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# Does COVID-19 affect mental health and substance use in young adults?

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**Abstract:**

**BACKGROUND:** Mental health has been impacted by COVID-19 throughout the United States and beyond. The mental health and well-being were further affected with excessive substance use during the pandemic. The aim of this research was to explore how the COVID-19 affects the mental health of the young adults (18–24 years) in the South Jersey area. We also examined the association between mental health symptoms in young adults and substance use during the first and second year of the pandemic.

**METHODS AND MATERIAL:** A cross-sectional survey was conducted with ($n$ = 711) 527 participants that included young adults (18–24 years old) across university campus in south jersey and in the community cohorts. Multinomial regression analysis and Chi-squared test were used to explore the association between mental symptoms and substance use. Data were analyzed using Microsoft Excel Spreadsheet for descriptive statistics and Python 3.0 scikit-learn package.

**RESULTS:** The study showed that "Lonely" and "Hopeless" were the top two mental health symptoms. It was observed that the symptoms of "Lonely" and "Hopeless" increased for both males and females. In general, males seemed to be affected more than females in this study for mental health symptoms. For substance use, "Nervous" and "Smoking" showed positive correlation in 2020 and "Hopeless" and "Alcohol" were positively correlated in 2021.

**CONCLUSIONS:** Young adults' mental health symptoms and substance use has been proven to be affected through the pandemic and this research results even though localized will assist the community and educational institutions to plan better support to assist young adults with better health and wellness initiatives.

**Keywords:**

COVID-19, loneliness, mental health, nervousness, substance use, young adults

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## Introduction

During the COVID-19 pandemic, there has been bereavement, isolation, loss of income, and increasing mental health conditions or exacerbating existing ones.[1-3] Seventy two percent of respondents for a poll conducted in late March 2020 reported that their lives were noticeably disrupted since the pandemic began, which was a 32% increase since the same poll conducted two weeks prior.[4] Any mental illness (AMI) is defined as a mental, behavioral, or emotional disorder and according to the National Institute of Health report from 2020, young adults aged 18–25 years had the highest prevalence of AMI (30.6%) compared with adults aged 26–49 years (25.3%) and aged 50 and older (14.5%).[5]

With the highest prevalence of mental illness in young adults as reported it is evident that young adults appeared to be an especially vulnerable group who may develop mental health problems during the pandemic and the national data on major depressive disorders also pointed toward the rates being highest for young adults.[5-7] A survey in 2020 addressed to college students aged 18 to 24 years old reported that the majority of students felt an increase in mental health symptoms since



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the beginning of the pandemic, though the number of students reporting increased mental health symptoms decreased as the year of study in college progressed. Most of those who responded positively to increase in mental health symptoms reported increased anxiety, depression, and feeling of loneliness.[8] Another survey from June 2020 reported that nearly three quarters of its respondents aged 18–24 experienced at least one mental health symptom.[9] The current study was designed to assess the symptoms experienced by young adults in a specific geographical location based on the reports and the need to develop measures based on local demographics.

Another area that has long been correlated with mental health problems is substance use.[10] The percentage of people in 2020 with a past year substance use disorder (24.4% or 8.2 million people), alcohol use disorder (15.6% or 5.2 million people), and illicit drug use (14.6% or 4.9 million people) was highest among young adults aged 18 to 25 as per National Survey for Drug Use and Health (NSDUH) data.[11] In addition, nearly 25% of respondents aged 18–24 in a June 2020 survey reported having started or increased substance use to cope with pandemic-related stress or emotions, which was the highest of all age groups polled.[9] Forty-four percent of respondents in another survey conducted in 2020 in adults aged 18–35 in the US reported binge drinking at least monthly, and from the same survey, 22% of respondents reported drug use with 38% of them qualifying for substantial and severe drug use. In this study, anxiety also was positively correlated with alcohol and drug use severity.[12]

With communities grappling with the health burden due to pandemic there should be quantifiable data to assess the impact and sound measures should be designed to meet the requirements of those who need the support. Good mental health is crucial for the normal functioning of the body even under normal situations and during a pandemic, it can further affect how we respond and recover. The purpose of the study was to assess the perceived mental health symptoms in young adults and to explore any associations between various factors (i.e., age, gender, etc.) that influenced the mental symptoms during the COVID-19 pandemic to provide baseline data to address the issues. The novelty of our study is that it provides geographic-based assessment and evidence on young adults mental health symptoms during COVID-19. Another aspect of the study is that, we analyzed the association between mental health symptoms and substance use with multinomial regression.

## Materials and Methods

### Study design and setting

A survey was created as a primary instrument for the study, which was designed using Google Form with privacy control and distributed to the South Jersey community. There were two surveys: the general public survey and the university students survey. Both surveys included 18 objective questions with a mixture of multiple-choice questions, multiple answer questions, and grid questions. To quantitatively compare the mental symptoms affected by COVID-19, we used numeric values to represent the duration of the symptoms where, "Since COVID-19" as 5, "About 6 months" as 4, "About 3 months" as 3, "About 1 month" as 2, and "less than a week" as 1. We accustomed the hospital anxiety and hospital depression scale to the symptom duration in the survey.[13] According to the Centre for Disease Control, the duration of symptoms for more than one year is considered a chronic condition.[14] For the current study, we assumed that only symptoms reported for $\leq$ 6 month were considered as the symptoms affected by COVID-19.

### Study participant and sampling

The survey was administered in the fall (November–December) of 2020 and 2021. We focused on the young adult participants ($18 \leq$ age $\leq 24$) including both university students and young adults from the general public. As the survey was open to the university students as well as general public, and thus the response rate could not be calculated precisely.

### Data collection tool and technique

Data were analyzed using Microsoft Excel Spreadsheet for descriptive statistics and Python 3.0 scikit-learn package for multinomial regression analysis. Cohen's *d* was used to indicate the standardized difference between the average symptom durations between male and female. The Chi-square test was used to examine relationships for all continuous and categorical variables, respectively. We also used multinomial logistic regression to analyze the association between mental symptoms and substance use. We explored the L2 penalty with weighting values in the range from 0.0001 to 1.0 on a log scale, in addition to no penalty or 0.0. Statistical analysis was conducted and significance was set at 0.05.

### Ethical consideration

The study was approved by the University's Institutional Review Board (IRB). The IRB approval letter (IRB #: 2022.010) along with the consent form attached to the email with a link to the survey was sent to the participants (i.e., university students, senior centre/community centre mailing list). We followed NAADAC Code of Ethics I-9, V-1, V-6, V-7, and VI-12.

## Results

In total, we received 711 responses (343 responses are from the 2020 survey, whereas 368 are from the 2021 survey). Among all 711 responses, a total of 527 participants were

included for analysis based on the inclusion criteria for young adults. There were 264 young adults in 2020 and twelve were reported as transgender, gender variant or other gender; while there were 263 young adults in 2021, two of them were reported as transgender, gender variant or other gender. Please note we included participants who self-identified as transgender/gender variant in our descriptive statistics [see Table 1]. However, as there were only 14 young adult participants who self-identified as transgender/gender variant, their responses were excluded from regression analysis and association analysis due to the small sample size. We have discussed it in the Discussion section. Therefore, in this paper, we focused on the analysis of the participants who self-identified as either male or female.

The Chi-square test revealed the statistical differences across cohorts in terms of gender, $\chi^2(2) = 21.54$, $p < 0.001$, age, $\chi^2(5) = 13.93$, $p < 0.05$, and # household members, $\chi^2(6) = 13.28$, $p < 0.05$.

## Mental health symptoms and effect of COVID

As shown in Table 2, there was a significant difference for the symptoms "Lonely" and "Hopeless" between 2020 and 2021. Larger percentage of people felt "Lonely" and "Hopeless" in 2021 compared with the previous year.

## Mental health symptoms and gender

Table 3 shows the aggregated score based on the assessed mental health symptoms experienced during COVID-19 (assuming the smaller the value, the more possible to be affected by COVID-19). Both genders felt "Lonely" and "Hopeless" with the significance value $P \leq 0.05$. It was observed that there was a significant difference between males and females in terms of the symptoms "Nervous" and "Lonely". Only in 2020 can we notice the difference between males and females for the symptom "Physical Reaction" where males tend to feel more of this symptom. According to Cohen's *d*, the difference between 2020 and 2021 was negligible, however, there was a statistically significant increase of the symptom "Lonely" and "Hopeless" for female participants (<0.05).

## Mental health symptoms and members in household

When mental symptoms were compared to the number of members in the household, there was a significant difference between a household with two members and a household with more than two members for "Depressed" [See Table 4]. In further observing 2020 vs 2021, significance was higher in 2020 compared to 2021. Another finding was that both households with less members and households with more members felt "Lonely" and "Hopeless" with the significance value

**Table 1: Participant demographic information**

| | 2020 | | 2021 | | $\chi^2$ |
|---|---|---|---|---|---|
| | *n* | % | *n* | % | (*df*) |
| Gender | | | | | 21.54 (2) |
| Female | 206 | 60.06 | 275 | 74.73 | |
| Male | 125 | 36.44 | 91 | 24.73 | |
| Trans, nonconforming, or gender variant | 12 | 3.50 | 2 | 0.54 | |
| Total | 343 | 100 | 368 | 100 | |
| The Chi-square statistic is 21.54. The *P* value is 0.000021. The result is significant at *P*<0.001. | | | | | |
| Age | | | | | 13.93 (5) |
| 18-24 | 264 | 76.97 | 263 | 71.47 | |
| 25-34 | 33 | 9.62 | 33 | 8.97 | |
| 35-44 | 13 | 3.79 | 28 | 7.61 | |
| 45-54 | 22 | 6.41 | 30 | 8.15 | |
| 55-69 | 10 | 2.92 | 5 | 1.36 | |
| >=70 | 1 | 0.29 | 9 | 2.45 | |
| Total | 343 | 100 | 368 | 100 | |
| The Chi-square statistic is 13.93. The *P* value is 0.016. The result is significant at *P*<0.05. | | | | | |
| # Household members | | | | | 13.28 (6) |
| One person in a family | 8 | 2.33 | 11 | 2.99 | |
| Two persons in a family | 78 | 22.74 | 49 | 13.31 | |
| Three persons in a family | 69 | 20.12 | 90 | 24.46 | |
| Four persons in a family | 95 | 27.70 | 115 | 31.25 | |
| Five persons in a family | 53 | 15.45 | 51 | 13.86 | |
| Six or more persons in a family | 40 | 11.67 | 51 | 13.86 | |
| Does not respond | 0 | 0 | 1 | 0.27 | |
| Total | 343 | 100 | 368 | 100 | |
| The Chi-square statistic is 13.28. The *P* value is 0.039. The result is significant at *P*<0.05 | | | | | |

**Table 2: Comparison duration of symptoms for the participants 2020 vs. 2021**

| Year | 2020 | | | 2021 | | | 2020 vs. 2021 |
|---|---|---|---|---|---|---|---|
| Symptoms | Affected by COVID (≤6 months) | Less Affected (>6 months) | Not Responded | Affected by COVID (≤6 months) | Less Affected (>6 months) | Not Responded | Affected by COVID diff. *P* |
| Nervous | 164 (65.1%) | 86 (34.1%) | 2 (0.8%) | 175 (67.0%) | 85 (32.6%) | 1 (0.4%) | 0.325 |
| Depressed | 186 (73.8%) | 63 (25%) | 3 (1.2%) | 202 (77.4%) | 57 (21.8%) | 2 (0.8%) | 0.171 |
| Lonely | 190 (75.4%) | 61 (24.2%) | 1 (0.4%) | 213 (81.6%) | 46 (17.6%) | 2 (0.8%) | 0.044* |
| Hopeless | 191 (75.8%) | 57 (22.6%) | 4 (1.6%) | 215 (82.4%) | 43 (16.5%) | 3 (1.1%) | 0.033* |
| Physical Reactions | 221 (87.7%) | 31 (12.3%) | 0 (0%) | 229 (87.7%) | 29 (11.1%) | 3 (1.1%) | 0.5 |

*NA

**Table 3: Comparison of mental symptoms and gender (male vs. female) 2020 vs. 2021**

| Symptoms | Male vs. Female mean (std) | | | |
|---|---|---|---|---|
| | Male | Female | *P* | Cohen's *d* |
| Nervous | 2.52 (1.66)/ 2.60 (1.54) | 3.52 (1.51)/ 3.47 (1.49) | <0.001*/ <0.001* | 0.45/ 0.41 |
| Depressed | 2.37 (1.63)/ 2.09 (1.35) | 2.75 (1.66)/ 2.81 (1.61) | 0.08/ <0.001* | 0.16/ 0.34 |
| Lonely | 2.46 (1.68)/ 2.17 (1.38) | 2.91 (1.53)/ 2.56 (1.53) | 0.04*/ 0.04* | 0.2/ 0.19 |
| Hopeless | 2.54 (1.48)/ 2.08 (1.30) | 2.75 (1.59)/ 2.39 (1.54) | 0.3/ 0.09 | 0.1/ 0.15 |
| Physical Reaction | 1.61 (1.17)/ 1.68 (1.16) | 2.01 (1.53)/ 1.92 (1.43) | 0.02*/ 0.15 | 0.21/ 0.13 |

*NA

$P < 0.05$. The results resonated with the findings in Table 2.

### Mental health symptoms and substance use

Multinomial logistic regression analyses revealed the association between mental symptoms and substance use. Table 5 indicated that the symptoms "Nervous" and substance "Smoking" were positively correlated in 2020; similarly, the symptom "Hopeless" and substance "Alcohol" were positively correlated in 2021.

## Discussion

Though young adults affected by COVID-19 pandemic were lesser in number compared to other age groups, the social isolation, stress, disruption of day-to-day life and lack of access to school services added to the emotional and mental health burden of young adults. The current research focuses on a specific geographical location and during a pandemic, it is best practice to have localized evidence for developing better policies.

### Mental health symptoms and impact of COVID

In a previous study on the mental health of college students, 59.8% reported experiencing Increased anxiety, depression, and feeling of loneliness in 60.8%, 54.1%, and 59.8% of the weighted population loneliness.[8] In this study, we observed that the symptoms of "Lonely" and "Hopeless" increased for both males and females (increased by 9.8% and 13.4%, respectively). In both years, for the symptoms "Nervous" and "Lonely", males experienced significantly worse symptoms than females ($p < 0.001$ and $P < 0.05$, respectively). For the symptoms of "Depression", there was no significant difference for males vs. females in 2020, but males had significantly worse symptoms than females in 2021 ($p < 0.001$). In contrast, for "Physical reaction", there was a significant difference between males and females in 2020 ($p < 0.05$), while no difference was observed for 2021. Our results also aligned with similar studies that reported an increase in mental health symptoms with increased anxiety, depression, and feeling of loneliness.[15,16]

### Mental health symptoms and gender

The results of the current study contradict another study in which females suffered more mental symptoms than their male counterparts. In a survey analysis done for prevalence and predictors of anxiety and depression study, women, younger age (18–29), and those reporting greater negative impact on their quality of life, were at higher risk for increased anxiety and depression symptoms ($p < 0.05$).[17] In the present study, males tend to struggle more with symptoms of "Nervous", "Depressed" and "Lonely" than females. We observed that either *P* - value reflected a significant increment for symptom "Depressed" with $P = 0.08$ in 2020 and $P < 0.001$ in 2021, or *P* - value remained the same for "Nervous" ($p < 0.001$) and "Lonely" ($p < 0.04$).

One possible explanation is the geographic location of the study, the South Jersey area, where quite a few males' occupations are related to Casinos and the Tourism industry. During the pandemic, the tourism and hospitality industry/casino industry were devastated. The US commercial gaming revenue totaled $30.0 billion in 2020, down more than 31 percent year-over-year, according to the American Gaming Association's (AGA).[18] Young adult's families or family members or themselves are potentially one of them who endured tough times.

### Mental health symptoms and members in household

Through this survey we also analyzed the mental symptoms and the number of family members in their place of living. The participants who stayed with less than

**Table 4: Comparison of mental symptoms and family members (Household ≤2 members and Household >2 members) 2020 vs. 2021**

| Symptoms | Household ≤2 (2020 vs. 2021) mean (std) | Household >2 (2020 vs. 2021) mean (std) | *P* (2020 vs. 2021) | Cohen's *d* (2020 vs. 2021) |
|---|---|---|---|---|
| Nervous | 3.29 (1.69)/ | 3.13 (1.62)/ | 0.53/ | 0.07/ |
| | 3.61 (1.47) | 3.26 (1.55) | 0.29 | 0.16 |
| Depressed | 2.79 (1.70)/ | 1.56 (1.64)/ | <0.001*/ | 0.52/ |
| | 3.39 (1.73) | 2.60 (1.56) | 0.05* | 0.34 |
| Lonely | 2.91 (1.65)/ | 2.70 (1.58)/ | 0.39/ | 0.09/ |
| | 3.00 (1.65) | 2.43 (1.49) | 0.12 | 0.26 |
| Hopeless | 2.88 (1.80)/ | 2.63 (1.54)/ | 0.34/ | 0.11/ |
| | 2.43 (1.62) | 2.32 (1.49) | 0.76 | 0.05 |
| Physical Reaction | 2.17 (1.59)/ | 1.77 (1.35)/ | 0.09/ | 0.19/ |
| | 2.13 (1.60) | 1.84 (1.37) | 0.41 | 0.14 |

*NA

**Table 5: The association between mental symptoms and substance use (a) 2020 (b) 2021**

| Symptoms | Substance Use Coef. (Std. Err) *P* | | | |
|---|---|---|---|---|
| | Smoking | Weed | Alcohol | Opioid* |
| Nervous | 1.7986 (0.8227) | −0.2090 (0.4213) | −0.5687 (0.4432) | N/A |
| | 0.0288 | 0.6198 | 0.1994 | |
| Depressed | −2.2963 (0.8327) | −0.1829 (0.4963) | 0.7906 (0.4968) | N/A |
| | 0.0058 | 0.7124 | 0.1115 | |
| Lonely | 0.6475 (0.5805) | 0.5418 (0.4206) | −0.5526 (0.3997) | N/A |
| | 0.2647 | 0.1977 | 0.1668 | |
| Hopeless | −1.5226 (0.5475) | −0.5680 (0.3640) | 0.8040 (0.3902) | N/A |
| | 0.0054 | 0.1186 | 0.0394 | |
| Physical Reactions | −1.5323 (0.4147) | −0.8289 (0.3117) | −0.4053 (0.3120) | N/A |
| | 0.0002 | 0.0078 | 0.1939 | |

(a)

| Symptoms | Substance Use Coef. (Std. Err) *P* | | | |
|---|---|---|---|---|
| | Smoking | Weed | Alcohol | Opioid* |
| Nervous | 0.6885 (0.6256) | 0.3894 (0.3971) | 0.1530 (0.3564) | NA |
| | 0.2711 | 0.3268 | 0.6677 | |
| Depressed | −0.7910 (0.6008) | −1.2962 (0.4149) | −0.6848 (0.3900) | NA |
| | 0.1880 | 0.0018 | 0.0791 | |
| Lonely | −0.5448 (0.5001) | −0.0714 (0.3699) | 0.0936 (0.3586) | NA |
| | 0.2760 | 0.8471 | 0.7940 | |
| Hopeless | −0.7242 (0.5463) | −0.0777 (0.4052) | −0.0046 (0.3903) | NA |
| | 0.1850 | 0.8480 | 0.9905 | |
| Physical Reactions | −1.6931 (0.4909) | −0.6661 (0.3585) | −0.9072 (0.3509) | NA |
| | 0.0006 | 0.0632 | 0.0097 | |

(b)

*In 2020, we only received one response on opioid, whereas in 2021 there was no response on opioid

two family members reported "Depressed" for both 2020 and 2021 and it was statistically significant.[19] Previous studies on depression and household status showed that a decrease in household size is associated with health effects, particularly poor mental health and depression, in addition to several socioeconomic consequences.[19]

## Mental health symptoms and substance use

A report from 2020 suggested that as many as 150,000 Americans being at risk of dying from drug/alcohol abuse or suicide due to coronavirus related despair.[9] We observed that mental health symptoms of "Nervous" had a positive correlation with "Smoking" in 2020 and "Hopeless" showed a positive correlation with "Alcohol" in 2021. Though longitudinal studies are still emerging with results, there are studies which report that frequent and problematic use of substances increased in some higher-risk young

adults, such as those with concurrent mental health conditions.[20-22]

The difference in finding within the current study can also be attributed to lifting restrictions with social isolation, vaccine administration, and coping mechanisms adopted as part of adapting to the "new way" of living. To build a resilient community, we need to foster equitable resources and support recovery efforts.[18]

### Limitations

The study was nonrandomized, and thus an important limitation is the potential for unmeasured variables to serve as confounds in the data. Also being cross-sectional survey design causal conclusions are not possible. Due to the limited sample size, the demographic information may not reflect the overall population in the South Jersey area and thus the conclusion may not be generalizable. This study was created to provide baseline data during the COVID-19 pandemic. Despite the limitations, our study strengths include focus on South Jersey area and thus address specialized care on public health needs and future longitudinal study will keep track of the mental health trend in young adults. Further, our research study can offer evidence for local policy/decision making in the future.

### Future work

As the pandemic related impacts continue to evolve it is important to monitor and evaluate the different ways the pandemic impacted mental health-related changes in young adults in further understanding and preparing the young adults. We will investigate changes of stress scales and coping mechanisms for both students and the public in future studies. The lessons learned through research will help us create effective strategies to provide resources to mitigate the impact on young adults and develop policies to address the issue. Further research is suggested from specific demographic locations to assess the pandemic effects and continued efforts will be done by our research team on this topic. In addition, as mentioned previously, the responses of 14 young adult participants who self-identified as transgender/gender variant were excluded from the analysis due to the small sample size. We understand that during the COVID-19 pandemic, transgender and gender-diverse individuals may suffer more from structural or systemic inequity and discriminations (i.e., unstable housing, unemployment, and financial difficulties), and thus mental health disparities experienced by these groups were exacerbated during the pandemic.[23,24] We will extend the research to investigate the mental health symptoms of transgender and gender-diverse groups during COVID-19 in future studies.

## Conclusion

Within the two years of the COVID-19 pandemic, loneliness, and hopelessness affected both genders, and households with less than two members had significant depression compared with more than two members. We also observed that the substance uses with respect to smoking and alcohol had a positive correlation with nervousness and hopelessness. Further research to evaluate specific mental health symptoms and predictors need to be conducted to generalize these findings.

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### Conflicts of interest

There are no conflicts of interest.

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