

Denison Office of Student Life and Hoaglin
Wellness Center

Final Report
National College Health Assessment Analysis

Denison Wellness Analysts



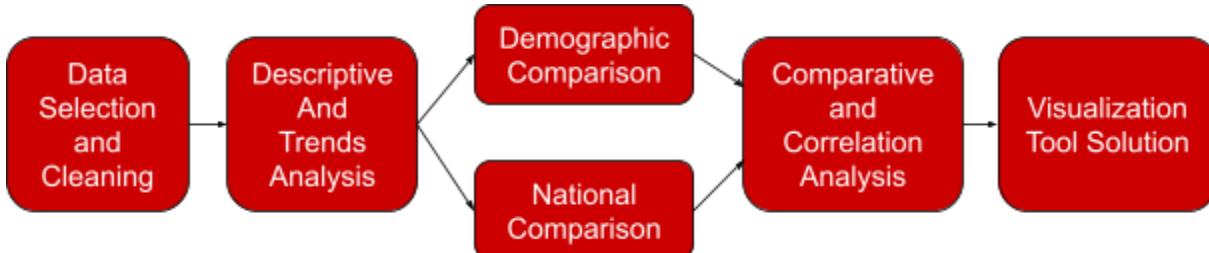
Submitted to: Denison Office of Student
Life and Hoaglin Wellness Center

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A. Executive Summary

Problem Statement: The Denison Wellness Analysts undertook a project from Denison Office of Student Life and Hoaglin Center to examine the National College Health Assessment data to bring insights to improve Denison students' wellness. Our team's first mission is to propose which group of students and wellness areas should be prioritized for improvement. Secondly, we are expected to show correlations among different wellness characteristics and behaviors and help guide our clients to create effective approaches. Finally, our last duty is to provide an effective way for the Student Life and Hoaglin Center staff to visualize and communicate about current and future data.

Summary of methodology:



- To address the complexity of Denison's extensive wellness data, we collaborated with our client to focus on key variables aligned with Denison Wellness Center's priorities. This strategic selection reduced the dataset from 770 to 165 variables. Our cleaned datasets consist of the 2023 NCHA survey data and a trend analysis file spanning 2011-2023.
- We then perform descriptive and trend analysis, laying the groundwork for in-depth analysis.
- We examine which areas Denison Students might be concerned with compared to the national average to know which area we should target. Additionally, we compared the demographic statistics in the survey with the Denison student population to know which student groups were underrepresented to avoid bias.
- For in-depth analysis, we use statistical tests to understand disparities among student groups; and regression to identify how different factors influence each other. Finally, we prepare a powerful, user-friendly visualization tool containing our analysis to help our client effectively communicate on Denison students' wellness.

Key findings and recommendations:

General and Mental Health:

- We found a critical relationship between students' general health and mental health. There is a significant correlation that when psychological distress decreases, general health can be improved. Moreover, to effectively target psychological distress, our client should focus on improving loneliness, suicide risk, hours of sleep during weekday, and resilience as they significantly correlate with lower psychological distress.
- **Recommended Prioritized Groups:** Our client should focus on helping Multiracial, Hispanic, Asian, and Non-Binary as they are reported to have significantly lower general health compared to other student groups in terms of ethnicity and gender.

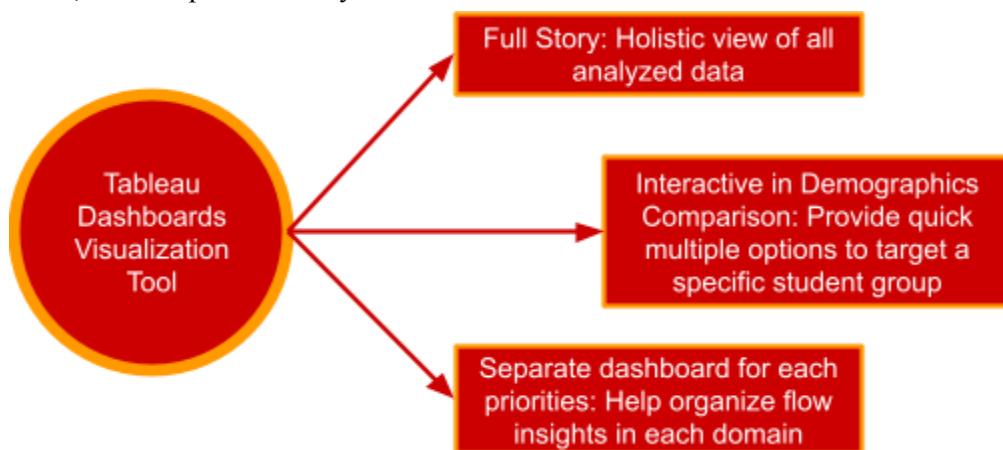
Substance Use:

- To reduce Blood Alcohol Concentration (BAC), we can target improving consent for sexual touching, lower sex partners and brownouts in students based on their significant correlation.
- **Recommended Prioritized Groups:** Varsity Athletes, Greek Life, and Senior students are significantly in concern and should be prioritized in alcohol use: Varsity Athletes exhibit a higher BAC level; Greek Life students display greater levels of moderate/high alcohol risk, and alcohol brownout; Seniors experience the most alcohol brownout compared to other class year students.

Sexual Health:

- To improve on using protections for vaginal sex behavior, we recommend target improving stress impact on academics and unprotected sex while drinking as students who had stress negatively impact their academics and students that report having unprotected sex when drinking are less likely to have used a protective barrier for vaginal sex most of the time or all the time.
- **Recommended Prioritized Groups:** While White, Hispanic, Black and Greek Life Students have vaginal sex more often, they use protections for vaginal sex significantly less than other groups.

Visualization Tools Solution: We chose Tableau interactive dashboards to present a cohesive story, and systematically integrated our project results to deliver meaningful insights. The finalized product encompasses a versatile dashboard for comparing diverse student groups with selectable variable options. Additionally, individual dashboards were dedicated to each wellness priority, featuring descriptive statistics, trends, and comparative analyses.



Limitation and Future Investigation: Our project's analysis of the Denison student well-being data is subject to limitations, including significant data omissions, discrepancies in survey questions across years, and potential underrepresentation of certain student demographics. Additionally, the possibility of identifying individuals due to detailed demographic information poses a privacy concern. We prioritized key variables in this analysis to manage the dataset's size, therefore, future investigations could benefit from addressing those limitations and a comprehensive examination of the remaining variables to glean further insights into student wellness.

B. Technical Progress Report

I. Background/Problem Statement and Scope

The Denison Office of Student Life and the Denison Hoaglin Wellness Center strive to provide support services that help foster student growth and enhance student well-being. They wanted to obtain a holistic view of the health and well-being of Denison students from the 2023 NCHA data. Given the volume of the 2023 NCHA data with over 700 variables and more than 1 million data points, they needed individuals with DA skills who are well-equipped to distill down the data and provide data-driven insights on how student well-being can be improved as a whole at Denison. Furthermore, with the various divisional departments at Denison wanting to see how their students are doing relative to the whole Denison community, they needed individuals with DA skills to find what aspects of their students' lifestyle and wellness they should address. We, the Denison Wellness Analysts, were assigned to perform analysis on students' well-being and lifestyle NCHA data.

In our project, we systematically cleaned NCHA data between 2011 and 2023, conducted summary statistics, analyzed trends over time, compared Denison to the national sample, and performed in-depth analysis to compare student student groups as well as to see relationships between student lifestyle and wellness variables. Through these tasks, we distilled down the 2023 NCHA data and the data from previous years in an efficient manner, and managed to obtain a holistic picture on student wellness at Denison across each of the Denison Wellness Center priorities: overall health, mental health, safety, service use, finance, substance use, academics, physical health behaviors, sexual health, and healthy relationships.

However, before performing any data cleaning and analysis for our project, there were multiple assumptions that we needed to keep in mind:

1. We have significant amounts of missing or erroneous data in our NCHA datasets.
2. The survey questions from the 2011, 2015, and 2019 NCHA data are significantly different from the 2023 data.
3. Certain groups of students are underrepresented in our data.
4. There is enough demographic information in the NCHA data to single out individuals.

II. Personnel

We, the Denison Wellness Analysts team, had three members who each made diverse contributions towards the completion of this project. Every member participated equally in:

- Filtering variables from 2011, 2015, 2019, and 2023 NCHA data
- Summary statistics, trends analysis, national comparison, and in-depth analysis
- Demographic comparison to see if any groups were underrepresented in the 2023 NCHA data

We divided our work based on priorities so that members from each background can understand the topic and perform analysis efficiently. The background and contributions of each team member are outlined in *Table 1* below.

Team member	Background	Priority
Hannah Nguyen	Data Analytics major with a concentration in Psychology	Overall health, mental health, safety, and service use
Ichhit Joshi	Computer Science and Data Analytics major with a concentration in Economics	Substance use, finance, and academics
John Platt	Data Analytics major with a concentration in Health	Physical health, sexual health, and healthy relationships

Table 1. Background and contributions of each team member of our project

We also give credit to our clients including the Denison Wellness Center Vice President, Jack Wheeler, and the Denison Office of Student Life Director: Katherine Snyder, who established their expectations on how we should accomplish each stage of our project.

III. Ethical Considerations

In concluding our project, we diligently adhered to a set of ethical considerations that reflected our commitment to student privacy and well-being. Emphasizing data anonymity, we refrained from data manipulations that could compromise individual privacy, presenting findings exclusively in aggregate form. Strict control over authorized access was maintained to safeguard sensitive data, limited solely to team members. Following the project's conclusion, a thorough data deletion protocol was implemented, eradicating any residual data from personal devices. Our commitment to integrity and honesty in data analysis ensured unbiased and genuine insights in our final report.

IV. Literature Review

We are well aware of the different challenges Denison students face today related to time management, equity, and financial status. For instance, research shows that if students can't afford enough money to eat a balanced diet, they develop food insecurity, which impairs mental health and academic performance (Ahmad et al., 2023). Moreover, students who get sufficient sleep are shown to have improved emotional

regulation and are better equipped to handle cognitive tasks (Dewald et al., 2010). According to Liu et al. (2023), college students from lower socioeconomic backgrounds are found to be 109.1% more likely to suffer from anxiety disorders. Ultimately, these initial researchers reveal the importance of taking a holistic view of relationships among mental health, physical health, college environment, and social factors.

V. Methodology

Our Process:

- Weekly Meetings: Regular team meetings facilitated progress discussions, task planning, and resource allocation. These sessions served as decision-making platforms, guiding task delegation and ensuring a unified approach to each project step.
- GitHub for Technical Collaboration: We used GitHub as our primary collaboration platform for code sharing, version control, and project management. Our private GitHub repository comprises a main branch containing the core code constituting our final product. Additionally, individual feature branches were used to work on specific features. ([See Appendix 3](#))
- Coding and Analysis Tools: Our toolset included Visual Studio Code and Python for coding and data wrangling, along with R and RStudio for constructing linear and logistic regression models. ([See Appendix 4](#))
- Dashboard and Visualization Tool: Tableau was utilized to create an interactive visual narrative comprising interconnected dashboards, illustrating Denison's holistic wellness story.
- Report Writing: Google Drive and Google Docs served as the collaborative hub for sharing progress reports, notes, ideas, and visual findings. The organized structure of Google Drive facilitated documentation and ensured easy access for all team members.
- Handling Missing Values: To maintain accuracy in findings, we calculated denominators representing the total number of students by excluding records with missing values.

Our project started with the development of a comprehensive data strategy that covers the entire data lifecycle, from initial dataset access to post-analysis data management.

1. Data Selection and Simplification

To address the complexity of Denison NCHA dataset, we collaborated with our client to focus on key variables aligned with Denison Wellness Center's priorities: Demographic, Overall Health, Mental Health, Safety, Service Use, Finance, Substance Use, Academics, Physical Health, Sexual Health, Healthy Relationships. This strategic selection reduced the dataset from 770 to 164 variables. These variables were chosen to address research questions, exploring complex relationships in student wellness.

Collaborative validation ensured comprehensive and objective-aligned choices, further refined by client input from Jack Wheeler for seamless alignment with project goals.

2. Dataset Cleaning

a) 2023 Dataset

With such a huge dataset, data cleaning was a pivotal phase that included several critical tasks:

Column Labeling: The original dataset's column names were based on the question numbers in the survey and uninformative. To fix this, we renamed the columns with clear and concise labels that provided more context.

Example: For instance, column N3Q72, previously lacking meaningful information, was renamed to "YearInSchool" to reflect the survey question, "What is your year in school?"

Value Encoding: The dataset featured numeric values that required encoding into human-readable labels, making the data more accessible for analysis and interpretation.

Example: We transformed numbered values (e.g., 1, 2, 3) into descriptive labels (e.g., "Freshman," "Sophomore," "Junior").

Race and International Student columns into Ethnicity Column: We condensed 9 individual binary-encoded race-related columns into a single "Race" column. We also applied logic to ensure that individuals who selected multiple races were appropriately categorized into "Multiracial". Then, we introduced an "Ethnicity" column, which combines and replaces the "Race" and "International Student" columns. Domestic students' races are now categorized under "Ethnicity," while international students are uniformly represented as "International" under "Ethnicity".

Data Type Standardization and Missing Values: To ensure data consistency, we standardized data types by assigning proper data types, such as floats for variables like LastNumDrinks, LastDrinkingDuration, BAC, and integers/strings for other variables. Ensuring data completeness, we methodically identified and documented missing values for each column in our [Data Dictionary](#).

b) Trends Dataset

We cleaned the 2011, 2015, and 2019 NCHA datasets by first selecting columns that matched exactly for all four years. We also encoded values in each column to align with the corresponding year's survey responses. Subsequently, we merged data from 2011, 2015, 2019, and 2023 into one cohesive dataset named 'NCHA Trends Clean.csv'. This dataset includes a year column for year-wise analysis and contains only the common columns shared across all four years (60 variables in total).

c) Final Datasets Overview

Upon completing the data preparation phase, we successfully exported 2 central datasets:

1. **NCHA Clean 2023:** This dataset contains the 2023 NCHA survey data with **552 rows and 164 columns**. It serves as the foundation for our demographic and national comparisons, as well as the in-depth analysis task.
2. **NCHA Trends Clean:** This dataset focuses on data from 2011 to 2023, emphasizing common columns across all four years. This dataset serves as the foundation for our trend analysis.

Data Dictionary: This resource outlines column details, data types, possible values, and the count of missing values in each column of our two main datasets. The data dictionary acts as a crucial reference for our analysis.

3. 2023 Initial Analysis

In the initial analysis phase, we conducted a comprehensive exploration of the NCHA dataset. We generated summary statistics for key variables aligned with the Wellness Center's priorities. This entailed calculating means and frequencies, focusing on variables that directly addressed the Wellness priorities. These statistics serve as a foundational reference for our subsequent analyses.

4. Trends Analysis

As part of an extension of the 2019 Wellness Center initiatives at Denison University, we explored the evolving landscape of wellness and health behaviors among students from 2011 to 2023 using line plots to visualize the change in percentage of students. This analysis aimed to determine whether students' health and wellness have been improving, remaining stable, or potentially showing signs of concerning deterioration. This enables us to identify areas where continued efforts and resources may be required to support students' well-being effectively.

5. Demographics 2023 Comparison

In this section, our primary goal was to recognize if certain student groups were inadequately represented, allowing us to address potential bias in our analysis. To achieve this, we compared demographic data from the 2023 NCHA survey with information from Denison's FactBook for the 2022-2023 academic year using 1-sample z-tests (Appendix 2A). We assessed Gender, Ethnicity, Greek Life participation, and Varsity Athletics involvement to identify underrepresented groups in our survey. Recognizing the significance of underrepresentation, we approach the analysis of such groups with caution, ensuring fair and accurate conclusions for all Denison students.

6. National Report 2023 Comparison

In our National Report 2023 Comparison, we took a close look at how Denison's wellness data compares to that of other colleges across the country. We examined percentage values from the [NCHA Executive Summary](#), which represents a wide range of universities and colleges. Our approach involved selecting specific questions for comparison, focusing on those variables with the most pronounced differences in percentages, and assessing statistical significance through 1-sample z-tests ([Appendix 2A](#)). This careful analysis allowed us to pinpoint areas where Denison excels in comparison to the national sample, as well as those where there is room for improvement.

7. In-Depth Analysis

a) Comparative Analysis

We compared student groups on various Wellness Center priorities, including different races, genders, meditators, first-generation students, Greek life students, athletes, international students, and spiritual students. We used hypothesis testing to assess the significance of differences using 2-sample z-tests for percentages and 2-sample t-tests ([Appendix 2B](#)) for averages between student groups. We also used chi-squared tests of independence to assess whether the distribution of categorical variables differed significantly across multiple groups, examining potential relationships among categorical variables across student groups.

b) Correlation Analysis

We strategically identified key variables based on preceding analyses that called for in-depth examination. By using linear and logistic regressions, we found and assessed the strength of relationships among the identified variables, observing both the influencing factors and their extents. Our model excludes null values and considers only statistically significant factors ($p < 0.05$). This analysis offers actionable insights, pinpointing priority factors for improvement, while also identifying the strongest positive or negative correlations for targeted interventions.

8. Tableau Dashboards

Our primary focus was on crafting a customized, interactive visualization tool that aligned with client specifications. This involved collaborating with our clients to finalize the choice of visualization tool and subsequently creating dashboards using Tableau. These resulting Tableau dashboards, presented as a cohesive story, systematically integrated our project results to deliver meaningful, data-driven insights aimed at improving student wellness at Denison. The finalized product encompasses a versatile dashboard for comparing diverse student groups with selectable variable options. Additionally, individual dashboards were dedicated to each wellness priority, featuring descriptive statistics, trends analyses.

VI. Findings

1. Demographics and Sample Characteristics

Denison's ACHA-NCHA III Spring 2023 survey consisted of **552** respondents.
The response rate was **22.85%**.

Sex

Female: 64.31%
Male¹: 29.71%
Non-Binary: 4.35%
Missing: 1.63%

Year in School

Freshman: 35.04%
Sophomore: 25.91%
Senior: 22.45%
Junior: 16.06%
Fifth Year: 0.55%

Member of a social fraternity or sorority:
29.33%

Member of a varsity team¹: 9.81%

First generation students (*Proportion of students for whom no parent/guardian have completed a bachelor's degree*): 18.5%

Ethnicity

White: 59.96%
International: 19.56%
Multiracial: 7.68%
Asian: 4.94%
Black¹: 4.02%
Middle Eastern/North African (MENA) or Arab Origin: 3.29%
Hispanic¹: 0.37%
Identity Not Listed Above: 0.18%

Student who work for pay: 64.05%

Participated in meditation or meditative activities: 27.19%

Participated in spiritual or religious activities: 18.00%

¹ Means underrepresented in the sample compared to Denison's actual proportion

2. Overall

Descriptive Statistics:

- Belonging: 68.06% of students stated “Strongly Agree” or “Agree” with feeling belonged.
- Top Students’ Activities: The top 5 activities of Denison students are attending class (11-15 hours per week), studying (6-10 hours per week), socializing (6-10 hours per week), using social media (1-5 hours per week), and physical exercise (1-5 hours per week), indicating a balanced lifestyle.

Notable Trend:

From 2011 to 2023, we observed a consistent downtrend in students’ general health, with 68.92% of students stating “Excellent” or “Very good” in 2011 dropping to only 47.44% of them in 2023. (See Figure 1)

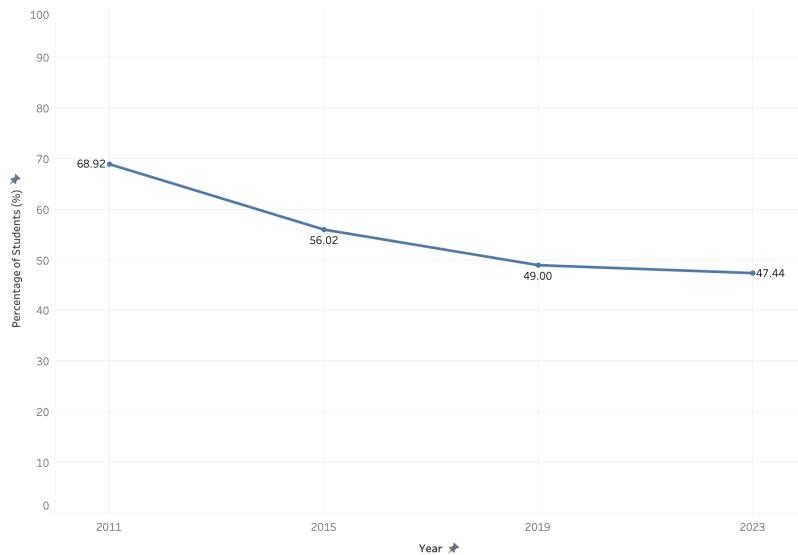


Figure 1. Percentage of Students Stating “Excellent” or “Very Good” General Health (2011-2023)

Correlation Analysis:

General health: Given the concern in general health downtrend, we conducted logistic regression to investigate more on general health and belonging. We observed a significant correlation between psychological distress and general health, $z = -2.301$, $p = .02$. The estimate is -.18, indicating that there is a negative relationship, when psychological distress decreases by one unit, general health will increase by 18%.

3. Mental Health

Descriptive Statistics:

- Loneliness: 49.09% of students reported to be “positive for loneliness”.
- Psychological Distress: 20.59% of students stated having serious psychological distress.

- Suicide Risk: 26.19% of students reported to have suicide risk.
- Consider Seeking Psychologically Professional Help: 81.9% of students said they would consider seeking psychologically professional help in the future if needed.
- Self-harm: Self-harm is not a common behavior in Denison students with 85.77% stating they never self-harm in the last 12 months. However, 12.23% stated they have done this behavior once or twice, and 1.28% of them did it monthly.
- Top 5 Stressors: Academics stand out as the primary stressor for students, with over 20% indicating high stress. Procrastination and personal appearance closely follow as stress sources. Finances and intimate relationships are the top 4 and 5 contributors to student stress (11.05%).

Notable Trend:

From 2011 to 2023, the Black student population displayed a remarkable uptrend on seeking psychological professional help, with their consideration levels rising from 64.71% in 2011 to 86.36% in 2023. Conversely, Asian students, who initially led in 2011 with 81.82% of students, experienced a notable decline to 62.96% by 2023. (See *Table 2*)

Ethnicity / Year	2011 (%)	2015 (%)	2019 (%)	2023 (%)
Black	64.71	70	62.5	86.36
White	76.04	83.2	87.8	84.15
Multiracial	70.59	67.44	83.67	83.33
International	70	86.15	75.34	80.37
Hispanic	43.75	76.47	73.17	72.22
Asian	81.82	75	74.07	62.96

Table 2. Descriptive Statistics of Students Consider Seeking Psychological Professional Help

Note. The green box indicates a noticeable uptrend, while the red box represents a noticeable downtrend

Correlation Analysis:

Psychological distress: As we have found a relationship between psychological distress and general health above, we continue to dive deeper in which factors can influence psychological distress.

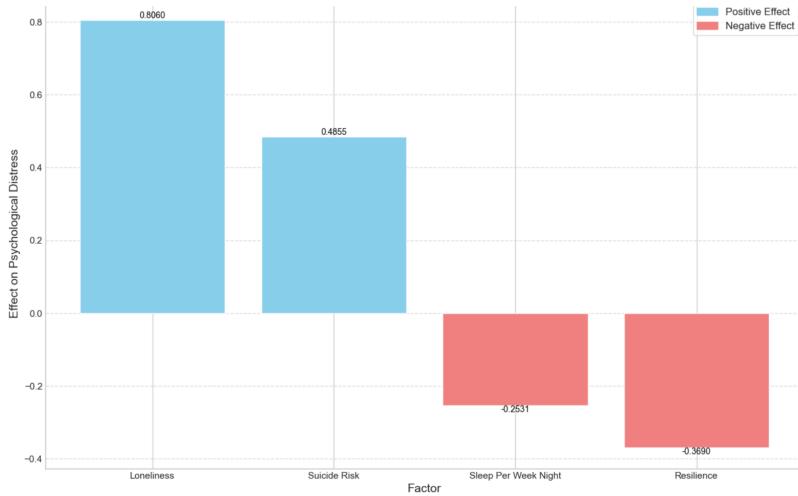


Figure 2. Factors Affecting Psychological Distress

[See Model \(Appendix 7A\)](#)

Illustrated in *Figure 2*, Loneliness and suicide risk appears to have strong and moderate positive relationship, respectively; while number of sleep hours per week day night and resilience have weak negative relationship with psychological distress. Therefore, when loneliness and suicide risk increase by one unit, psychological distress might increase by 80% and 48.5% respectively. On the other hand, when sleep per week night increases by one hour and resilience increases by one unit, psychological distress is predicted to decrease by 25.3% and 36.9% respectively.

4. Safety

Notable Trend:

Overall, the majority of students feel very safe on campus during the day, while only around half of them feel very safe at night. There is also a downward trend of feeling safe on campus both day and night, where the percentage of students stating “Very Safe” at night decreased noticeably from 57.83% in 2011 to 41.64% in 2023. (See *Figure 3*)

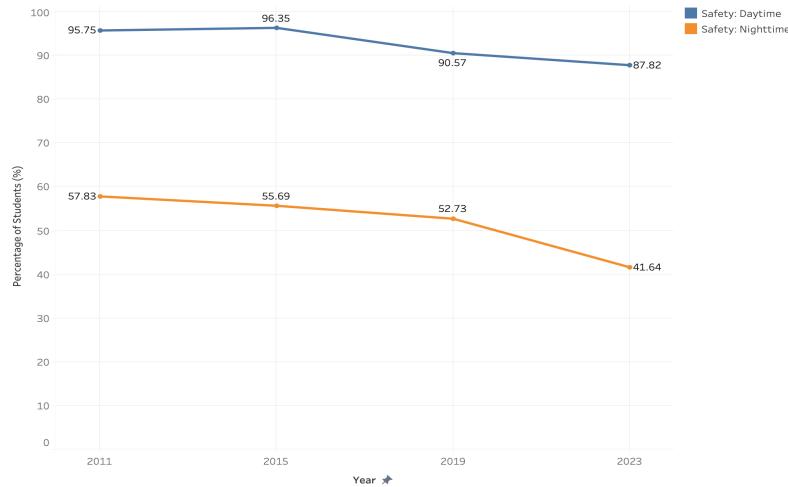


Figure 3. Percentage of Students Stating “Very Safe” Day and Night on Campus (2011-2023)

National Comparison:

A significantly higher percentage of Denison students feel very safe on campus, both during the day, $z = 8.53$, $p < .001$ (DU: 87.8% Nat: 71.3%) and at night, $z = 9.21$, $p < .001$ (DU: 41.6% Nat: 24.1%), compared to the national average.

5. Service Use

Descriptive Statistics:

There seem to be slightly more Denison students utilizing campus psychological services (57.66%) than medical services (52.01%).

National Comparison:

Denison students are more likely to use campus psychological (DU: 57.66% Nat: 40.7%) and medical services (DU: 52.01% Nat: 32.4%) compared to the national average.

6. Finance

Descriptive Statistics:

- Paid Work Engagement: 35.95% of students don't engage in paid work. For working students, the majority (28.47%) commit to 6-10 hours per week.
- Food Security: 59.23% of students reported high or marginal food security. However, 25.96% faced low food security, and 14.81% experienced very low food security.
- Financial Challenges: 40.59% of students reported having faced challenges related to their finances within the last 12 months.

National Comparison:

Regarding food security, Denison shines, with only 40.77% students facing food security issues compared to the higher national average of 49.5%. ($z = -4.07, p < 0.001$)

Trends Analysis: Financial Challenges

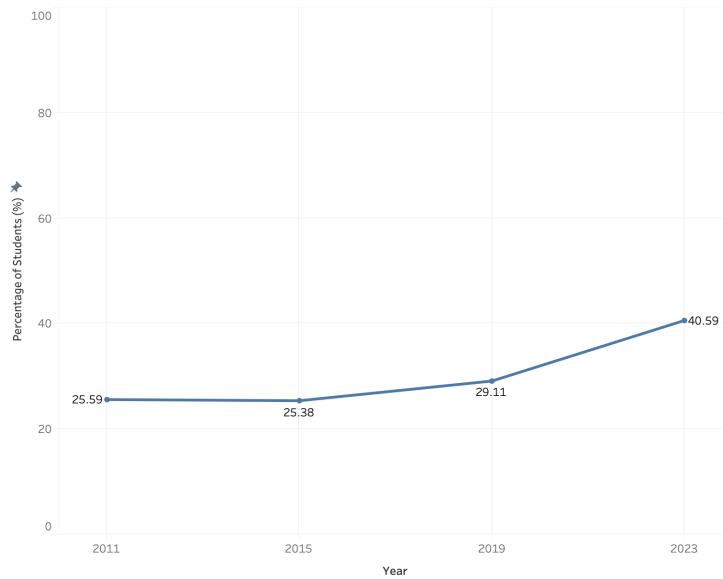


Figure 4. Percentage of Students Facing Financial Challenges (2011-2023)

Our trends analysis (*Figure 4*) revealed – the percentage of students facing financial challenges rose from 25.59% in 2011 to 40.59% in 2023, pinpointing financial challenges as a critical concern. Notably, Asian students observed an increase from 27.27% in 2011 to 46.15% in 2023, while Black students faced a surge from 36.36% to 71.43% during the same period. International students encountered a substantial rise from 28.81% to 61.68% between 2011 and 2023, indicating a pronounced financial difficulty rate compared to domestic students at 35.45% in 2023 (See *Table 3*).

Ethnicity / Year	2011 (%)	2015 (%)	2019 (%)	2023 (%)
Black	36.36	32.50	52.50	71.43
White	22.00	19.92	23.03	31.8
Multiracial	42.42	33.33	42.86	30.95
International	28.81	21.54	31.51	61.68
Hispanic	50.00	58.82	58.54	61.11
Asian	27.27	43.75	23.08	46.15

Table 3. Descriptive Statistics of Students Facing Financial Challenges Over Time by Ethnicity

Note. The green box indicates a noticeable uptrend, while the red box represents a noticeable downtrend

National Comparison:

Despite these challenges, Denison's financial challenge rate of 40.59% remains lower than the national average of 50.8% ($z = -4.76, p < 0.001$).

Correlation Analysis: Factors Influencing Financial Challenges

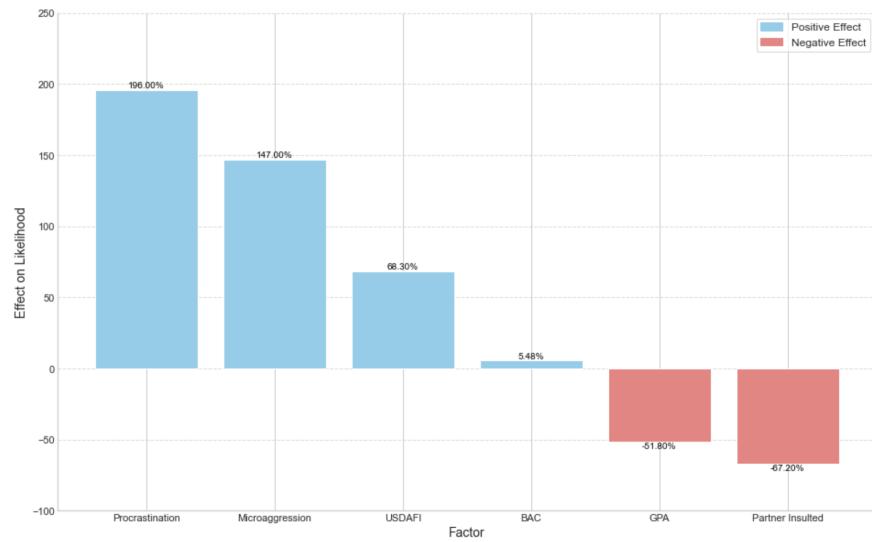


Figure 5. Factors Affecting Financial Challenges for Students

[See Model \(Appendix 6A\)](#)

Students reporting the impact of procrastination faced a 196% increased likelihood of financial challenges. Similarly, students reporting the impact of microaggressions were 147% more likely to face financial challenges. Higher USDAFI scores, indicating lower food security, correlated with a 68.3% increased likelihood of financial challenges. Additionally, a 0.01% increase in BAC was associated with a 5.48% higher likelihood of financial challenges. Conversely, achieving one letter grade higher in GPA correlated with a 51.8% lower likelihood of financial difficulties. Notably, students reporting their partner insulting them were 67.2% less likely to face financial challenges.

7. Substance Use

Descriptive Statistics:

- Drinking Habits: Among alcohol consumers, the average drink count during their last social session was approximately 4, lasting an average drinking duration of 3 hours.

- BAC: The Average Blood Alcohol Concentration (BAC) among consumers indicated moderate alcohol intoxication (approximately 0.065626), pointing towards responsible drinking.
- Alcohol-related experiences: The top five include brownout (37.03%), regrettable actions (29.14%), unprotected sex (16.59%), blackout (16.34%), and self-injury (13.27%).

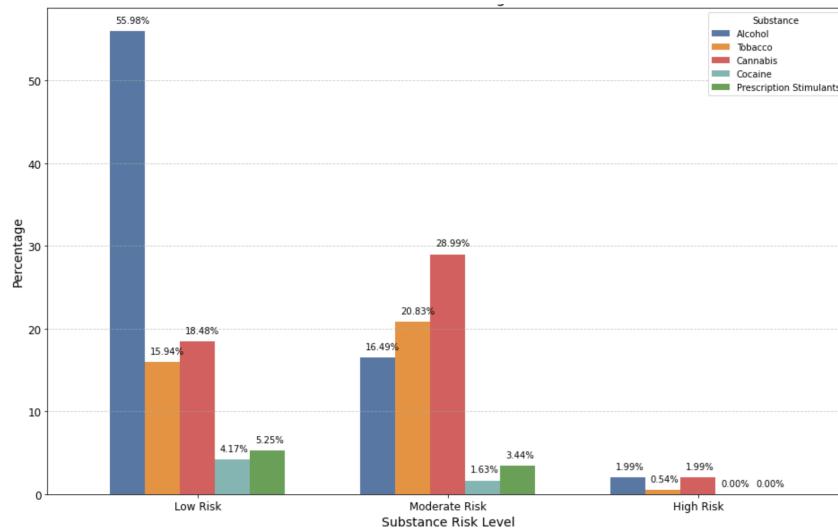


Figure 6. Substance Use Risk Levels Among Denison Students

Figure 6 illustrates that cannabis stands out among the five substances as a significant concern, with 28.99% of students in the "moderate risk" category, while 1.99% are at "high risk". While cannabis clearly exhibits higher percentages in the moderate and high-risk categories, it's worth noting that tobacco and alcohol closely follow. These three substances seem to be the primary areas of concern regarding substance use on the campus.

Trends Analysis:

In 2023, Denison's drinking behavior showed positive changes, lower percentages are observed in categories such as alcohol-related regrettable actions, blackout, unprotected sex, and self-injury.

National Comparison:

- Higher percentage of students at moderate risk for cannabis use, $z = 4.97, p < .001$ (DU: 28.99% Nat: 20.4%) and prescription stimulant use, $z = 3.71, p < .001$ (DU: 3.44% Nat: 1.5%).
- For brownout after alcohol use, Denison reports a higher percentage, $z = 6.37, p < .001$ (DU: 37.03% Nat: 24.1%).
- For regrettable actions after alcohol use, Denison reports a higher percentage, $z = 4.16, p < .001$ (DU: 29.14% Nat: 21.1%).

- In contrast, Denison students exhibit responsible behavior in terms of driving under the influence, $z = -2.53$, $p = 0.011$ (DU: 6.72% Nat: 11.7%), with lower percentages than the national averages.

Correlation Analysis: Factors Influencing Blood Alcohol Concentration

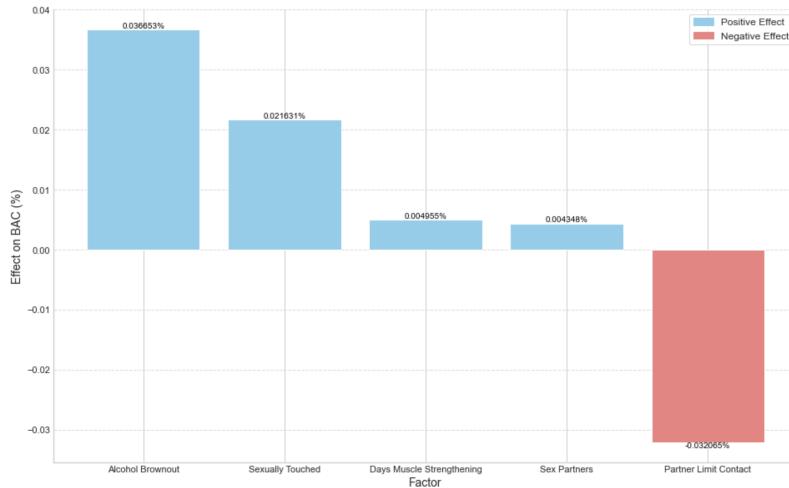


Figure 7. Factors Affecting Blood Alcohol Concentration

[See Model \(Appendix 7B\)](#)

Experiencing a brownout correlates with a 0.036653% increase in BAC, while unwanted sexual touching is linked to a 0.021631% BAC increase. Additionally, each additional day of muscle-strengthening activity is associated with a 0.004955% BAC increase, and an extra sex partner in the last 12 months correlates with a 0.004348% BAC increase. Notably, having a partner who often insisted on knowing your whereabouts or tried to limit your contact with family or friends is associated with a 0.032065% decrease in BAC.

8. Academics

Descriptive Statistics:

- Top 5 behavioral factors causing negative academic impacts: Procrastination (67.97%), Faculty (64.10%), Bereavement (42.66%), Bullying (38.30%), and Intimate Relationships (34.38%).
- Top 5 environmental factors causing negative academic impacts: Stress (47.24%), Anxiety (38.48%) , Sleep Difficulties (29.96%), Depression (27.41%), and COVID-19 (18.75%).
- On average, students have a GPA of 3.53.

Trends Analysis:

The analysis of behavioral factors' impact on academic performance over time reveals a significant upward trend in 2023, with a notably sharp increase in the percentage of students reporting such impacts (See *Figure 8*).

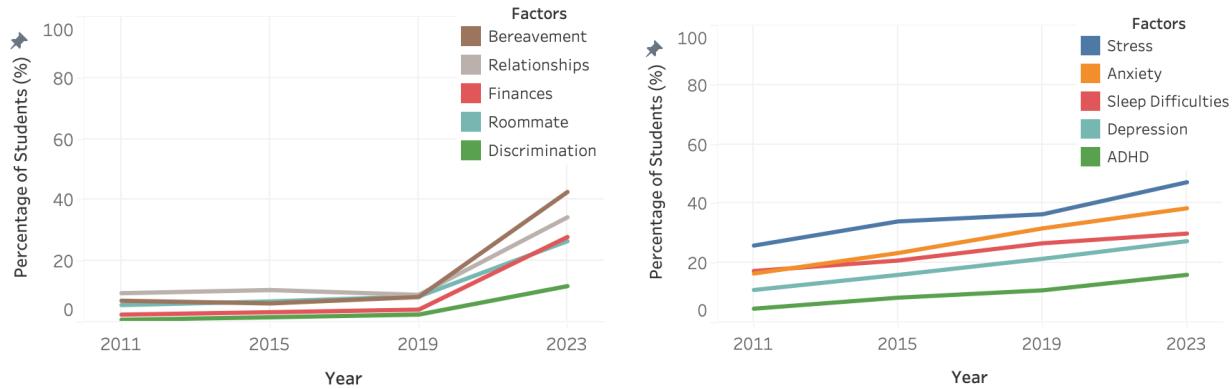


Figure 8. Percentage of Students Impacted by Behavioral (Left) and Environmental (Right) Factors on Academic Performance (2011-2023)

The analysis of environmental factors' impact on academic performance demonstrates a similar concerning trend, with a notable increase in 2023. The increasing percentages in 2023 indicate a potential worsening of these impacts, emphasizing the importance of addressing the mental health and well-being of students to mitigate these academic challenges.

National Comparison:

Denison reported 16.67% for microaggressions, $z = 17.93, p < .001$ (compared to 3.1% nationally), 13.41% for sexual harassment, $z = 14.76, p < .001$ (versus 2.8% nationally), and 11.78% for discrimination, $z = 11.86, p < .001$ (compared to 3.0% nationally). Due to alarming numbers for microaggressions, stress, and procrastination, these variables were chosen for in-depth observation.

Correlation Analysis: Factors Influencing Academic Impact

1. Microaggressions Impact on Academics:

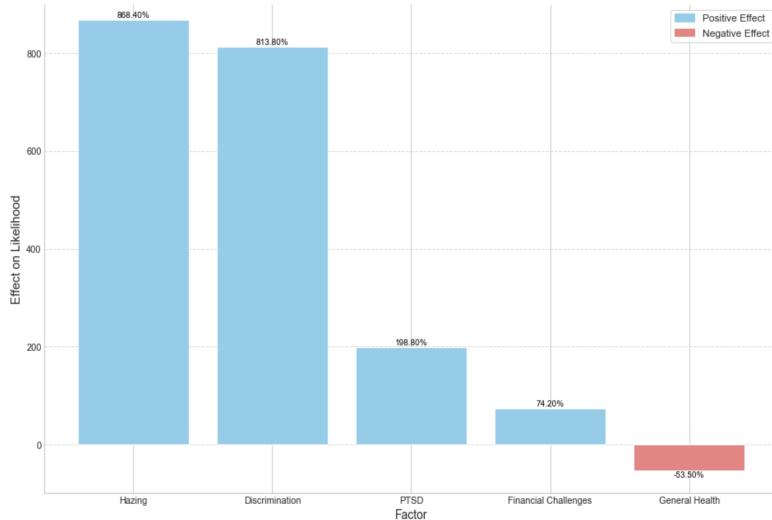


Figure 9. Factors Affecting Microaggressions Impact on Academics

[See Model \(Appendix 6B\)](#)

Experiencing the impact of hazing on academics increases the likelihood of encountering negative academic microaggressions by 868.4%. Similarly, students facing discrimination's impact on academics are 813.8% more likely to experience negative academic microaggressions. Those reporting PTSD's impact on academics face a 198.8% increased likelihood of negative academic microaggressions. Financial challenges in the last 12 months result in a 74.2% higher likelihood of experiencing microaggressions negatively affecting academics. Notably, students rating their overall health as Very Good or Excellent demonstrate a 53.5% lower likelihood of facing microaggressions impacting academic well-being compared to those rating their health as Poor, Fair, or Good.

2. Procrastination Impact on Academics:

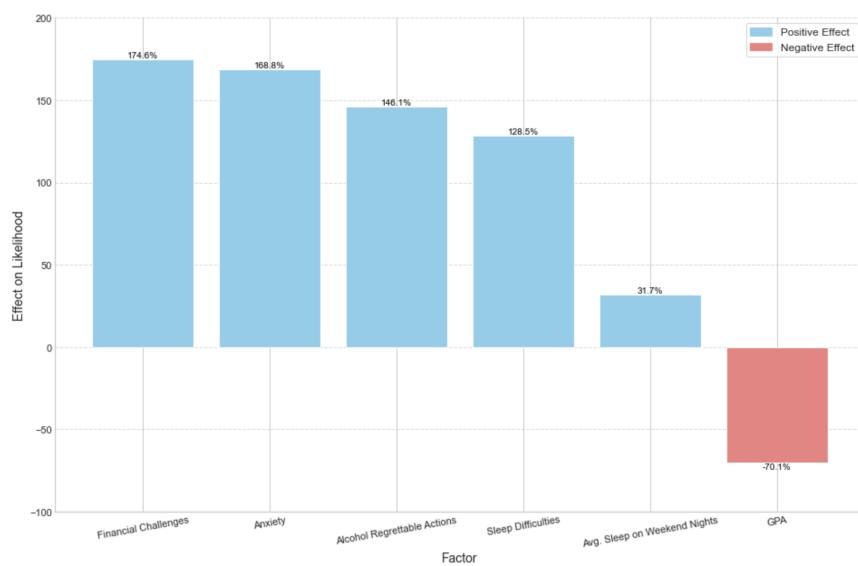


Figure 10. Factors Affecting Procrastination Impact on Academics

[See Model \(Appendix 6C\)](#)

Experiencing financial challenges in the last 12 months is linked to a 174.6% higher likelihood of facing negative academic impacts from procrastination. Similarly, reporting anxiety's impact on academics is associated with a 168.8% increased likelihood of experiencing procrastination negatively impacting academics. Individuals reporting regrettable actions related to alcohol face a 146.1% higher likelihood of negative academic impacts from procrastination. Additionally, those reporting sleep difficulties' impact on academics exhibit a 128.5% increased likelihood of facing procrastination negatively impacting academics. Interestingly, one extra hour of weekend night sleep is associated with a 31.7% higher likelihood of experiencing procrastination negatively impacting academics. Notably, each increase of one letter grade is linked to a 70.1% decrease in the likelihood of facing negative academic impacts from procrastination.

Correlation Analysis: Factors Influencing GPA

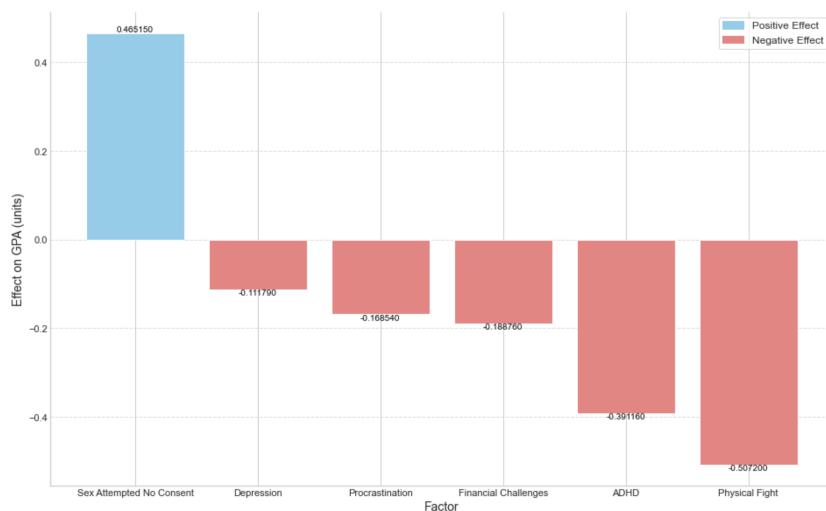


Figure 11. Factors Affecting GPA (Grade Point Average)

[See Model \(Appendix 6D\)](#)

Having experienced sexual attempts without consent is correlated with an increase in GPA by 0.46515 units. Conversely, being involved in a physical fight is associated with a decrease in GPA by 0.50720 units. Additionally, facing the impact of ADHD on academics is linked to a decrease in GPA by 0.39116 units. Experiencing financial challenges is associated with a decrease in GPA by 0.18876 units. Furthermore, the impact of procrastination on academics is correlated with a decrease in GPA by 0.16854 units. Similarly, experiencing the impact of depression on academics is associated with a decrease in GPA by 0.11179 units.

9. Physical Health

Summary Statistics: Physical Health Behaviors, Sleep, and Nutrition

- Meeting physical activity guidelines: Approximately 53% of the students reported meeting the weekly guidelines for aerobic physical activity and muscle strengthening ([see Appendix F1](#)).
- Average sleep on weeknights and weekends: When comparing sleep between weeknights and weekends for Denison students, we found that students in the 2023 NCHA survey averaged 7.77 hours of sleep per night on weekend nights, but only 6.77 hours of sleep on weeknights.
- Fruit serving distribution: 71% of Denison students in our 2023 NCHA data stated they had 1-2 fruit servings ([see Appendix F1](#)) over 7 days on average. 16% of students in our data stated they had 0 servings of fruit on average in the last 7 days. 11% stated they had 3-4 servings on average in the last 7 days.
- Vegetable serving distribution: 62% of Denison students in our 2023 NCHA data stated they had 1-2 vegetable servings ([see Appendix F1](#)) over 7 days on average . 23% of the students in our data stated they had 3-4 servings on average over 7 days. 12% of students stated having 0 servings on average over 7 days.

Trends Analysis: BMI

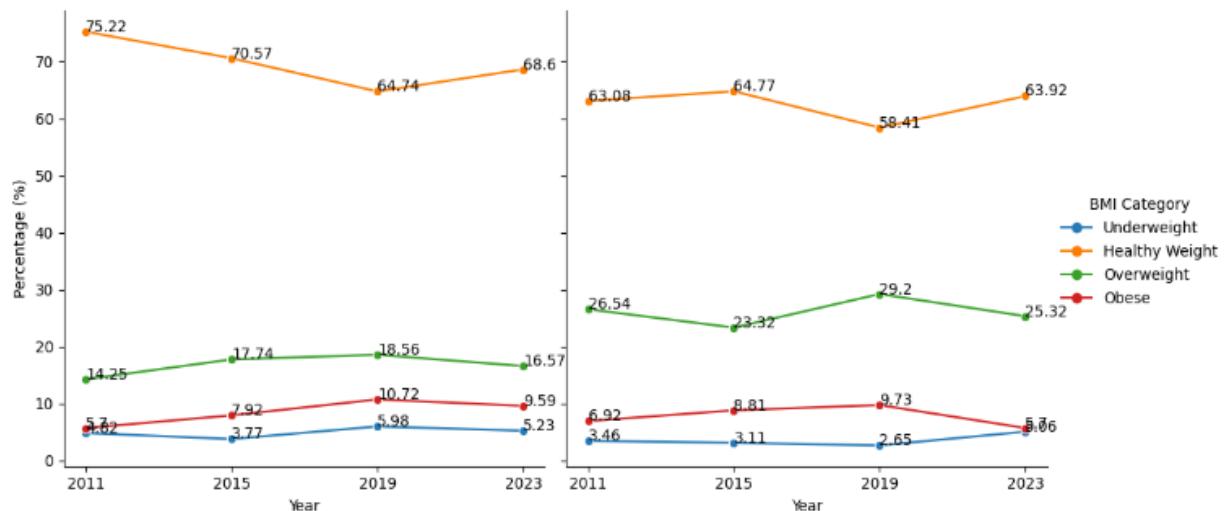


Figure 12: BMI distribution of females (left) and males (right) between 2011 and 2023

According to *Figure 12*, from 2011 to 2023, we saw the reported body composition of Denison females for BMI get worse, as the percentage of females that are a healthy weight declined from 75.22% in 2011 to 68.6% by 2023 with the most noticeable dip in 2019 (64.74%). Furthermore, the proportion of females who are obese increased from just 5.2% in 2011 to 9.59% in 2023.

However, with males, BMI proportions did not change much with the percentage of males that reported being healthy weight and overweight following a zig-zag pattern over the years. Overall, we conclude that Denison females saw declines in body composition between 2011 and 2023, while Denison males saw no change in body composition between those same years.

National Comparison: Sleep and Physical Health Behaviors

Average sleep on weeknights: As of 2023, Denison students had a higher percentage that reported averaging 7 to 9 hours of sleep on weeknights (DU: 59.96% Nat: 55.8%) compared to the national sample, $z=1.96$, $p=0.049$.

BMI: As of 2023, Denison students have a higher percentage being a healthy weight (DU: 66.8% Nat: 56.7%), $z=4.668$, $p=<.001$

Meeting Physical Activity Guidelines: As of 2023, Denison students have a higher percentage that reported meeting physical activity guidelines (DU: 52.8% Nat: 43.3%), $z=4.474$, $p=<.001$

Correlation Analysis: Factors Influencing Sleep on Weeknights

For each one point in increase in loneliness score (3-9 with 6-9 indicating positive for loneliness and 3-5 indicating negative for loneliness), Denison students are expected to have reported getting .068 less hours of sleep on average during weeknights over the last 2 weeks. Denison students that reported having sleep difficulties negatively impact their academics are expected to have reported getting .578 less hours of sleep on average during weeknights over the last 2 weeks ([see Appendix 7C](#)).

Correlation Analysis: Factors Influencing Meeting Physical Activity Guidelines

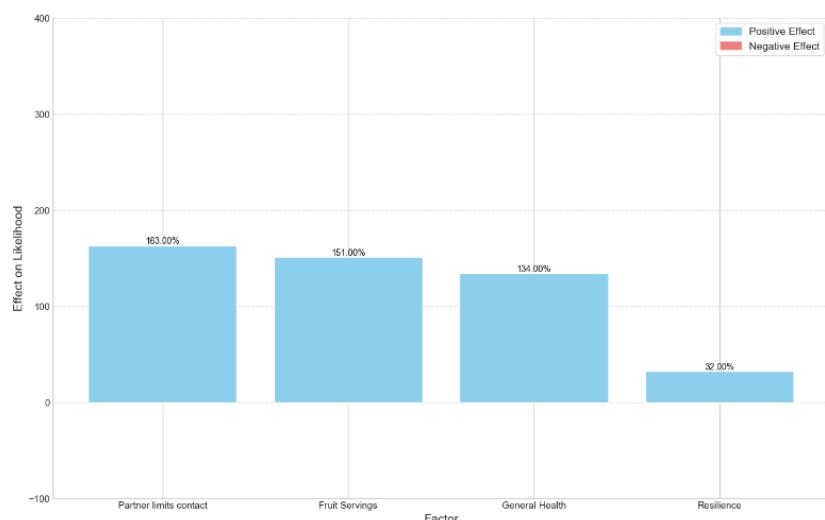


Figure 13. Factors Affecting the Chance of Meeting Physical Activity Guidelines

[See Model \(Appendix 6E\)](#)

Students that reported having a partner that tried to limit his/her contact with family/friends are 163% more likely to meet physical activity guidelines. Students that reported eating at least 1-2 servings of fruit over the last 7 days are 151% more likely to meet physical activity guidelines. Students that reported having very good or excellent general health are 134% more likely to meet physical activity guidelines. For each one point increase in resilience (score of 0-8 with higher scores meaning higher levels of resilience), students are 32% more likely to meet physical activity guidelines.

10. Sexual Health

Summary statistics: Sex Frequencies and Protection Use

- Protective Barrier Use and frequencies across oral, vaginal, and anal sex: 1.29% of the students in our data reported having anal intercourse within the last 30 days and 66% of these students reported sometimes or never using a protective barrier. 33.21% of the students in our data reported having oral intercourse within the last 30 days and 93.92% of those students reported sometimes, rarely, or never using a protective barrier. 34.61% of the students in our data reported having vaginal intercourse within the last 30 days and about 53.44% of these students reported using a protective barrier most of the time or always.
- Emergency Contraception Use: 77% of Denison students in our 2023 data reported not using emergency contraception in the last 12 months.
- Method used to prevent pregnancy: 92% of Denison students in our 2023 data that stated they had vaginal intercourse within the last 12 months reported they used a method to prevent pregnancy the last time they had vaginal intercourse. Only 6% stated they did not use any method.

Trends Analysis: Oral and Vaginal Sex Protective Barrier Use

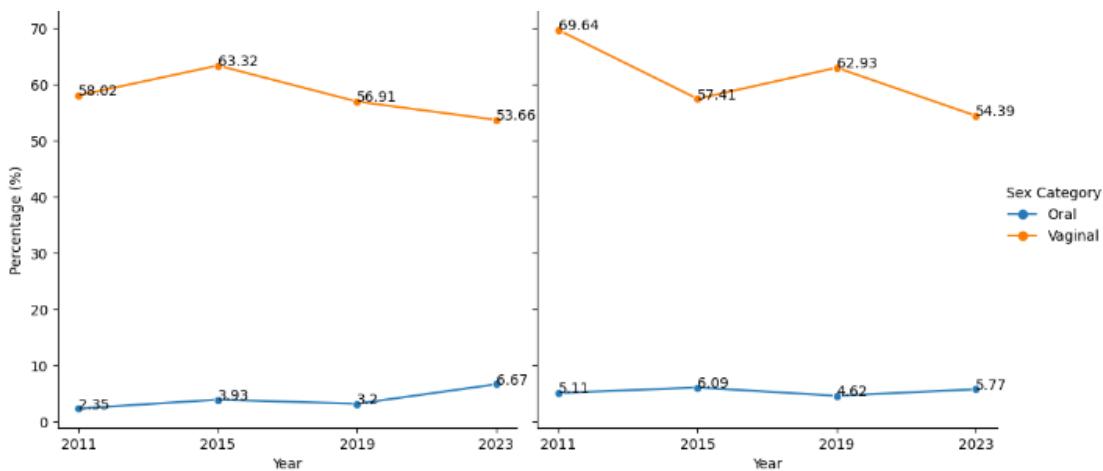


Figure 14. The percentage of females (left) and males (right) that most of the time or always used a protective barrier for oral and vaginal sex in the last 30 days between 2011 and 2023

The percentage of females that most of the time or always used a protective barrier for vaginal sex declined from 58.02% in 2011 to 53.66% in 2023. A similar trend is seen with males. For males, we saw a decline in condom or protective barrier use for vaginal sex from 69.64% in 2011 to 54.39% in 2023. Yet, we observed an incline in the percentage of males that most of the time or always used a protective barrier for oral sex from 2011 to 2023. Therefore, we found here that, except for oral sex, males and females at Denison have practiced less safe sex now compared to 2011.

National Comparison: Vaginal Sex Protective Barrier Use

Vaginal Sex Protective Barrier Use: For the percentage of students that used a protective barrier for vaginal sex in the last 30 days, Denison does significantly ($p < .001$) better compared to the national sample (DU: 53.4% Nat: 41%).

Correlation Analysis: Factors Influencing Vaginal Sex Protective Barrier Use

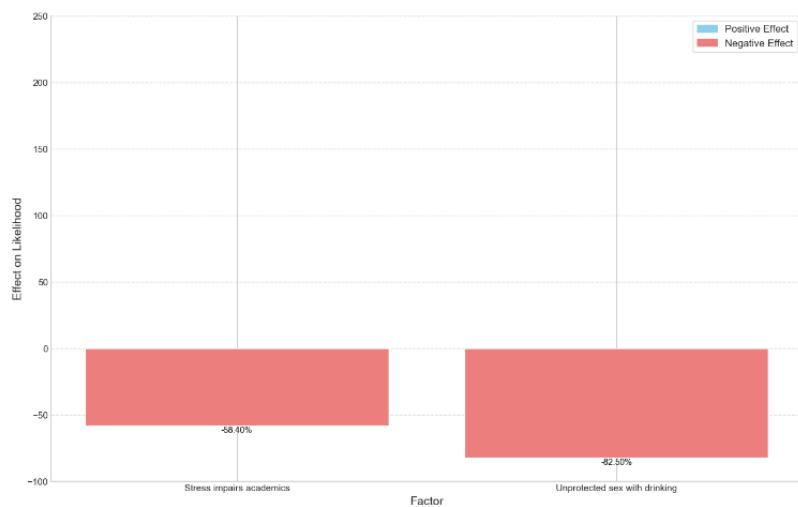


Figure 15. Factors Affecting Vaginal Sex Protective Barrier Use

[See Model \(Appendix 6F\)](#)

For students that had stress negatively impact their performance in class or have delayed progress towards their degree, they are 58.4% less likely to have used a protective barrier for vaginal sex most of the time or always in the last 30 days. Students that report having unprotected sex when drinking in the last 12 months are 82.5% less likely to have used a protective barrier for vaginal sex most of the time or always in the last 30 days.

11. Healthy Relationships

Summary Statistics: Partner Challenges, Verbal Abuse, Sexual Abuse, and Stalking

- Partner insulted to make them feel bad: 7% of Denison students in our 2023 data reported having a partner that called them names, insulted them, or put them down to make them feel bad in the last 12 months.
- Partner tried to limit contact: 5% of Denison students in our 2023 data reported having a partner that tried to limit contact with their family or friends within the last 12 months
- Partner pressured unwanted sexual contact: 3% of Denison students in our 2023 data reported having a partner that pressured them into unwanted sexual contact with the use of alcohol or drugs within the last 12 months
- Verbally threatened: 11% of Denison students in our 2023 data reported being verbally threatened in the last 12 months
- Sexually touched: 9% of Denison students in our 2023 data reported being sexually touched without their consent in the last 12 months
- Stalking victim: 5% of Denison students in our 2023 data reported being a victim of stalking in the last 12 months

Trends Analysis: Sexual Touching

As shown by *Figure 16*, the percentage of males from Denison that reported being sexually touched without consent in the last 12 months rose overall from 2.67% in 2011 to 5.52% in 2023 with a dramatic increase in 2015 from 2.67% to 7.65% and a decline in 2019 from 7.65% to 4.82%. The percentage of females from Denison that reported being sexually touched without consent in the last 12 months rose dramatically between 2011 and 2019 from 10.61% in 2011 to 21.95% in 2019. However, the percentage of females experiencing sexual touching went back down a lot in 2023 to 10.48%. Overall, other than the sexual touching rate for females dramatically declining in 2023, these trends are alarming.

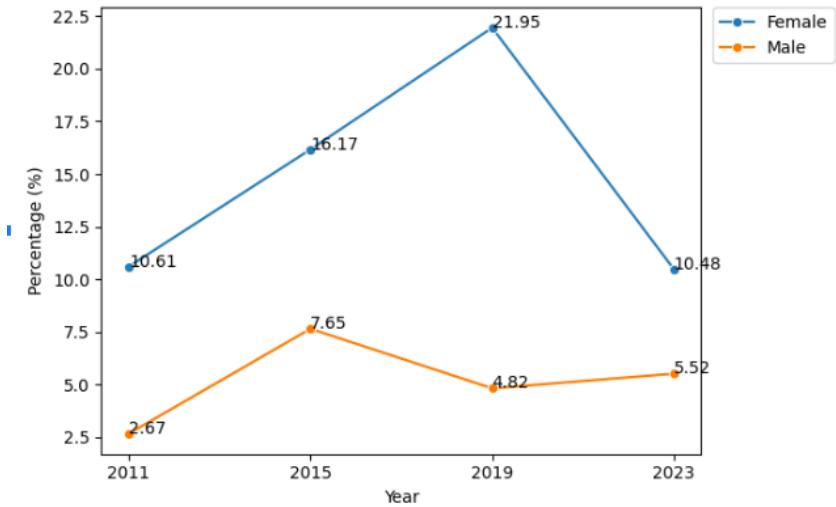


Figure 16. Sex Touching Frequencies Between 2011 and 2023

Correlation Analysis: Factors Influencing Sexual Touching

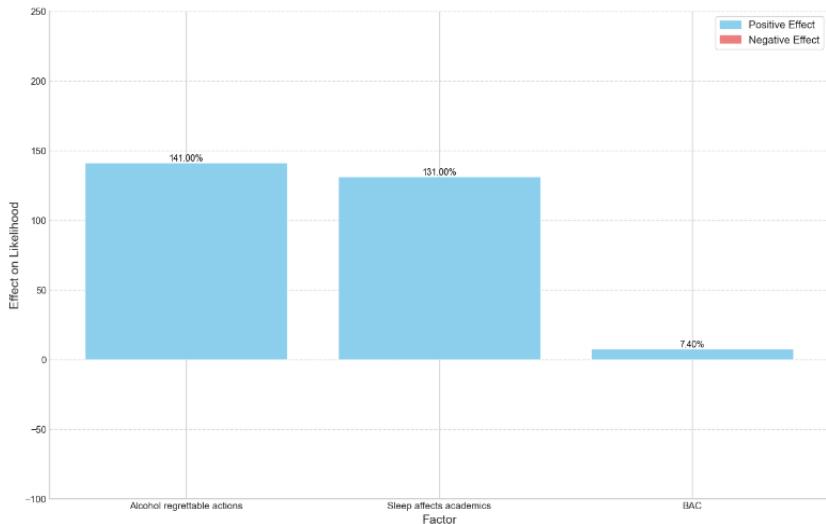


Figure 17. Factors Affecting Sexual Touching

[See Model \(Appendix 6G\)](#)

Students that did something they later regretted when drinking alcohol in the last 12 months are 141% more likely to have experienced sexual touching in the last 12 months. Students that had sleep difficulties negatively impact their academic performance are 131% more likely to have experienced sexual touching in the last 12 months. For each increase in BAC by 0.01%, students are 7.4% more likely to have experienced sexual touching in the last 12 months.

12. Demographics Comparison

Varsity Athlete:

- a) **Areas where Varsity Athlete Students perform well compared to Non-Varsity:** belonging, general health, loneliness, psychological distress, suicide risk, financial challenges, microaggressions and stress impact academics, meeting physical activity guidelines, and eating fruit and vegetable ([see Appendix 5A](#)).

b) **Areas of Concern for Varsity Athlete Students:**

- **Blood Alcohol Concentration:** Varsity athletes exhibit a higher average BAC than non-varsity athletes, $f = 4.39, p = 0.037$ (Varsity: 0.078 - Non-Varsity: 0.062).
- **Moderate/High Cannabis Risk:** Varsity athletes exhibit higher moderate/high cannabis risk than non-varsity athletes, $p = 0.024$ (Varsity: 31.93% - Non-Varsity: 29.25%).

Greek Life Students:

a) **Areas where Greek Life Students perform well compared to Non-Greek Life Students:**

belonging, general health, loneliness, psychological distress, suicide risk ([see Appendix 5B](#)).

b) **Areas of Concern for Greek Life Students:**

- **Moderate/High Alcohol Risk:** Greek Life Students exhibit higher moderate/high alcohol risk than non-Greek Life students, $p = 0.024$ (Greek-Life: 28.57% - Non-Greek Life: 14.43%).
- **Alcohol Brownout:** Greek life students reported experiencing more alcohol brownout, than non-Greek life students, $p < 0.001$ (Greek-Life: 48.05% - Non-Greek Life: 31.53%).
- **Average sleep on weekends (hours):** Non-Greek Life students reported getting significantly more sleep on weekends over 2 weeks than Greek Life students, $z = -4.294, p = < .0001$ (Non-Greek Life: 7.95 - Greek Life: 7.34).
- **Had oral sex in the last 30 days:** A significantly higher proportion of Greek Life students had oral sex in the last 30 days than non-Greek Life students, $z = 2.916, p = < 0.035$ (Greek Life: 42.24% - Non-Greek Life: 29.35%).
- **Had vaginal sex in the last 30 days:** A significantly higher proportion of Greek Life students had vaginal sex in the last 30 days than non-Greek Life students, $z = 3.792, p = 0.0002$ (Greek Life: 46.25% - Non-Greek Life: 29.46%).
- **Vaginal sex protective barrier use:** Non-Greek Life students reported using a protective barrier for vaginal sex in the last 30 days more frequently than Greek Life students, $z = -2.023, p = .0043$ (Non-Greek Life: 59.65% - Greek Life: 44.59%).

Areas of Concern By Ethnicity:

- Belonging: There is a significant difference in the proportion of students who agree or strongly agree with feeling belonging among different ethnic groups, $F = 3.12$, $p = 0.008$. (See *Figure 18*)
- General Health: There is a significant difference in the proportion of students who stated “Excellent” or “Very good” general health among different ethnicity groups, $F = 5.6$, $p < 0.001$. (See *Figure 19*)
- Psychological Distress: There is a significant difference in the proportion of students with serious psychological distress among different ethnicity groups, $F = 2.89$, $p = 0.013$. (See *Figure 20*)

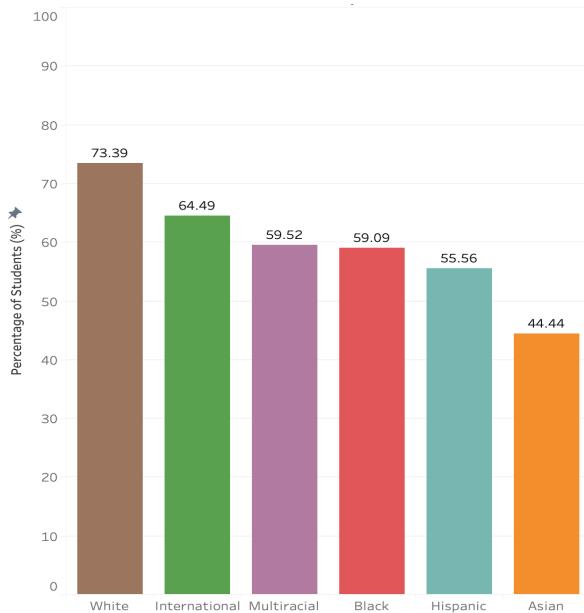


Figure 18. Percentage of Students feel belonged across different ethnicities

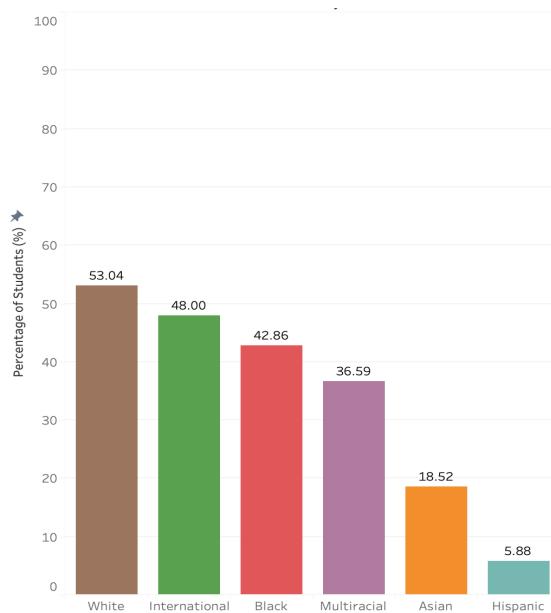


Figure 19. Percentage of Students with “Excellent”/“Very good” general health across different ethnicities

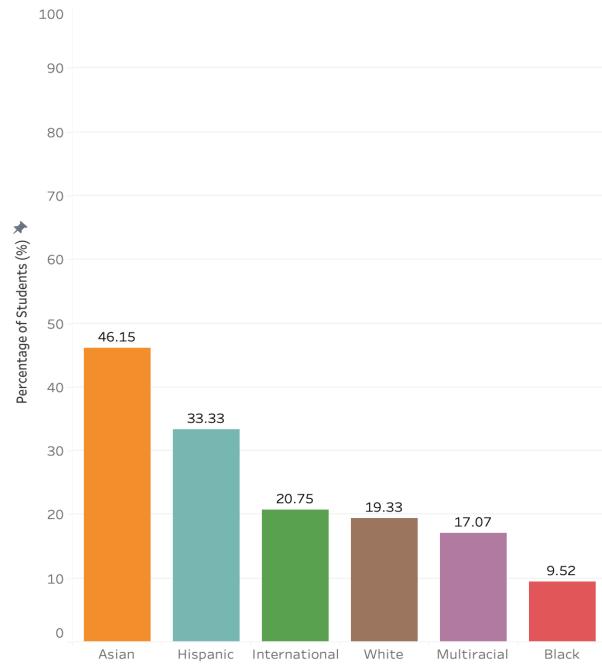


Figure 20. Percentage of Students with Serious Psychological Distress by Ethnicity

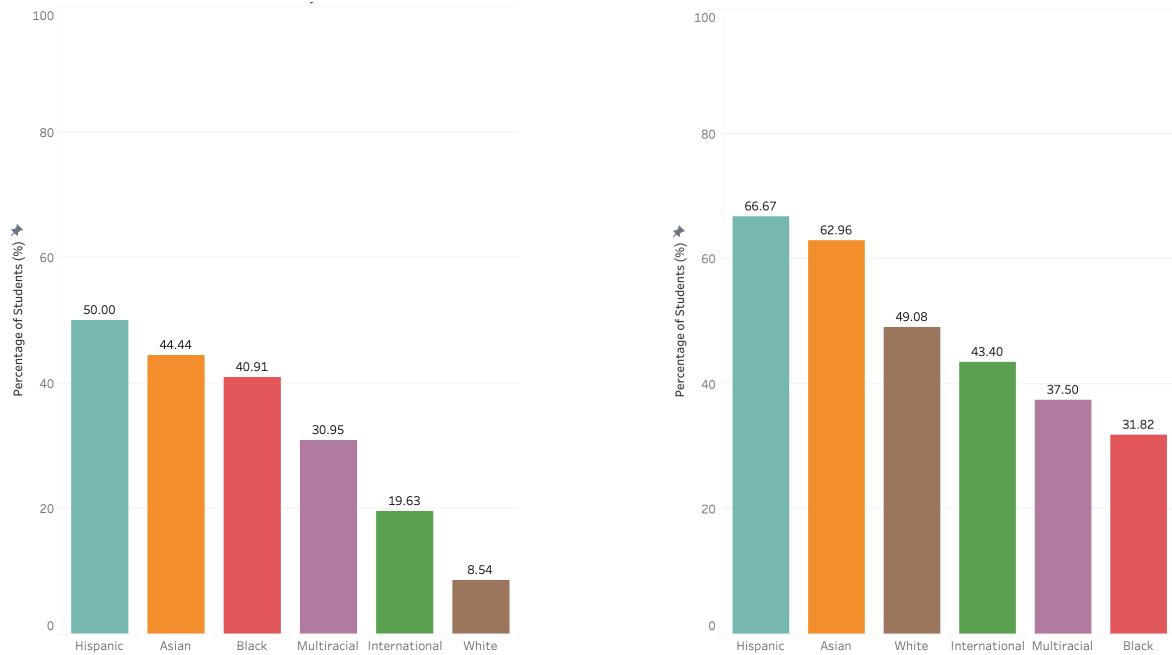


Figure 21. Microaggressions impact on academics by ethnicity

Figure 22. Stress impact on academics by ethnicity

- Microaggressions Impact Academics: There is a significant difference in the proportion of students impacted by microaggressions among different ethnicity groups, $p < .001$. (See *Figure 21*)
- Stress Impact Academics: There is a significant difference in the proportion of students impacted by stress among different ethnicity groups, $p = 0.0282$. (See *Figure 22*)

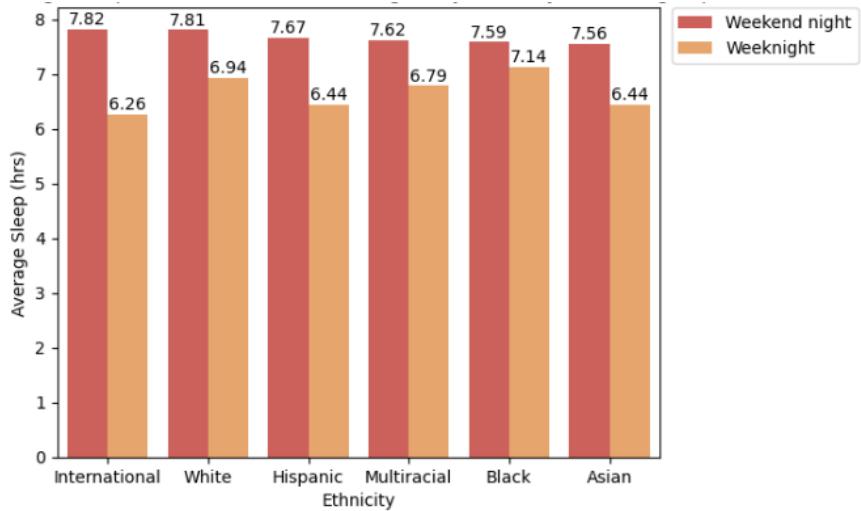


Figure 23. Average sleep on weekends and weeknights by ethnicity

- Average sleep on weeknights (hours): There is a significant difference in reported average sleep on weeknights over 2 weeks by ethnicity, $F = 5.715, p = <.001$. (See *Figure 23*)
- Getting at least 1-2 servings of fruits and at least 1-2 servings of vegetables per day: There is a significant association between ethnicity and the percentage getting at least 1-2 servings of fruits and vegetables per day, $X^2 = 27.73, p = <0.001$.

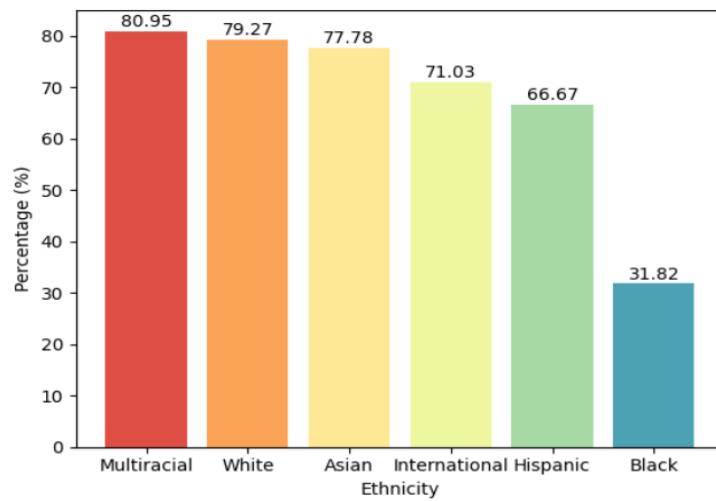


Figure 24. Percentage getting at least 1-2 servings of fruits vegetables by ethnicity

- Had vaginal sex in the last 30 days: There is a significant association between ethnicity and the percentage that had vaginal sex in the last 30 days, $X^2 = 19.82, p = 0.0013$.

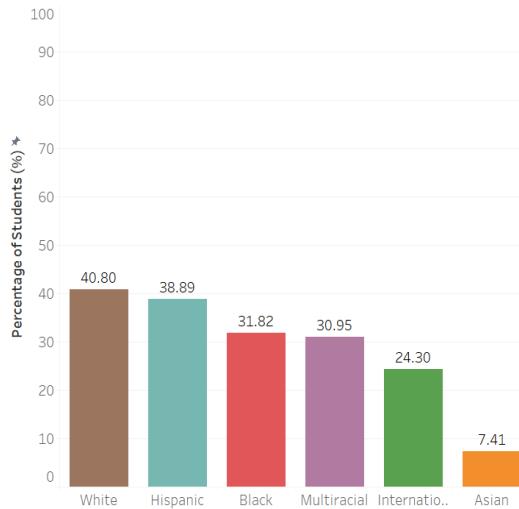


Figure 25. Had Vaginal Sex in the last 30 days

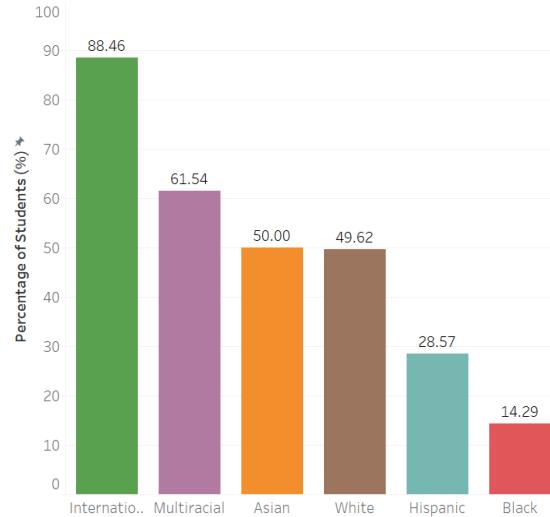


Figure 26. Used Protective Barrier for Vaginal sex in the last 30 days

- Used protective barrier for vaginal sex in the last 30 days: There is a significant association between ethnicity and the percentage that used a protective barrier for vaginal sex in the last 30 days, $X^2 = 20.009, p = 0.0012$.

Gender:

- General Health: There is a significant difference in the proportion of students who stated “Excellent” or “Very good” general health among different genders, $F = 8.07, p < 0.001$.
- Psychological Distress: There is a significant difference in the proportion of students with serious psychological distress among different genders, $F = 5.76, p = 0.003$.

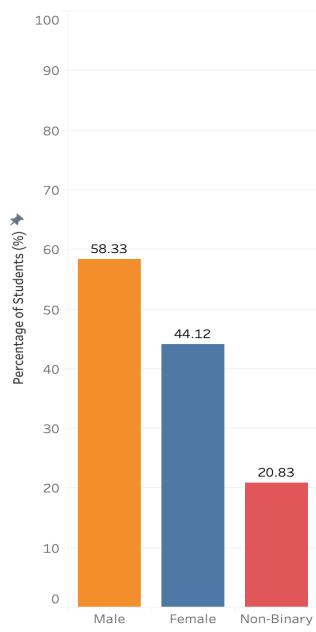


Figure 27. “Excellent”/“Very good” General Health

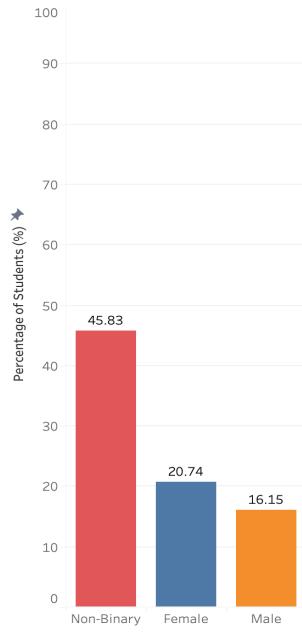


Figure 28. With Serious Psychological Distress

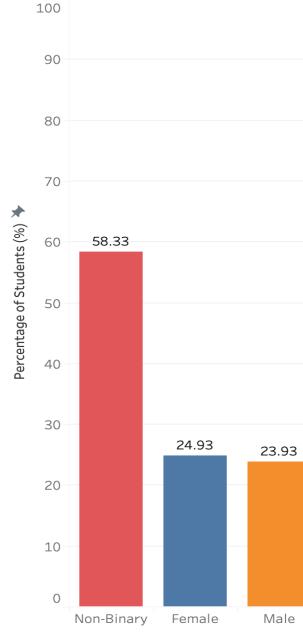


Figure 29. With Suicide Risk

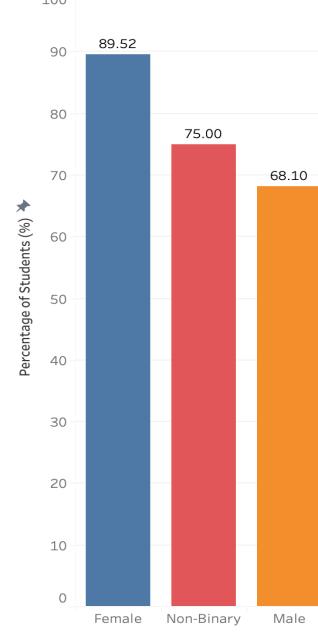


Figure 30. Seek Psychological Professional Help

- Suicide Risk: There is a significant difference in the proportion of students with suicide risk among different genders, $F = 6.92$, $p = 0.001$.
- Consider Psychological Professional Help: There is a significant difference in the proportion of students who consider seeking psychological professional help if they need it in the future among different genders, $F = 19.32$, $p < 0.001$.
- Microaggressions Impact Academics: There is a significant difference in the proportion of students impacted by microaggressions among different genders, $p <.001$. (See *Figure 31*)
- Stress Impact Academics: There is a significant difference in the proportion of students impacted by stress among different genders, $p <.001$. (See *Figure 32*)

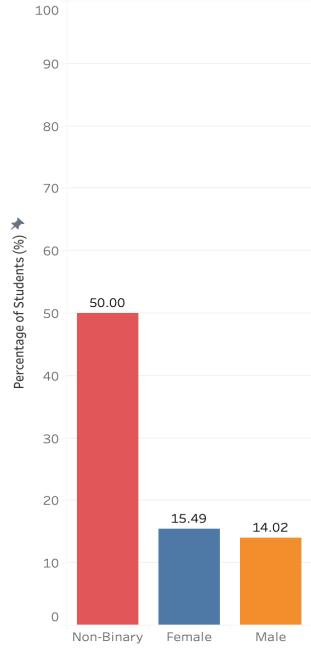


Figure 31. Microaggressions Impact on Academics by Gender

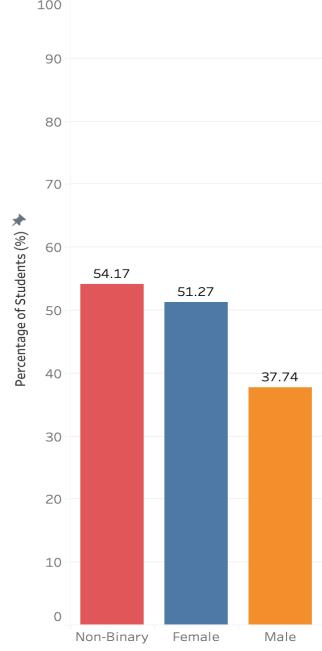


Figure 32. Stress Impact on Academics by Gender

- Meeting physical activity guidelines: There is a significant association between gender and whether or not physical activity guidelines are being met, $X^2=35.648, p < 0.001$.

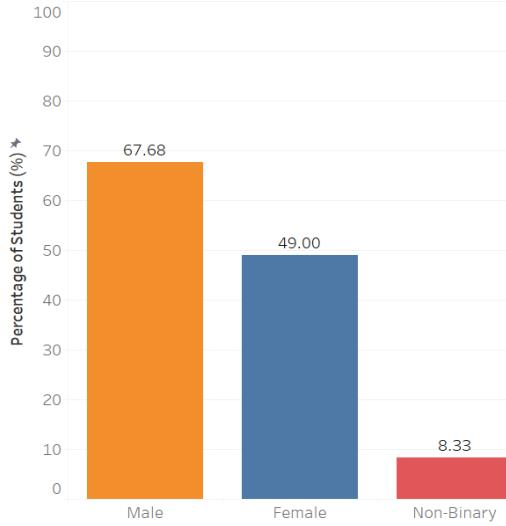


Figure 33. Meeting physical activity guidelines

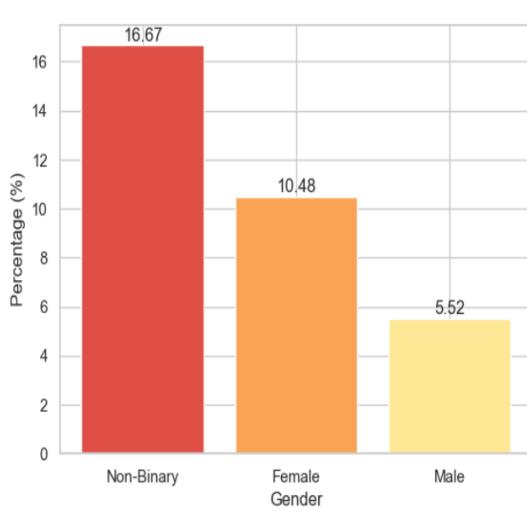


Figure 34. Sexual Touching Frequencies by gender

- Sexual touching in the last 12 months: A significantly greater proportion of Non-Binary students reported experiencing sexual touching in the last 12 months than males, $z=2.004, p=0.045$ (Non-Binary: 16.67% - Male: 5.52%).

- Verbal threatening in the last 12 months: A significantly greater proportion of Non-Binary students reported experiencing verbal threatening than females, *Test statistic (Fisher's Exact)=3.473, p=0.021* (Non-Binary: 25% - Female: 8.76%).
- Stalking victim in the last 12 months: A significantly greater proportion of Non-Binary students reported being a victim of stalking in the last 12 months than males, *Test statistic (Fisher's Exact)=2.004, p=0.0105* (Non-Binary: 16.67% - Male: 2.45%)..

Areas of concern for First Generation students:

- Financial Challenges: First-generation students exhibited higher financial difficulty rates compared to non-first-generation peers, $p < .001$ (First-Gen: 57.58% - Non-First Gen: 36.94%).
- Microaggressions Impact on Academics: First-generation students experienced a notable impact compared to non-first-generation students, $p = 0.002$ (First-Gen: 27.72% - Non-First Gen: 14.38%).
- Average sleep on weekends (hours): Non-First Generation students reported getting significantly more sleep on weekends on average over 2 weeks than First Generation students, $T=2.007, p = 0.045$ (Non-First Generation: 7.83 First Generation: 7.5).

Areas of concern by Class Year:

- Had oral sex in the last 30 days: There is a significant association between class year and the percentage that had oral sex in the last 30 days, $X^2 = 21.494, p < 0.0001$.
- Had vaginal sex in the last 30 days: There is a significant association between class year and the percentage that had vaginal sex in the last 30 days, $X^2 = 28.327, p < 0.0001$.

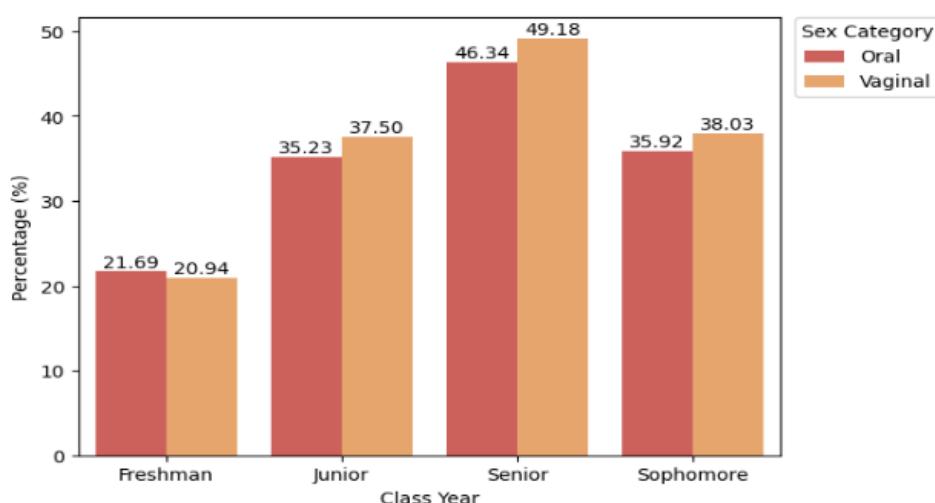


Figure 35. Had oral sex and vaginal sex in last 30 days by class year

- **Alcohol Brownout:** Seniors are notably impacted, with 47.86% experiencing alcohol brownout. This trend appears to escalate with class year, as 39.24% of juniors, 36.31% of sophomores, and 28.47% of freshmen also report experiencing brownout, $p = 0.016$.

Areas of concern for Student Employees:

- **Financial Challenges:** Student employees faced more financial challenges than non-working students, $p < .001$ (Employee: 46.36% - Non-Employee: 29.74%).

Areas of concern for Meditators:

- **Stress Impact Academics:** Students who meditate were more impacted by stress than non-meditators, $p = 0.033$ (Meditator: 51.39% - Non-Meditator: 45.71%)

VII. Recommendations

We have the following recommendations about how wellness at Denison can be improved across each Wellness Center Priority:

I. General Health

1. Demographic groups to target:

- Priority groups: Multiracial, Hispanic, Asian, Non-Binary
- Note: Multiracial, Asian, and Hispanic students report noticeably lower levels of general health relative to other ethnicities; Non-Binary students reveal lower levels of general health relative to other genders

II. Mental Health

1. Demographic groups to target:

- Priority groups: Asian, Hispanic, Non-Binary
- Note: Asian and Hispanic students have higher levels of psychological distress and lower levels of belonging compared to all other races and ethnicities; Non-Binary students display higher levels of psychological distress and suicide risk relative to other genders

2. Areas to address for reduction in psychological distress:

- Reduce loneliness
- Reduce suicide risk
- Improve sleep per week night

III. Service Use

1. Demographic groups to target:

- Priority groups: Males, Non-Binary

- Note: Males and Non-Binary students were the least likely to seek professional psychological service relative to females

IV. Finance

1. **Demographic groups to target:**

- Priority Groups: Black, International, Hispanic, Asian, and First-Generation students.
- Note: All the above priority groups face higher financial challenges.

2. **Areas to target to reduce financial difficulties:**

- Lower procrastination and microaggression
- Improve food security and responsible alcohol consumption
- Foster healthier partner relationships

V. Substance Use

1. **Demographic groups to target:**

- Priority Groups: Varsity Athletes, Greek Life, Seniors
- Note: Varsity Athletes exhibit a higher BAC level and more moderate/high cannabis risk than Non-Varsity Athletes; Greek Life students display greater levels of moderate/high alcohol risk, moderate/high cannabis risk, and alcohol brownout compared to Non-Greek Life students; Alcohol brownout escalates with class year with seniors experiencing the most alcohol brownout

2. **Areas to target to reduce BAC:**

- Lower brownouts
- Improve consent for sexual touching
- Lower sex partners

VI. Academics

1. **Demographic groups to target:**

- Priority Groups: Hispanic, Asian, Black, Non-Binary, First Gen, Females
- Note: Hispanic, Asian, and Black students experienced higher levels of microaggression impact on academics than other races and ethnicities; We see similar trends for Non-Binary and First Gen students; We see higher levels of stress impacting academics for Hispanic, Asian, Non-Binary, Females, and Meditators relative to their respective demographics

2. **Areas to target to reduce microaggression's impact on academic performance:**

- Lower hazing
- Lower discrimination
- Support students dealing with PTSD
- Lower financial challenges

- Improve overall health

3. Areas to target to reduce procrastination's impact on academic performance:

- Lower procrastination
- Reduce and manage financial challenges better
- Decrease anxiety
- Lower alcohol regrettable actions
- Lower sleep difficulties
- Sleep lesser on weekends
- Increase GPA

4. Areas to target to increase GPA:

- Lower physical fights (conflict resolution and safer environment)
- Help students with ADHD
- Address financial difficulties
- Lower procrastination (better time management)
- Address depression

VII. Physical Health

1. Demographic groups to target-

- Priority Groups: Hispanic, International, Black, Female, Non-Binary, Greek Life, First Generation
- Notes: Hispanic and international students demonstrate lower amounts of sleep on weeknights relative to other ethnicities; Hispanic, International, and Black students demonstrate lower amounts of fruit and vegetable consumption relative to other ethnicities. Females and Non-Binary students aren't meeting physical activity guidelines as often as males; Greek Life and First Generation students demonstrate lower levels of sleep on weekend nights

2. Areas to target to improve the rate at which Denison students meet physical activity guidelines-

- Increase resilience
- Increase daily fruit intake

3. Areas to target to improve sleep on weeknights-

- Reduce loneliness
- Reduce sleep difficulties impact on academics

VIII. Sexual Health

1. Demographic groups to target-

- Priority Groups: Ethnicity, Greek Life

- Note: Greek Life students reported having vaginal and oral sex a lot more frequently than non-Greek Life students; Greek Life students reported using a condom for vaginal sex a lot less often than non-Greek Life students; White and Hispanic students at Denison reported having vaginal sex more than most of the other ethnicities and races, and used a condom for vaginal sex less often than most ethnicities.

2. Areas to target to improve the rate at which Denison use condoms for vaginal sex-

- Reduce stress
- Reduce unprotected sex when drinking alcohol

IX. Healthy Relationships

1. Demographic groups to target-

- Priority Groups: Gender
- Note: Non-Binary students experienced heightened levels of verbal threatening and sexual touching in the last 12 months relative to other genders (see *Figure 35*)

2. Areas to target to reduce sexual touching without consent-

- Reduce alcohol regrettable actions
- Reduce sleep difficulties impact on academics
- Reduce BAC

With these recommendations and our dashboards on Tableau illustrating these demographic comparisons, we are confident that our clients and various divisional divisional departments can form support services that enhance student well-being in the future. We expect that our clients and the divisional departments will use our user friendly dashboards to evaluate and compare how their groups of students are doing relative to the Denison population. In addition, we desire for our clients and the divisional departments to utilize our dashboards for identifying alarming trends and summary statistics in student well-being.

C. Conclusion

In summary, we cleaned our 2011, 2015, and 2019 NCHA datasets narrowing them down to columns that are needed for our trends analysis and the same in our 2023 NCHA data, changing the names and values of our columns, altering the data types of our columns, and documenting missing values. Subsequently, we conducted demographic comparison, trends analysis, and national comparison. Finally, we implemented our in-depth analysis, examining how Denison Wellness center priorities vary across different student groups at Denison and seeing correlations between Denison Wellness Center priorities. Following our final analyses, we created a user-friendly dashboard in Tableau to visualize summary statistics, trends, and comparative analysis. To summarize important findings for each Wellness Center priority:

- I. Overall Health: Feelings of belonging on Denison's campus noticeably vary across different races.
- II. Mental Health: A significant proportion of students at Denison intentionally harm themselves (>12% of Denison students in our 2023 data said they intentionally injured themselves within the last 12 months).
- III. Safety: Non-binary students display higher concerns for safety during the day and at night relative to males and females at Denison. Females show higher concerns for safety at night relative to males and non-binary students at Denison.
- IV. Service Use: There are significant demands for mental health support across the Denison student population with domestic students and international students seeking psychological services more often than medical services.
- V. Finance: A significant proportion of students at Denison are experiencing financial challenges (40.22%) with those students especially including Black, International, Hispanic, Asian, and First-Generation students.
- VI. Substance Use: Varsity Athletes and Greek Life students exhibit a higher BAC level and more moderate/high cannabis risk.
- VII. Academics: Hispanic, Asian, and Black students demonstrated higher levels of microaggression impact on academics than other races and ethnicities. We see these same trends for microaggression impact on academics for Non-Binary and First Gen students.
- VIII. Physical Health Behaviors: Hispanic and international students get lower amounts of sleep on weeknights and consume lower amounts of fruits and vegetables relative to other ethnicities.
- IX. Sexual Health: White, Hispanic, and Greek Life students have oral and vaginal sex more frequently than other student groups. These same groups of students use protective barriers for vaginal sex less frequently than other students.
- X. Healthy Relationships and Consent: Non-Binary students experience heightened levels of verbal threatening, sexual touching, and stalking.

Following this project, a good next step would be to perform data collection, summary statistics, and analyses on the other hundreds of variables that we did not include in our data. With this, we can unveil additional findings that will be tangible to the Wellness Center.

D. Deliverables and Supporting Materials

File	Folder	Description
denison_wellness_analysts_data_preparation.ipynb	\Github Code	IPYNB file containing code for data collection, cleaning, and exporting clean CSV files.
denison_wellness_analysts_initial_analysis.ipynb	\Github Code	IPYNB file containing code for initial analysis step.
denison_wellness_analysts_trends_analysis.ipynb	\Github Code	IPYNB file containing code for trends analysis step.
denison_wellness_analysts_demo_graphics_comparison.ipynb	\Github Code	IPYNB file containing code for demographics comparison step.
denison_wellness_analysts_national_comparison.ipynb	\Github Code	IPYNB file containing code for national comparison step.
denison_wellness_analysts_comparative_analysis.ipynb	\Github Code	IPYNB file containing code for comparative analysis step.
denison_wellness_analysts_correlation_analysis.ipynb	\Github Code	IPYNB file containing code for correlation analysis step.
Denison Wellness Analysts Comparative Analysis.Rmd	\Github Code	R Markdown file containing code for linear and logistic regressions for correlation analysis.
Denison_Wellness.twb	\Github Code	Tableau File containing collection of Dashboards as visualization tool for client use.
Tableau Dashboard Guide.mov	\Github Code	Visual Guide to how to use our Tableau Dashboards
Data Dictionary.xlsx	\Github Code	Excel Spreadsheet containing a list of all columns in our 2 main datasets, description, their possible values, data types, and total number of missing values
README.md	\Github Code	MD file containing an introduction of our project, description, and shows users how to use our project
NCHA Trends Clean.csv	\Github Code\data	Comma-delimited ASCII text file containing cleaned & selected

		columns from the NCHA Denison survey dataset from 2011, 2015, 2019, and 2023 for trend analysis
NCHA 2023 Clean.csv	\Github Code\data	Comma-delimited ASCII text file containing cleaned & selected columns from the NCHA Denison survey dataset from 2023
NCHA 2023 All Data.csv	\Github Code\data	Comma-delimited ASCII text file containing all variables from the NCHA Denison survey raw dataset from 2023
NCHA 2019.csv	\Github Code\data	Comma-delimited ASCII text file containing all variables from the NCHA Denison survey raw dataset from 2019
NCHA 2015.csv	\Github Code\data	Comma-delimited ASCII text file containing all variables from the NCHA Denison survey raw dataset from 2015
NCHA 2011.csv	\Github Code\data	Comma-delimited ASCII text file containing all variables from the NCHA Denison survey raw dataset from 2011
2019 NCHA Summary.pdf	\Github Code\data\external	
2022-23 Fact Book.pdf	\Github Code\data\external	PDF file containing student demographic distributions of Denison University from 2022-2023 school year
2023 NCHA III Data Report.pdf	\Github Code\data\external	PDf file containing data report of the national 2023 NCHA Spring Survey from undergraduate institutes all over the US
2023 NCHA III Executive Summary.pdf	\Github Code\data\external	PDf file containing executive summary of the national 2023 NCHA Spring Survey from undergraduate institutes all over the US
ACHANCH_III_Spring_2023_Codebook.pdf	\Github Code\data\external	PDF file containing questions and possible responses from the 2023

		NCHA spring survey
ACHA-NCHA_IIc_Spring_2019_SAMPLE.pdf	\Github Code\data\external	PDF file containing questions and possible responses from the 2019 NCHA spring survey
ACHA-NCHAIISpring_2015_sample.pdf	\Github Code\data\external	PDF file containing questions and possible responses from the 2015 NCHA spring survey
ACHA-NCHA_II_Paper_Spring_2011_SAMPLE.pdf	\Github Code\data\external	PDF file containing questions and possible responses from the 2011 NCHA spring survey

We created a google drive containing all these files, enabling our clients and future Wellness Center staff to be able to access our data, code, and dashboards.

E. References

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F. Appendix

1. Additional Context

What are the guidelines on aerobic physical activity and muscle strengthening?

The physical activity guidelines issued by the US Department of Health and Human Services (HHS) state that adults should get at least 150 minutes of moderate physical activity and at least 2 days of muscle strengthening per week (“*Physical Activity Guidelines for Americans Summary*”, 2019).

How did the NCHA measure fruit and vegetable servings in the survey?

One serving of fruit is a medium piece of fresh fruit; 1/2 cup of fresh, frozen, or canned fruit; 1/4 cup of dried fruit; or 3/4 cup of 100% fresh fruit juice). One serving of vegetables is ½ cup of fresh, frozen, or canned vegetables; ¾ cup 100% vegetable juice; or 1 cup salad greens.

Guidelines for fruit and vegetable consumption?

The current guidelines outlined by the USDA state that people needing 2,000 calories per day should include 2 cups of fruit and 2.5 cups of vegetables in their daily diets (Hayden S. et al., 2019).

2. Description of Statistical Tests Used

A. Z-test

In the context of statistical analysis, a z-test is a hypothesis testing method that assesses whether the sample mean (average) of a dataset is significantly different from a known population mean when the population standard deviation is known. It helps in determining whether the observed differences between the sample and the population are likely due to random chance or if they are statistically significant. A one-sample z-test is a specific type of z-test used when you have one dataset and wish to compare its mean to a known population mean, making it a valuable tool for concluding sample populations when the population parameters are known. The test calculates a z-score, which is then used to determine the probability that the observed sample mean is consistent with the population mean, helping researchers make informed decisions based on statistical significance.

B. T-test

A t-test is a type of statistical analysis used to compare the averages of two groups and determine whether the differences between them are more likely to arise from random chance. It is any statistical hypothesis test in which the test statistic follows a Student's t-distribution under the null hypothesis. It is most commonly

applied when the test statistic would follow a normal distribution if the value of a scaling term in the test statistic were known (typically, the scaling term is unknown and is therefore a nuisance parameter). When the scaling term is estimated based on the data, the test statistic—under certain conditions—follows a Student's t distribution. The t-test's most common application is to test whether the means of two populations are different.

C. ANOVA

Analysis of variance (ANOVA) is a collection of statistical models and their associated estimation procedures (such as the "variation" among and between groups) used to analyze the differences among means. ANOVA was developed by the statistician Ronald Fisher. ANOVA is based on the law of total variance, where the observed variance in a particular variable is partitioned into components attributable to different sources of variation. In its simplest form, ANOVA provides a statistical test of whether two or more population means are equal, and therefore generalizes the *t-test* beyond two means. In other words, the ANOVA is used to test the difference between two or more means.

D. Chi-Square

A chi-squared test (also chi-square or χ^2 test) is a statistical hypothesis test used in the analysis of contingency tables when the sample sizes are large. In simpler terms, this test is primarily used to examine whether two categorical variables (two dimensions of the contingency table) are independent in influencing the test statistic (values within the table).[1] The test is valid when the test statistic is chi-squared distributed under the null hypothesis, specifically Pearson's chi-squared test and variants thereof. Pearson's chi-squared test is used to determine whether there is a statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency table. For contingency tables with smaller sample sizes, a Fisher's exact test is used instead.

E. Fisher's Exact

Fisher's exact test is a statistical significance test used in the analysis of contingency tables. Although in practice it is employed when sample sizes are small, it is valid for all sample sizes. It is named after its inventor, Ronald Fisher, and is one of a class of exact tests, so called because the significance of the deviation from a null hypothesis (e.g., p-value) can be calculated exactly, rather than relying on an approximation that becomes exact in the limit as the sample size grows to infinity, as with many statistical tests.

3. GitHub

GitHub is a digital platform that allows us to store, manage, and track changes in our code projects. Think of it as a Google Drive, where we have folders for data and code files and can manage access to only a certain group of people. GitHub helps us keep a history of all the changes, combine our codes, and collaborate with others, ensuring everyone is on the same page.

4. Visual Studio Code

Visual Studio Code, often referred to as VS Code, is a sophisticated text editor used by data analysts or developers to write and edit code. Imagine it like an advanced version of Microsoft Word, but specifically tailored for coding. It offers features like highlighting specific parts of the code for easy readability and providing suggestions to help fix errors. Additionally, it can be customized with a connection to GitHub, helping us to easily access our code and data files.

5. Comparative Analysis Areas Where Targeted Student Groups Perform Well

A. Varsity Athlete:

- Belonging: There is a significantly higher proportion of varsity students who feel they belong than non-varsity students, $z = 2.298$, $p = 0.02$ (Varsity: 77.36% - Non-varsity: 65.89%).
- General Health: There is a significantly higher proportion of varsity students stated “Excellent” or “Very good” general health than non-varsity students, $z = 7.73$, $p < 0.001$ (Varsity: 79.81% - Non-varsity: 38.48%).
- Loneliness: There is a significantly lower proportion of varsity students with loneliness than non-varsity students, $z = -2.929$, $p = 0.003$ (Varsity: 36.79% - Non-varsity: 52.68%).
- Psychological Distress: There is a significantly lower proportion of varsity students with serious psychological distress than non-varsity students, $z = -2.539$, $p = 0.01$ (Varsity: 11.32% - Non-varsity: 22.7%).
- Suicide Risk: There is a significantly lower proportion of varsity students with suicide risk than non-varsity students, $z = -3.1$, $p = 0.001$ (Varsity: 14.56% - Non-varsity: 28.9%).
- Financial Challenges: There is a significantly lower proportion of varsity students facing financial challenges than non-varsity athletes (Varsity: 26.42% - Non-varsity: 43.56%).
- Microaggressions Impact Academics: There is a significantly lower proportion of varsity students impacted by microaggressions than non-varsity athletes (Varsity: 9.43% - Non-varsity: 18.65%)
- Stress Impact Academics: Significantly lower proportion of varsity athletes are impacted by stress than non-varsity athletes (Varsity: 34.91% - Non-Varsity: 50.23%)

- Meeting physical activity guidelines: A significantly higher proportion of varsity athletes meet physical activity guidelines relative to non-varsity athletes, $z = 9.455, p = <0.001$ (Varsity: 94.23% - Non-varsity: 42.59%).
- Getting at least 1-2 servings of fruits and vegetables per day: A significantly higher proportion of varsity athletes are getting at least 1-2 servings of fruits and vegetables per day relative to non-varsity athletes, $z = 3.52, p = <0.001$ (Varsity: 88.68% - Non-varsity: 72.26%).

B. Greek Life Students:

- Belonging: There is a significantly higher proportion of Greek life students feel they belong than non-Greek life students, $z = 3.19, p = 0.001$ (Greek life: 78.13% - Non-Greek life: 63.66%).
- General Health: There is a significantly higher proportion of Greek life students stated “Excellent” or “Very good” general health than non-Greek life students, $z = 2.179, p = 0.029$ (Greek life: 55.26% - Non-greek life: 43.82%).
- Loneliness: There is a significantly lower proportion of Greek life students with loneliness than non-Greek life students, $z = -2.229, p = 0.025$ (Greek life: 41.61% - Non-greek life: 52.06%).
- Psychological Distress: There is a significantly lower proportion of Greek life students with serious psychological distress than non-Greek life students, $z = -1.98, p = 0.04$ (Greek life: 14.65% - Non-Greek life: 23.06%).
- Suicide Risk: There is a significantly lower proportion of Greek life students with suicide risk than non-Greek life students, $z = -3.13, p = 0.001$ (Greek life: 16.88% - Non-Greek life: 29.87%).

C. First-Generation Student:

- BAC: First-generation students have a significantly lower average BAC than non-first-generation students, $f = 4.50, p = 0.034$ (First-Gen: 0.052 - Non First-Gen: 0.069)

6. Logistic Regression Model Outputs

A. Financial Challenges Model:

Number of observations: 293, $R^2 = 0.592$

Variable	Slope	P-Value
USDAFI	0.5205	<.001
BAC	5.3324	0.021

Microaggression Impact Academics	0.9042	0.017
Procrastination Impact Academics	1.0864	<.001
Partner Insulted 12 Months	-1.1140	0.027
GPA	-0.7300	0.013

B. Microaggressions Model:

Number of observations: 516, $R^2 = 0.587$

Variable	Slope	P-Value
Hazing Impact on Academics	2.2709	0.01712
Discrimination Impact on Academics	2.2127	<.001
PTSD Impact on Academics	1.0961	0.03204
Finances Challenges in Last 12 Months	0.5567	0.04180
General Health	-0.7629	0.00871

C. Procrastination Model:

Number of observations: 327, $R^2 = 0.603$

Variable	Slope	P-Value
Financial Challenges in the Last 12 Months	1.00973	<.001
Anxiety Impact on Academics	0.98908	<.001
Alcohol Regrettable Actions	0.90094	0.003930
Sleep Difficulties Impact on Academics	0.82634	0.010746
Average Sleep on Weekend Nights	0.27554	0.003234
GPA	-1.20711	<.001

D. GPA Model:

Number of observations: 390, $R^2 = 0.213$

Variable	Slope	P-Value
Sex Attempted No Consent 12 Months	0.46515	0.007384
Physical Fight 12 Months	-0.50720	0.003342
ADHD Impact on Academics	-0.39116	<.001
Finances Challenges in Last 12 Months	-0.18876	<.001
Procrastination Impact on Academics	-0.16854	0.002331
Depression Impact on Academics	-0.11179	0.046262

E. Physical Activity Guidelines Model:

Number of observations: 516, $R^2 = 0.102$

Variable	Slope	P-Value
At least 1-2 fruit servings over last 7 days	0.91872	<.001
Displayed “Very Good” or “Excellent” general health	0.84832	<.001
Resilience	0.27804	<.001
Contact Limited By Partner in last 12 months	0.96691	.04

F. Vaginal Sex Protective Barrier Use Model:

Number of observations: 177, $R^2 = 0.14$

Variable	Slope	P-Value
Sleep Negatively Impacted Academics	-0.8768	.009
Had unprotected sex when drinking alcohol	-1.7456	<.001

G. Sexual Touching Model:

Number of observations: 402, $R^2 = 0.101$

Variable	Slope	P-Value
Had sleep difficulties negatively impacted academics	0.8361	.0013
Did regrettable actions when consuming alcohol	0.8785	.001
BAC	7.1001	<.001

7. Linear Regression Model Outputs

A. Psychological Distress Model:

Number of observations: 552, $R^2 = 0.286$

Variables	Slope	P-Value
Resilience	-0.66	<.001
Loneliness	0.89	<.001
Sleep per Week Day Night	0.53	.006
Suicide Risk	-0.33	<.001

B. BAC Model:

Number of observations: 271, $R^2 = 0.1862$

Variable	Slope	P-Value
Days Muscle Strengthening 7 days	0.004955	0.00712
Partner Limit Contact 12 Months	-0.032065	0.02334
Sexually Touched No Consent 12 Months	0.021631	0.04231
Alcohol Brownout	0.036653	<.001
Sex Partners	0.004348	0.00536

C. Sleep on Weeknights Model:

Number of observations: 544, $R^2 = 0.058$

Variable	Slope	P-Value
Loneliness Scale	-0.06765	.022
Sleep Difficulties Negatively Impact Academics	-0.57785	<.001