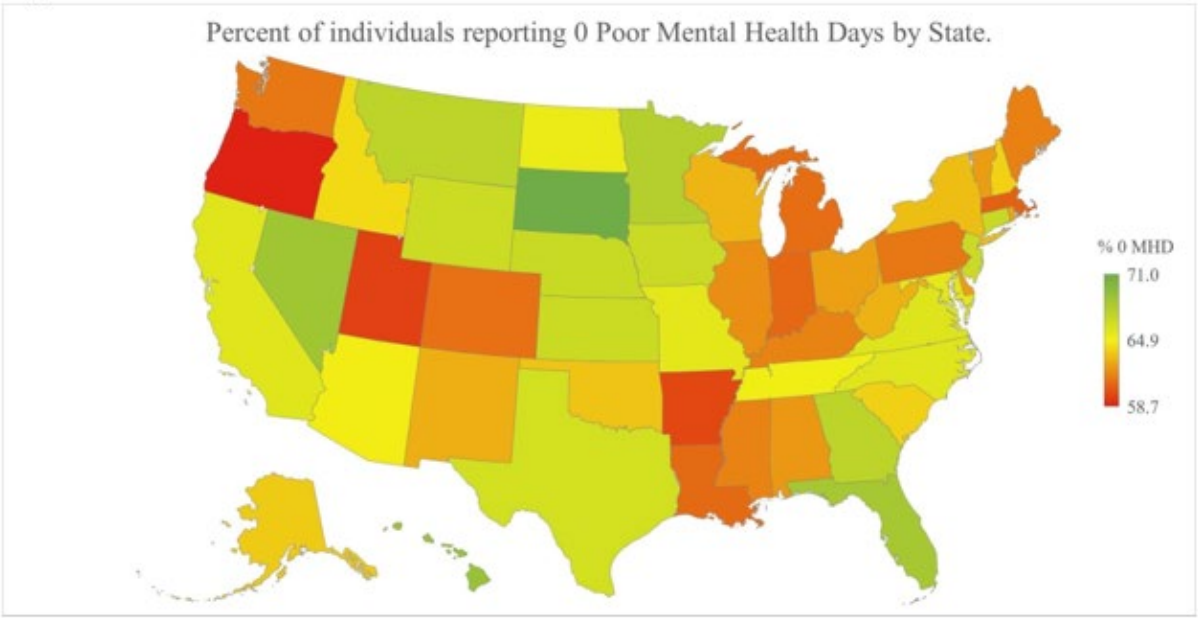
All states report greater than 50% of their population experiencing 0 poor mental health days per month. Individuals reporting the most frequent 0 poor mental health days per month were South Dakota, (70.99%; Figure 1), Hawaii (69.08%), and Nevada (68.70%). States reporting the least frequency of 0 poor mental health days per month were Oregon (58.7%), Utah (59.65%), and Arkansas (59.84%). Although over 60% of individuals from West Virginia, Oklahoma, and Mississippi reported 0 PMHD per month, those that did experience PMHD reported the highest average number of PMHD per month compared to any other state with 14.11 days, 12.94 days, and 12.87 days, respectively (Figure 2). States with the lowest average number of PMHD per month were Delaware (8.65 days) and Minnesota (9.38 days).

Figure 1



Caption: Average Poor Mental Health Days by State

Figure 2



Caption: Percent of individuals reporting 0 Poor Mental Health Days by State

Discussion

With persistent disparities in mental health care and a growing burden of mental health disease, this study investigated the frequency of PMHD and SDOH by race, age group, SES, and sex. We found a statistically significant association between FPMHD and all SDOH variables as well as disparities in reporting on FPMHD based on race, gender and age. State differences in reported FPMHD were also identified. States with the highest rates of individuals reporting 0 poor mental health days per month were South Dakota, Hawaii, and Nevada, while those with the lowest rates of reporting 0 poor mental health days were Oregon, Utah, and Arkansas. Among individuals reporting at least 1 poor mental health day, the states with the highest average number of PMHD per month were West Virginia, Oklahoma, and Mississippi. These findings highlight the growing need to address gaps in mental health care resources across the U.S.

Mental health has been shown to negatively affect overall health. For example, individuals experiencing depression are at a higher risk for developing physical illnesses.[32] One study found that mental health both directly and indirectly — via lifestyle choices and social interactions — influences physical health.[33] It has been shown that poverty is associated with an increased prevalence of mental health disorders.[34] Additionally, individuals living in low SES neighborhoods have shown to have increased stressors, fewer resources, and fewer support sources which increases their risk of having poor mental health.[34] Meyer *et al.,* demonstrated that low SES was associated with increased concerns regarding neighborhood safety causing a negative association with physical activity and leading to worsened mental and self-rated health.[20] All of these findings are in agreement with our findings of FPMHD being significantly associated with SDOH domains with the stress domain being the most notably significant. Interestingly, Mississippi, West Virginia, and Oklahoma are all rated within the top 10 most stressed states in the US[35], and individuals in these states reported the highest average number PMHD per month. Therefore, exploring factors that may be influencing regional differences in FPMHD might highlight areas for improvement within these states.

All states reported greater than 50% of their population experiencing 0 PMHD. However, state differences existed between the populations who reported experiencing PMHD. Individuals living in Minnesota and Delaware had the lowest average number of PMHD reported compared to all states. According to the 2022 Mental Health America report, Minnesota consistently landed in the top 13 states for lowest prevalence of mental health illness and highest rates of access to mental health care resources.[36] Additionally, the 2022 United Health Foundation found that in Minnesota and Delaware, the number of licensed mental health practitioners were 320 and 317 per 100,000 respectively, compared to a US average of only 305 per 100,000.[37] These higher average numbers of mental health providers may account for increased access to mental health services in these states and thus, the lower average number of PMHD. However, to maintain adequate access to mental health services, state governments in both Minnesota and Delaware must continue to identify areas of weakness in mental health resources for continued provision of adequate mental health care and to maintain low FPMHD among their population.

Conversely, West Virginia, Oklahoma and Mississippi were found to have the highest reported FPMHD. The 2022 United Health Foundation (UHF) found West Virginia and Mississippi had a much lower number of licensed mental health practitioners per capita (165 and 205 per 100,000

residents, respectively).[37] However despite Oklahoma being one of the states with the highest reported rate of FPMHD, the UHF found their per capita rate of mental health practitioners to be 424 per 100,000 residents, which is above the national average of 305. Conversely, a study by Andrilla et al., using the 2015 National Provider Identification data to assess for regional differences in per capita supply of psychiatrists, psychologists, and psychiatric nurse practitioners found that the West South Central Census Division, which includes Oklahoma, had among the lowest supply of all three provider types with a total of 26 per 100,000, while the national average was 47 per 100,000 with larger deviations among non-metropolitan areas.[38] This variation in reported estimates of mental health practitioner shows that Oklahoma has made efforts to increase its supply of mental health practitioners in the last 7 years, however, FPMHD continues to be high in the state highlighting the fact that other barriers to accessing mental health services may continue to exist. Therefore, to address these disparities, states must identify barriers to mental health care and avenues for improvement in order to decrease FPMHD.

Recommendations

Identifying barriers to mental health care implementation would be the first step in improving outcomes. Currently, there is an identified national shortage of mental health care providers by the Association of American Medical Colleges with more than half of U.S. counties lacking a single psychiatrist in 2018.[39,40] Additionally, telehealth measures continue to lag behind need due to unreliable or limited broadband or cellular service access in rural communities, and concerns about data security and patient privacy.[41,42] Both of which limit the reach and utility of virtual telehealth services as a tool for increasing access to care. Some potential recommendations, especially in rural and urban underserved areas could be the use of faith based mental health resources.[43,44] By incorporating mental health care into trusted community centers such as churches, individuals with increased burden of mental health illness might be more aptly reached. Another possible community intervention could be the use of library systems to reach those in need of mental health care. The addition of mental health services to library systems could take the form of lectures for the public, training programs for library staff, a directory of readily available community health resources and referrals for patrons who have mental health conditions.[45] An additional focus should be placed on ensuring community based interventions to improve mental health are evidence-based and include specific recommendations for neurodiverse populations.

A model that has been adopted by Oklahoma in 2016 to increase access to mental healthcare is the Project Extension for Community Health Care Outcomes (ECHO) model[46] which shows some institutions are initiating systems to improve mental health services within the state. Project ECHO expands access to preventive and specialty care for rural and underserved urban populations by building the capacity of primary care physicians and community health workers.[47] Osei-Twum et al., conducted a scoping review of 15 studies describing Project ECHO programs to examine the impact of Project ECHO programs on patient and community health outcomes.[48] They identified emerging evidence of the effectiveness of Project ECHO as a tele-education model that improves patient health outcomes and may potentially improve community health.[48]

Limitations and Future Research

Limitations to our study include that all data was self-reported via survey which increases the risk for recall bias. However, BRFSS is a nationally recognized survey completing over 400,000 interviews every year which makes it the largest survey system in the world.[49] Additionally, our study is cross-sectional in nature, therefore our results should be interpreted as correlational rather than causal. Individuals experiencing SDOH and increased FPMHD have shown to experience all domains of SDOH including decreased access to care, affordability, and increased stress. Looking forward, future research should focus on further implementation of resources such as project Echo, telehealth, or community-based interventions to increase access to mental health care services which may lead to improvement in mental health outcomes, thus decreasing FPMHD and improving overall health.

Conclusion

Our study highlights the impact of social determinants of health on mental health, revealing differences in frequency of poor mental health days among those who have and do not have access to resources. We also found variations in the rates of poor mental health days by states—with the highest average number found in West Virginia, Oklahoma, and Mississippi—coinciding with states with the greatest shortages of mental health practitioners. While some institutions in these states are making efforts to improve access to mental health services, they still face significant challenges. Therefore, expanded mental health care through improved medical coverage for mental health services, and increased numbers of evidence-based programs and community-based centers for mental health, may improve the mental health of individuals experiencing increased domains of SDOH.

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