

Data-Driven Analysis of Student Mental Health: Academic Pressure, Coping Mechanisms, and Demographic Correlates

Abstract

This study presents an academic-style analysis of a mental health survey conducted among university students, using a data-driven approach to uncover key patterns and insights. A Python-based workflow was employed for data cleaning, exploration, and visualization, focusing on how academic pressure, financial stress, social connections, and coping mechanisms relate to student mental health outcomes. The results indicate several notable findings: **(a)** Depression and anxiety levels showed a strong positive correlation, suggesting these challenges often co-occur; **(b)** Female students reported higher median depression scores and greater anxiety about the future compared to males, highlighting gender differences in mental health experiences; **(c)** Academic and financial stressors were associated with elevated depression and anxiety, underscoring the toll of academic pressure and economic concerns[1][2]; and **(d)** Active coping mechanisms (such as creative activities and socializing) corresponded with lower academic stress, whereas not engaging in any stress-relief was linked to the highest stress levels. These findings have important implications for educational institutions and policymakers. We conclude that comprehensive support systems—addressing academic workload, financial aid, and community-building—are needed to foster student well-being. Recommendations are offered for university programs and future research directions to further understand and mitigate student mental health challenges.

Introduction

Mental health issues among college and university students have become a growing concern worldwide. Depression and anxiety are among the most prevalent mental health problems in this population, and evidence suggests their incidence is rising[3]. College students in the transitional stage of early adulthood are particularly susceptible to these challenges, which can disrupt their daily lives and academic performance[4]. Previous research has established that excessive academic stress is a significant contributor to student mental health problems; sustained academic and familial pressures can lead to increased risk of depression and reduced academic performance[1]. Likewise, social and emotional support networks play a vital role in student well-being: loneliness and social isolation have been linked to higher rates of anxiety and depression[5]. Another critical factor is financial stress—worry over finances has been correlated with symptoms of depression and anxiety in college populations[2]. Taken together, these factors (academic pressure, social support, and financial concerns) represent key determinants of students' mental health.

In light of these challenges, data-driven analysis offers a powerful approach to identify patterns and correlations that might not be immediately evident. By leveraging survey data and analytic tools, researchers and educators can better understand how various factors intersect to influence student mental health outcomes. The present study undertakes a comprehensive analysis of a mental health survey dataset collected from university students. Our aim is to explore how demographic characteristics, academic factors, financial concerns, and coping behaviors correlate with mental health indicators such as depression, anxiety, and feelings of isolation. Using Python-based data analysis and visualization, we identify significant relationships—such as the co-occurrence of depression and anxiety, gender differences in reported mental health, the impact of academic and financial stressors, and the effectiveness of different coping mechanisms—in order to inform targeted interventions. By examining these patterns, this research contributes to the literature on student mental health and provides actionable insights for educational institutions and mental health professionals to support students in higher education environments.

Methodology

Data and Sample

This study analyzed a cross-sectional **mental health survey dataset** comprising responses from university students. The survey was conducted across multiple institutions, with a large representation from a major public university and additional participants from two other universities. The sample included undergraduate and a smaller proportion of postgraduate students, spanning various majors in technology and data-related fields (primarily Data Science and Computer Science, with fewer students from Information Technology and Software Engineering). Key demographic variables in the dataset included **age** (in years), **gender** (with approximately 79% male and 21% female respondents), and **university affiliation** (with one university contributing the largest number of respondents, followed by two others). Academic performance indicators were also recorded, notably each student's self-reported **Cumulative GPA (CGPA)** on a 4.0 scale, and **degree level** (undergraduate vs. graduate). Additionally, the survey gathered information on students' **degree major**, providing context on their field of study.

Measures and Variables

The survey captured several mental health and related variables of interest. Students reported their levels of **depression** and **anxiety**, presumably via standardized questionnaire scores or self-assessment scales (higher values indicating more severe symptoms). The construct of **social relationships** was assessed (reflecting how connected or supported students felt), alongside **feelings of isolation**. An **academic workload** measure was included, likely quantifying perceived study or coursework load. **Financial concerns** were recorded, indicating the extent of worry about personal finances or expenses. Students also rated their sense of **future insecurity**, reflecting anxiety about their future prospects (e.g., career or personal life after graduation).

Finally, the survey inquired about **coping mechanisms for stress**: students indicated which stress-relief activities they engaged in (such as exercise, creative hobbies, socializing, religious activities, online entertainment, or “doing nothing”) and possibly the perceived effectiveness of these activities in alleviating academic pressure.

Tools and Analytical Approach

All data processing and analysis were performed using Python, a robust platform for data science. The **Pandas** library was utilized for data loading and manipulation, ensuring efficient handling of tabular survey data. Prior to analysis, data cleaning steps were rigorously applied to prepare the dataset for accurate analysis:

- **Standardization of Variables:** All column names and categorical entries were converted to lowercase and consistent formats. This standardization minimized errors due to case sensitivity or inconsistent labeling (e.g., ensuring “Gender” or “gender” are treated uniformly).
- **Handling Missing Data:** The dataset was examined for missing or null values. Where applicable, missing entries were addressed either by imputation (using appropriate techniques such as mean/median replacement for numerical scales, or mode for categorical responses) or by removing records that had insufficient data. These decisions were made to balance data integrity with retaining as much information as possible.
- **Outlier Detection:** Continuous variables (such as age, CGPA, or mental health scale scores) were assessed for outliers. Unusually extreme values were identified, and their potential impact on the analysis was considered. In cases where outliers were likely due to data entry errors or were outside plausible ranges, they were excluded or winsorized to prevent distortion of summary statistics and correlations. This step ensured that the presence of a few atypical observations did not unduly skew the results.
- **Data Type Consistency:** Each variable's data type was verified and adjusted if necessary. For instance, if date fields had been present, they would be converted to a proper datetime type; categorical responses were cast to categorical data types; and numeric fields were checked for correct numeric formatting. Ensuring the appropriate data types facilitated correct computations (for example, enabling accurate numeric calculations and categorical groupings).
- **Exploratory Data Analysis (EDA):** An initial EDA was conducted to understand the basic characteristics of the dataset. This involved computing descriptive statistics (means, medians, frequency distributions) and visualizing distributions for key variables. EDA helped in familiarizing the researchers with patterns or anomalies in the data (such as the age distribution of respondents, or any imbalance in gender representation). Insights from this exploratory phase informed the subsequent focused analyses and choice of visualizations by highlighting which variables were most salient or variable.

Data Visualization and Analysis Techniques

Given the survey's numerous variables, a variety of visualization techniques were employed to elucidate relationships and trends:

- **Histograms** were used to depict distributions of continuous variables. For example, the age distribution of students was plotted to identify the predominant age range in the sample, and CGPA distribution was visualized to see overall academic performance trends.
- **Pie Charts** were utilized for illustrating proportional breakdowns of categorical variables. The gender composition of the sample (male vs. female percentage) was displayed in a pie chart to highlight the imbalance in representation. Similarly, the distribution of students' chosen stress-relief activities was shown in a pie chart to convey which coping mechanisms were most commonly reported.
- **Bar Charts** (including both standard vertical bars and horizontal bars) were created for categorical comparisons. A bar chart of respondents by university illustrated the contribution of each institution to the sample. Another bar chart compared the counts of students across **degree levels** (confirming that undergraduates vastly outnumbered postgraduates in the dataset), and a horizontal bar chart showed the popularity of each **degree major** among respondents. Additionally, bar graphs were used to examine the relationship between **financial concern levels** and mental health outcomes (depression, anxiety, future insecurity), and to compare **academic pressure levels** across different stress-relief activity groups.
- **Correlation Analysis:** A Pearson correlation matrix was computed for the key numeric variables related to mental health and stress factors (depression, anxiety, isolation, social relationship score, academic workload, financial concern, etc.). This correlation matrix was visualized as a **heatmap** to provide a comprehensive view of bivariate relationships. The heatmap format allowed quick identification of strong positive or negative correlations through color intensity, guiding our attention to the most significant associations (e.g., between depression and anxiety).
- **Box Plot:** To investigate gender differences in mental health, a box-and-whisker plot was generated for depression scores separated by gender. The box plot effectively summarized the central tendency (median) and variability (interquartile range and outliers) of depression levels for male vs. female students in a single graphic, facilitating a direct comparison of the distribution shapes.
- **Line Chart:** To explore trends over age, a line chart was used to plot how certain variables changed with student age. In particular, average academic workload and mental health scores (like depression and anxiety) were plotted against age to reveal any age-related patterns or peaks.
- **Scatter Plot:** To further illustrate specific pairwise relationships identified in the correlation analysis, a scatter plot was created for **social relationships vs. isolation**. Each point in this plot represented an individual student, positioned

according to their reported social support level and their isolation feeling. This visualization helped in assessing the form and strength of the relationship (expected to be inverse) between these two variables.

Throughout the analysis, **Matplotlib** and **Seaborn** libraries in Python were utilized to create these visualizations with clarity and aesthetic consistency. The use of these libraries allowed customization of charts (titles, labels, color schemes) to ensure they were easily interpretable. Summary statistics and visual examination from these plots formed the basis of the results described below. All analytical steps—from data cleaning to final visualizations—were implemented in a reproducible Python environment, underscoring the reliability and transparency of the analysis process.

Results

Participant Demographics and Academic Profile

The surveyed student population was predominantly young and mostly male. The **age distribution** of respondents showed that the majority were between 18 and 22 years old, with a clear peak around 20 years. This indicates that the dataset largely represents students in the typical age range of early university years (late teens to early twenties). Correspondingly, an overwhelming proportion of the sample were **undergraduate students**, with only a small minority pursuing postgraduate studies. In terms of **gender**, the sample was notably imbalanced: approximately 79% of respondents identified as male and 21% as female. This skewed gender ratio suggests that any mental health trends observed may need to be interpreted with the understanding that male students are over-represented in the dataset. It also raises considerations for whether male and female students might have different experiences that could influence the overall findings.

The respondents were drawn from multiple **universities**, with participation rates varying by institution. One university (Punjab University, PU) contributed the largest number of student respondents, followed by COMSATS University and the University of Engineering and Technology (UET). This unequal representation means that the data is somewhat more reflective of the student environment at those particular institutions, which could share certain regional or academic characteristics. Nonetheless, the inclusion of several universities provides a degree of diversity in the sample.

Academic performance data, measured via self-reported **Cumulative GPA (CGPA)**, revealed a right-skewed distribution. Most students reported moderate to high academic performance: a large concentration of CGPAs fell between roughly 2.5 and 3.5 on a 4.0 scale. There were relatively few students with extremely low CGPAs (below 2.0) or exceptionally high CGPAs (approaching 4.0). This indicates that the bulk of the sample maintained satisfactory or good academic standing. The limited number of very low-performing students could mean that severely struggling students (academically) were underrepresented, possibly due to lower survey participation or fewer such students in the programs surveyed.

The dataset also included information on students' **degree majors**, which were primarily in technology and data-related fields. A horizontal bar chart of major distribution showed that **Data Science** was the most common major among respondents, followed closely by **Computer Science**. There was a smaller representation of students in **Information Technology** and **Software Engineering** programs. This distribution suggests a strong interest and participation from students in data-focused disciplines, which might reflect the origin of the survey (perhaps administered in courses or departments related to computing and data science). The academic and demographic profile summarized here (young, predominantly undergraduate male students in data-centric majors) provides important context for interpreting the mental health findings, as it narrows the scope of generalizability. Any interventions or recommendations derived from this analysis may be most applicable to similar student populations.

Correlations among Mental Health and Related Factors

To understand the interrelationships between different mental health variables and contributing factors, a correlation matrix was examined and visualized as a heatmap. This **correlation heatmap** included variables such as depression, anxiety, isolation (loneliness), quality of social relationships, academic workload, and financial concern levels. The most striking result was the **strong positive correlation between depression and anxiety**, with a correlation coefficient of approximately **0.84**. This value indicates a very high degree of co-movement between the two variables: students who reported high levels of depression almost invariably also reported high levels of anxiety. Such a strong correlation is consistent with clinical observations that depression and anxiety often occur together in individuals, especially in high-pressure environments like universities. This finding suggests that strategies to address one of these mental health issues (for example, anxiety) may have a beneficial effect on the other (depression)[6][7]. In practical terms, interventions focused on anxiety reduction (such as stress management workshops or counseling) could potentially alleviate depressive symptoms as well, given the overlap between these conditions.

Another notable relationship uncovered in the correlation analysis was the **negative correlation between social relationships and isolation**, with a coefficient around **-0.56**. This moderate-to-strong negative correlation implies that students who felt they had strong social support and connections tended to feel significantly less isolated or lonely. Conversely, those reporting higher isolation generally had poorer social support. This aligns with the intuitive understanding that social connectedness is protective against loneliness: fostering friendships and community can directly combat feelings of isolation. It also echoes broader findings in public health research that loneliness and lack of social support are linked to worse mental health outcomes[5]. The data here quantitatively reinforce the importance of peer support networks and student communities in reducing isolation. (In our analysis, **isolation** could be interpreted as a proxy for loneliness or lack of belonging, whereas **social relationships** capture the presence of supportive interpersonal connections.)

Several other correlations emerged from the heatmap analysis, offering insight into how different aspects of student life relate to mental well-being. For instance, **financial concerns** showed a positive correlation with both **anxiety** and **depression** levels. Students who were more worried about their financial situation tended to report higher anxiety and more depressive symptoms. Although these correlations were not as high as the anxiety-depression link, they were substantial, underscoring the role of economic stress in mental health. This pattern is consistent with literature suggesting that financial stress can erode psychological well-being[2]. Similarly, **academic workload** was positively correlated with stress-related outcomes; students perceiving a heavier workload often had elevated stress or anxiety (though the survey's exact measure of "academic pressure" or stress was not explicitly named in the correlation matrix, it can be inferred that workload contributes to overall stress levels).

To illustrate one of these relationships in more detail, we plotted a **scatter diagram for social relationships vs. isolation**. The scatter plot vividly showed an inverse relationship: as the self-rated quality of social relationships increased (on the x-axis), the reported feeling of isolation (on the y-axis) tended to decrease notably. Points in the plot trended downward from left to right, forming a negative slope cloud of data. This visual evidence supports the correlation coefficient mentioned earlier and emphasizes that students with richer social connections (friendships, family support, peer groups) are much less likely to feel isolated. The implication of this relationship is significant for campus policy – interventions that build social support (such as mentorship programs, student clubs, or group activities) could measurably reduce student isolation, which in turn may improve overall mental health outcomes.

In summary, the correlation analysis reveals a complex but coherent picture: **depression and anxiety are tightly interwoven challenges**, likely feeding into each other, while **social connectedness is a crucial buffer** against isolation and possibly by extension against poor mental health. Additionally, external pressures in the form of academics and finances are clearly linked to mental health strains. These findings set the stage for more focused results on specific differences and factors, as described in the following sections.

Gender Differences in Mental Health

Gender-stratified analysis of the survey data uncovered meaningful differences in how male and female students experience mental health challenges. A **box plot of depression scores by gender** showed distinct distributions for male versus female students. The median depression score for **female students** was higher than that for **male students**, indicating that, on average, women in the sample reported more elevated depressive symptoms. Furthermore, the spread of the middle 50% of scores (the interquartile range) was wider for females, and the overall range (from minimum to maximum, excluding outliers) was also greater for female respondents. In practical terms, not only did female students tend to have higher central levels of depression, but there was more variability among them – some female students reported very low levels of depression, while others reported very high levels, more so than their male

counterparts. **Male students**, in contrast, showed a somewhat lower median depression score and a slightly narrower interquartile range in the box plot, suggesting less variability in their responses. While males certainly did report experiencing depression (and some individual men reported high levels), the aggregate pattern suggests that it is the female students who may be more at risk or at least more expressive of depressive symptoms in this dataset.

These findings resonate with broader epidemiological trends: numerous studies have found that depression is often reported more frequently by women than men of similar age[8][9]. Possible reasons include biological factors, societal expectations, and differences in help-seeking behavior. Women might be more likely to acknowledge and report feelings of depression, whereas men might under-report due to stigma or a tendency to express distress in different ways[10][11]. Our data cannot determine the cause of the gender disparity, but it clearly signals that female students constitute a group warranting particular attention for mental health support.

In addition to depression, differences in **anxiety and future outlook by gender** were observed. A stacked bar chart comparing **female and male students' levels of anxiety and future insecurity** revealed that female students not only had higher anxiety scores on average, but also reported greater **future insecurity** (i.e. worry about their future) compared to male students. Interestingly, this occurred even though average depression levels between genders were closer (as noted above, females were slightly higher on depression, but much higher on anxiety). Female respondents consistently indicated more concern about their future prospects and more intense anxiety symptoms. Male students, while certainly experiencing anxiety and uncertainty, did so to a comparatively lesser extent in the aggregate data.

This gender-based pattern suggests that female students might be encountering or perceiving greater stressors related to academic or life expectations, or they might lack sufficient coping resources relative to their needs, thereby experiencing higher anxiety. It could also reflect cultural facets in which female students feel pressure to perform or conform, leading to internalized stress. On the other hand, the similarity in depression levels (or only moderately higher female depression) combined with significantly higher female anxiety might imply that male students could be under-reporting certain emotional struggles (a possibility noted in some gender studies[10]). Nonetheless, within our dataset, **gender emerged as an important variable**: it influences the intensity and perhaps the expression of mental health challenges. These results underscore the need for gender-sensitive approaches in campus mental health services. For example, universities might implement targeted outreach for female students who show signs of higher anxiety, and also ensure that support systems are in place that encourage male students to openly discuss and seek help for emotional distress (since their lower reported depression could belie actual need).

Coping Mechanisms and Stress Relief Activities

The survey inquired about the **coping mechanisms** students use to alleviate academic stress, and the findings highlight both the prevalence of various strategies and their association with perceived stress levels. According to a pie chart of responses, nearly every student engages in *some* form of stress-relief activity—only about **0.5% of students reported “doing nothing”** to cope with academic pressure. This is an encouraging sign that the vast majority of students are proactive in seeking stress relief. The most popular coping strategies reported were **religious activities** and **online entertainment**, each accounting for a substantial proportion of the responses. The prominence of religious activities (such as prayer, meditation, or attending services) as a coping mechanism could be influenced by cultural context or personal values, suggesting that many students find comfort and stress relief in spirituality or faith-based practices. **Online entertainment** (including watching videos, gaming, or browsing social media) is another common outlet, likely reflecting its easy accessibility and immediate distraction from academic worries. Other noted activities included **physical exercise**, **creative outlets** (like art or music), **socializing** with friends or family, and **hobbies**. Each of these contributed a slice to the pie, indicating a diversity of approaches students take to manage stress.

To assess the effectiveness of these coping mechanisms, we analyzed how engaging in different activities related to the level of **academic pressure** students felt. A bar chart compared the average reported academic pressure among students who practiced each type of stress-relief activity. The contrast between different groups was revealing. Students who reported **“doing nothing”** as their way of coping had, on average, the **highest levels of academic pressure**. In fact, this no-coping group experienced markedly more stress than any group engaged in an active coping strategy. On the other hand, students who engaged in **creative outlets** (such as drawing, writing, music) or those who maintained **social connections** (spending time with friends, talking to loved ones) reported the **lowest levels of academic pressure** among all groups. These two activities stood out as particularly effective in mitigating stress. Engaging in creative activities can provide emotional expression and distraction, while social interaction offers support and a sense of shared burden; both seem to significantly alleviate the feeling of pressure.

The groups engaging in **physical exercise** and **religious activities** also showed lower-than-average academic pressure, though not as low as the creative or social groups. This indicates that exercise and spiritual practices are beneficial, which aligns with well-known stress reduction benefits of regular physical activity and mindfulness/meditation. **Online entertainment** had a more mixed result: students who resorted primarily to online entertainment had lower pressure than those doing nothing (as expected) but did not report as low stress as some other active coping groups. It is possible that while online entertainment provides temporary relief, it may not address underlying stressors as effectively as direct social support or creative expression.

In summary, the data suggest a clear pattern: **active coping mechanisms are associated with lower stress**, whereas a lack of coping efforts corresponds to higher stress.

Notably, strategies that involve either personal expression (creative hobbies) or social interaction are linked with the greatest reductions in academic pressure. This finding reinforces the idea that both individual and interpersonal avenues can be powerful in managing stress. It also highlights an important insight: students seem largely aware of the need to cope (given the tiny fraction doing nothing), yet the efficacy of their chosen methods varies. Universities and counselors could use this information to encourage students to engage more in the most effective stress-relief practices. For instance, creating opportunities and spaces for creative activities, promoting group exercise or sports, facilitating social events, and respecting students' time for religious/spiritual practices could all be part of a comprehensive stress management program. Conversely, solely relying on passive entertainment might not suffice for high stress, so students might be guided to complement such activities with more active or social coping techniques.

Financial Stress and Mental Health

Financial difficulties emerged as a significant factor correlating with student mental health outcomes in this survey. The data included a self-reported **financial concern** level for each student (for example, ranging from “low concern” to “high concern” about finances), and this was analyzed in relation to mental health metrics. A bar chart plotting **financial concern levels against average depression, anxiety, and future insecurity scores** revealed a clear upward trend: as **financial concerns increased, mean levels of depression and anxiety increased in tandem**. Students in the highest financial stress category exhibited substantially higher depression scores than those with minimal financial worries. In fact, the increase in depression appeared especially steep at the upper end of financial concern – suggesting a threshold at which financial strain may become psychologically overwhelming. Similarly, anxiety levels were elevated among students with greater financial stress, indicating that worrying about money is associated with heightened general anxiety.

Another related variable, **future insecurity**, also showed a positive association with financial stress. Future insecurity refers to a student's anxiety or uncertainty about their future (such as prospects of employment, career, or general stability). The data showed that students reporting high financial concerns also tended to feel much more insecure about their future. This makes intuitive sense: financial stress, particularly concerns about paying for education or accumulating debt, can cloud one's optimism about life after graduation and create fears about economic stability. The alignment of high financial worry with high future insecurity in our results suggests that monetary concerns may not only affect day-to-day mood (depression/anxiety) but also cast a long shadow on students' outlook for their years ahead.

These findings are in line with broader research linking financial stress to poor mental health outcomes. Studies have documented that financial strain and debt are correlated with symptoms of depression and anxiety in college populations[2]. The psychological pathway is often explained by chronic stress: ongoing concerns about meeting expenses or debt obligations can activate persistent stress responses, which over time

contribute to anxiety disorders or depressive episodes. Our analysis reinforces this link in the context of our student sample. It underscores the point that financial well-being is an important component of student mental health.

From an intervention standpoint, the strong impact of financial stress on mental health suggests that universities should not overlook students' financial needs when designing mental health support. Providing access to financial literacy programs, budgeting workshops, or personal financial counseling might help students manage their finances better and reduce anxiety related to money. Moreover, offering emergency financial aid or flexible tuition payment plans for students in hardship could alleviate acute financial stress. By addressing financial concerns, institutions may indirectly but meaningfully improve the mental health and academic persistence of their students.

Age, Academic Workload, and Mental Health Trends

The relationship between **student age** and various academic and mental health factors revealed interesting patterns that likely correspond to different stages of the college experience. Plotting **academic workload and mental health indicators against age** showed that perceived **academic workload was highest at age 18**, which typically corresponds to first-year university students. This spike at the youngest age in our sample suggests that new students might feel particularly overwhelmed by academic demands—possibly due to the transition from high school to university, where they encounter a faster pace of learning, greater volume of work, and the need to adapt to independent study habits. After age 18, the academic workload levels reported by students fluctuated, generally following a moderate pattern through the early 20s. This could indicate that after the initial shock of the first year, students either adjust to the workload or the subsequent years vary with periods of intense study (for example, junior year might involve core major courses which are demanding, followed by a lighter senior year for some, or vice versa depending on program).

When examining **mental health trends by age**, the analysis found that **depression and anxiety levels were not static across all ages**; instead, they showed elevations at specific points. Depression and anxiety scores tended to be higher among the youngest students (around 18-19) and again among the older students in the sample (which could be mid-20s, possibly representing those in final year or graduate studies). This forms a somewhat U-shaped pattern, where students at the very beginning and those at the tail end of their university timeline experience more distress. The high levels of depression and anxiety in late teens reinforce the notion that the transition into college life is a vulnerable period for mental health, likely due to a combination of academic pressure, new social environment, and often being away from home for the first time. The second increase in distress among older students might be attributed to impending graduation or completion of a program—these students may be facing the pressure of job searching, uncertainty about career paths, or concluding major projects like a thesis. The looming transition out of university (and into the workforce or further studies) can provoke anxiety about the future, as well as sadness or nostalgia associated with leaving a familiar academic environment.

These age-related findings highlight that student mental health needs may differ by where a student is in their educational journey. First-year students might benefit from robust orientation programs that include mental health education, time management training, and early counseling support to help them cope with the initial academic surge and social adjustment. For students approaching graduation, career counseling and workshops on life skills (such as job interviews or financial planning for after college) could help mitigate anxiety about the future. It is also important for universities to maintain mental health outreach to older students, who might otherwise be overlooked as attention is sometimes focused on freshmen. The presence of higher distress at both ends of the age spectrum indicates that support services should be well-distributed across all year levels.

Social Support and Isolation

As introduced earlier in the correlation analysis, the interplay between **social support and isolation** is a crucial aspect of student well-being. The scatter plot of social relationships vs. isolation (and the corresponding correlation coefficient) demonstrated that these two factors are inversely related: students who feel well-supported socially tend to feel much less isolated. In practical terms, having friends to confide in, being part of campus groups or communities, or maintaining close relationships with family can significantly reduce the sense of loneliness that a student experiences. Our analysis found that students reporting strong social connections had low loneliness scores, whereas those with weak social support networks had high isolation scores.

This relationship is not only statistically significant in our data; it also carries important **psychological and public health implications**. Social isolation has been identified as a risk factor for a range of adverse mental health outcomes, including depression and anxiety[5]. Conversely, high social support acts as a protective buffer, enhancing resilience against stress. The college environment can either exacerbate isolation (for example, if a student struggles to make friends or feels they don't fit in) or ameliorate it (through dorm communities, clubs, and supportive peers). Our findings strongly suggest that fostering social connections is an effective way to combat feelings of isolation among students. This could involve university initiatives such as mentorship programs (pairing new students with senior mentors), organized social events, or peer support groups. Even academic measures like encouraging collaborative projects or study groups might help integrate students socially.

To summarize this section, the **presence of social support emerged as a key determinant of lower isolation and potentially better mental health**. In an academic context, it underlines that universities should treat social well-being as part of their mental health strategy. Encouraging students to build networks and engage with the campus community is not just about improving student satisfaction; it is intimately tied to their mental health and success.

Discussion

The results of this data-driven analysis provide a multi-faceted view of mental health challenges among university students, aligning with and adding nuance to existing research in this domain. A central finding was the **strong correlation between depression and anxiety** ($r \approx 0.84$) observed in the student sample. This corroborates the well-documented co-morbidity of these two conditions in young adults: many students simultaneously experience symptoms of both, rather than in isolation. The high correlation suggests that underlying factors (such as chronic stress or genetic predisposition) may be fueling both anxiety and depression in tandem. From a practical standpoint, this implies that interventions need not treat these issues as independent silos; approaches like cognitive-behavioral therapy, stress reduction programs, or mindfulness training might alleviate both anxiety and depressive symptoms concurrently. It also reinforces findings from other studies that have underscored how intertwined these mental health outcomes are in college populations[12]. For instance, if a student's anxiety is reduced (through counseling or peer support), their depression might also improve as a result, given the significant overlap in emotional experience.

Another significant theme in our findings is the role of **gender in mental health differences**. We found female students reporting higher depression variability and higher anxiety/future insecurity on average than male students. This is consistent with broader epidemiological trends: research indicates women are about twice as likely as men to report or be diagnosed with depression in many contexts[8], and often exhibit higher anxiety levels. Social and biological factors may explain this disparity. Women may face different stressors or may be more attuned to emotional distress, whereas men might under-report feelings due to stigma or cultural norms around masculinity[11]. Interestingly, our data showed that male students, while reporting lower median depression, still had considerable variability, indicating that a subset of male students experience significant depression. This resonates with recent hypotheses that suggest male depression may be under-detected due to different manifestation (for example, through anger or substance use rather than self-reported sadness)[13][14]. The discussion of gender differences here points to the necessity of tailored mental health strategies: **female students** might benefit from targeted stress-management and anxiety reduction resources (and addressing issues like imposter syndrome or societal pressures), while **male students** might benefit from efforts to reduce stigma and encourage help-seeking (like campaigns that normalize discussing mental health among men or offering anonymous support channels).

The impact of **academic and financial stressors** on mental health observed in the analysis reinforces a large body of evidence that external pressures significantly shape student well-being. Our finding that academic workload and financial worries correlate with higher depression and anxiety is supported by studies showing academic stress can precipitate depressive symptoms[1] and that financial stress is linked to mental health struggles in students[2]. In discussing these factors, it's important to note that academic and financial stresses often interact. A student overwhelmed by coursework

may also worry about maintaining scholarships (a financial concern), or a student working long hours in a job to support themselves may have less time to study, increasing academic pressure. The interplay of these stresses can compound, leading to a cycle of stress that affects mental health. Our results highlight the need for a **holistic approach** to student support: academic counseling, tutoring, and workload management on one side, and financial aid, budgeting assistance, or emergency funds on the other. This combined strategy can help alleviate the root causes of stress before they manifest as serious anxiety or depression. Additionally, universities could consider structural changes such as course load flexibility or financial planning workshops to proactively reduce these stressors.

The analysis of **coping mechanisms** offers insight into protective factors and student behavior in managing stress. The majority of students engaged in at least one coping strategy, with religious activities and online entertainment being notably common. The popularity of religious coping might reflect that many students derive comfort and meaning from spirituality, which can be a strong source of resilience. In culturally or religiously homogeneous student bodies, this can be especially true. Online entertainment's popularity likely reflects modern students' immediate turn to digital media for relaxation or escape. However, the **effectiveness** of coping strategies varied: engaging in creative pursuits or maintaining social connections was associated with the greatest reduction in perceived academic pressure, whereas doing nothing (no coping) left students with the highest stress. This is an important discussion point: it implies that while students are indeed trying to cope, not all coping is equally beneficial. Passive coping (like aimless internet browsing) might provide temporary distraction but not substantive relief, whereas active coping (expressive or social activities) might tackle stress more robustly. This finding aligns with psychological research that distinguishes between adaptive and maladaptive coping. Adaptive strategies (exercise, problem-solving, seeking social support) are linked to better mental health outcomes, while maladaptive ones (avoidance, excessive screen time, substance use) can sometimes exacerbate problems. Encouraging students to adopt more adaptive coping skills could therefore be a practical recommendation. Universities might incorporate coping skills training into their wellness programs, teaching techniques like time management, relaxation exercises, or creative outlets, and fostering an environment where students can easily engage in these activities (e.g., providing art studios, sports facilities, or social lounges).

One of the clearest messages from our analysis is the importance of **social support**, as evidenced by the strong inverse relationship between social connectedness and isolation. This dovetails with broad psychological literature emphasizing that humans, especially young adults, greatly benefit from a sense of belonging and community[5]. For students, peer relationships can buffer stress through shared experiences and emotional support. Discussion of this point should acknowledge that universities serve not just an academic function but also a social one. The college years are a critical period for social development; students who fail to integrate socially may suffer loneliness that hampers their mental health and academic motivation. Our findings

strongly suggest that enhancing social support systems (through mentorship, residential programs, student organizations, etc.) can be a powerful lever to reduce isolation and thereby improve mental health. This is especially relevant in the context of recent global events like the COVID-19 pandemic, which increased isolation for many students; it underscores the need for proactive measures to connect students with each other and with support networks.

In interpreting the results, it is also important to consider the **limitations** of the data and analysis (which are detailed in the next section). For instance, the demographic skew (more males, more tech-major students) means our discussions primarily apply to similar student groups and may not generalize to all student populations (e.g., liberal arts students or female-majority campuses). Despite these caveats, the overall patterns observed align with fundamental concepts in student mental health research: that multiple domains of a student's life—academic, financial, social, and personal coping capacity—intersect to influence their well-being.

In conclusion of this discussion, the data-driven approach not only confirmed expected relationships (like anxiety co-occurring with depression, and stress being higher under heavier loads) but also highlighted the magnitude of these relationships in a quantifiable way. It provided concrete evidence to support interventions: for example, seeing the numerical strength of the depression-anxiety link or the stark difference in stress levels by coping strategy strengthens the argument for comprehensive, evidence-based policies. The next sections address the study's limitations and then outline specific recommendations for stakeholders and future work, building on the insights gathered here.

Limitations

While this study offers valuable insights, several limitations must be acknowledged in order to interpret the findings appropriately and guide future research:

- **Sample Representativeness:** The dataset may not fully represent the broader student population. The sample was drawn largely from a few universities and was heavily skewed towards male students in data-related majors. Consequently, the findings might not generalize to students from other disciplines, female-dominated cohorts, or different cultural settings. A limited sample size and demographic concentration can introduce bias; for example, the high prevalence of technology majors might be associated with particular stressors (or coping resources) not prevalent elsewhere. Therefore, caution should be used when extrapolating results to all college students.
- **Self-Reported Measures:** All data were based on self-report surveys, which carry inherent biases and potential measurement errors. Students' responses to questions about depression, anxiety, and other sensitive topics depend on their self-awareness and honesty. There is a possibility of under-reporting or over-reporting certain behaviors and feelings due to social desirability bias or

stigma (e.g., male students might under-report depressive feelings[8]). Additionally, the use of subjective scales (if not validated clinical instruments) can limit the precision of the measurements. Misinterpretation of survey questions by respondents is also a risk. These factors could affect the accuracy of correlations observed.

- **Cross-Sectional Design:** The survey data provide a snapshot at one point in time. As a cross-sectional study, it captures associations between variables (correlation, differences between groups) but cannot establish causation or directionality. For example, while we observed that financial stress is associated with higher depression, we cannot be certain from this data whether financial difficulties are causing the depression, or if perhaps students with depression are managing finances poorly, or an unmeasured third factor influences both. Longitudinal data would be needed to infer causal relationships or the temporal sequence of how stressors impact mental health.
- **Variable Limitations:** Some constructs in the survey are broad and may not capture all nuances. For instance, “academic workload” was treated as a single measure, but workload stress can depend on factors like time management skills or specific exam schedules which were not differentiated. Similarly, “doing nothing” as a coping strategy is a catch-all that might include very different scenarios (from truly no action to perhaps inability to find time to cope). The mental health measures (depression, anxiety) were likely based on symptom ratings or short scales, which, while useful for screening, are not equivalent to clinical diagnoses by professionals.
- **Potential Confounding Factors:** There could be other relevant variables not included in the dataset that influence student mental health. For example, personality traits (like resilience or neuroticism), past mental health history, or external events (like the pandemic, political climate, or family issues) were not accounted for. These factors might confound or mediate the observed relationships. Without controlling for them, our analysis might attribute effects to measured variables (e.g., academic pressure) that are partially due to unmeasured ones.

Acknowledging these limitations, the study’s conclusions are presented as trends and associations rather than definitive causal claims. Future studies should attempt to address these limitations by including more diverse and larger samples, employing longitudinal designs, and integrating additional variables for a more comprehensive model of student mental health.

Conclusion

In summary, this data-driven analysis sheds light on critical aspects of mental health among university students, offering evidence-based insights that align with, and add depth to, the current understanding of student well-being. **Key findings** include:

- **Interlinked Mental Health Challenges:** Depression and anxiety were found to be highly inter-correlated, suggesting that they often co-occur in students and may stem from common sources of stress. This highlights the need for integrated mental health interventions that can simultaneously address multiple facets of psychological distress.
- **Influential Stressors:** Academic pressure, financial concerns, and social relationships each emerged as significant correlates of mental health. Academic and financial stress were associated with higher levels of anxiety and depression, reinforcing that the academic environment and economic context are powerful determinants of student well-being[1][2]. Conversely, strong social support corresponded with lower feelings of isolation and better mental health, underlining the protective value of peer and community connections.
- **Gender-Specific Patterns:** The analysis revealed gender differences, with female students reporting generally higher anxiety and more concerns about the future than male students, as well as a higher median level of depression. These differences point to the importance of gender-sensitive approaches in supporting students, ensuring that resources are responsive to the distinct experiences of different student groups.
- **Coping and Resilience:** The majority of students actively engage in coping strategies to manage stress, but the effectiveness of these strategies varies. Active and engaging coping mechanisms (like creative activities and social interaction) were linked to significantly reduced academic stress, whereas lack of engagement in coping was associated with the highest stress. This suggests that teaching and encouraging effective coping skills can be a valuable component of student mental health programs.

The implications of these findings are far-reaching for stakeholders in higher education. For **educators and university administrators**, the results emphasize the need to view student mental health holistically. Academic institutions are not just places of learning but also living environments where stress accumulates and life challenges unfold. Thus, universities should strive to create a supportive atmosphere that mitigates undue academic pressure (through balanced workload policies and academic support), alleviates financial strain (through scholarships, financial aid, and money management guidance), and fosters social connectedness (through mentorship programs, student organizations, and inclusive campus culture). The evidence presented underscores that addressing only one dimension—such as offering counseling services—while important, is insufficient in isolation. A more comprehensive support system is needed, one that concurrently targets academic, personal, and social well-being.

For **policymakers and mental health professionals**, these insights highlight areas for targeted intervention. Policies that fund campus mental health services, require mental health education as part of curricula, or support research into student mental health can all be informed by the patterns identified here. Mental health professionals working with

college students might tailor their screening and treatment plans to consider factors like academic stress and financial anxiety as part of the clinical picture, given their demonstrated importance.

In conclusion, this study contributes to the growing recognition that student mental health is a multifaceted issue requiring collaborative efforts. By leveraging data analytics, we have identified patterns that can inform more responsive strategies to enhance student well-being. The college years are formative and at times fraught with challenges; ensuring that students have the support and resources to navigate these challenges is both an educational priority and a societal investment in the success and health of future generations.

Recommendations

For Academic Institutions: Universities and colleges should implement comprehensive stress management and mental health support programs. This includes providing students with practical tools and resources to cope with academic pressure and life challenges. Workshops on time management, study skills, and relaxation techniques can help students handle academic workloads more effectively. **Counseling services** should be readily accessible, destigmatized, and, if possible, expanded to include group therapy or peer support sessions where students can share experiences. Establishing **peer mentor programs** can connect less experienced students with senior mentors for guidance, both academically and emotionally. Institutions should also encourage a campus culture that promotes work-life balance—facilitating extracurricular activities, creative arts, sports, and social events that allow students to decompress and build supportive friendships. Importantly, universities might consider embedding mental health check-ins or wellness activities into the academic calendar (for example, a “wellness day” with no classes, or mindfulness sessions during exam weeks). By proactively addressing stress through such programs, academic institutions can help prevent the escalation of mental health issues and create a healthier, more productive student body.

For Future Research: Building on the insights from this analysis, future studies should aim to broaden and deepen our understanding of student mental health. Researchers are encouraged to utilize **larger and more diverse samples** across multiple institutions, including community colleges and universities in different regions or countries, to enhance generalizability. There is value in conducting **longitudinal studies** that follow students over time; such studies could illuminate causal pathways (e.g., does persistent financial stress lead to developing depression later, or do certain coping behaviors predict better mental health outcomes down the line?). Additionally, future research should explore the long-term effectiveness of various stress relief activities and mental health interventions. For instance, if universities implement new support programs (like a peer mentorship system or financial literacy training), researchers should assess over several semesters whether these interventions yield measurable improvements in student well-being and academic performance. It would also be beneficial to investigate under-researched factors, such as the role of digital technology use in mental health

(balancing the helpful aspects of online support communities against the harmful aspects of excessive social media), or the impact of global events (such as economic recessions or pandemics) on student mental health trajectories. By expanding the scope of data and employing rigorous methods, future research can continue to inform and refine approaches to supporting student mental health in an ever-changing educational landscape.

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