

Examining the Mental Health Status of D.D.S. Students at UNMC College of Dentistry

As part of a collaboration between Carson Trego, Anna
Campbell, and Shayla Meyer

5/5/2025

Meet the Domain Experts

Examining the
Mental Health
Status of
D.D.S.
Students at
UNMC
College of
Dentistry

Carson Trego,
Anna
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Shayla Meyer

Anna Campbell and Shayla Meyer are both dental students working on a research project as part of a requirement for the completion of their dental program.

The project includes data collection, a poster presentation, and a written report.

Campbell and Meyer had decided to base their project on another group's project last year, which had compared the mental health of 4 dental school grades using three mental health metrics.

Question of the Former Study

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In the 2023–2024 academic year, do dental school grades show significant differences from each other in the three mental health measures?



Examining Mental Health Status of Dental Students in the Midwest

Natalie Benoy, Therese Cooney, Dr. Sarah Fischer, & Dr. Steven Wengel
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Abstract

While in dental school, students face a variety of stresses which may result in feelings of depression, anxiety, and burnout.

Objective:

- Understand mental health confidence of midwestern dental students
- Find trends between and across students in different years of dental school
- Determine whether depression, anxiety, or burnout is more prevalent among midwestern DDS students
- Measure the prevalence of dental students on mental health

Our hypothesis: There will be significant differences in mental health confidence between the years of dental students.

A research survey was sent to all DDS candidates at the University of Nebraska Medical Center's College of Dentistry. The survey consisted of 22 questions compiled from the Generalized Anxiety Disorder-7 (GAD-7) survey, Patient Health Questionnaire-9 (PHQ-9), and the Maslach Burnout Questionnaire.

We discovered high rates of depression, anxiety, and burnout amongst all years of dental students. Between years, there was no significant difference as expected for any of our three metrics, however we found correlations between these metrics. Finding these correlations and the prevalence of mental illness amongst dental students, is a step that serves to mental health resources in dental schools are crucial.

Background

- WHO's definition of mental health:
 - "Mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community."
- Importance of mental health (WHO):
 - "It is an integral component of health and well-being that underpins our individual and collective abilities to live a better life, build relationships, and share the world we live in."
- Very little existing literature on mental health status of dental students
- According to the American Dental Association's (ADA) 2021 Well-Being Survey Report of Dentists:
 - Anxiety (along with high cholesterol) is a leading medical condition that dentists reported (10%)
 - Dentists younger than 30 years old are more likely to see higher on depression risk assessment questions
 - Less than half of dentists were aware of a stress disorder web/pager program through their dental association

Methods

Survey:

- The survey was emailed to DDS students in all four years of UNMC's COD programs (21 D1s, 38 D2s, 99 D3s, and 54 D4s)
- Three pre-existing screening surveys were used including the PHQ-9 for depression, GAD-7 for generalized anxiety, and the Maslach Burnout Questionnaire
- Students' knowledge of and use of mental health resources available to them through their university was gauged through a series of questions

Analysis:

- An ANOVA (F-value) test was used to find difference between years
- Correlation matrices were created to show how the presence of one mental health condition related to the presence of another

Results

Among 88 participating dental students (Figure 1), 57% experience at least one symptom of depression, 83% experience at least one symptom of anxiety, and 92% of students experience mild levels of burnout. 14.7% of students were completely unaware of counseling services available to students.

No statistically significant differences in levels of anxiety, depression, nor burnout among the 5 years of dental students (Table 1).

D4 students displayed increased levels of burnout than other years, although no statistical significance exists. D2, D3, and D4 students also experience increased levels of anxiety, also experienced increased levels of burnout, with D4 students reported experiencing the highest levels of burnout and anxiety (Figure 1). D4 students did not show the same trend of increased anxiety correlating to increased burnout.

	F	df1	df2	p
Burnout	0.652	3	36.6	0.587
GAD Score	1.282	3	34.8	0.296
PHQ Score	1.970	3	36.4	0.136

Table 1. Comparison between years of dental students showed no significant differences between the groups.

Figure 1. Number of responses from each year of dental students. That year's dental cohort totaled 20-25 responses, however only 12 D4 students responded.

Figure 3. PHQ-9 questionnaire scores of dental students with scores 1-4 indicating normal depression, 5-9 indicating mild depression, 10-14 indicating moderate depression, and 15-19 indicating severe depression.

Figure 4. Maslach Burnout questionnaire scores of dental students with scores 1-3 indicating moderate burnout, and scores 4-6 indicating severe burnout.

Figure 5. GAD-7 questionnaire scores of dental students with scores 1-3 indicating mild anxiety, 4-5 indicating moderate anxiety, and 6-7 indicating severe anxiety.

Current Resources

- As of 1/15/2023 there is no on-site counselor at the UNMC
- Counseling available to students through:
 - UNMC Counseling and Psychological Services in Omaha (Omaha Area - Free MFT)
 - UNMC Counseling and Psychological Services on UNL City Campus in Lincoln (Hearst Area - Free MFT)
 - Voluntarily appointments are available through both UNMC and UNL CAPS
- Adults report that there were several crucial stressor counseling sessions, even when there overlapped with students not having class.

Conclusions

Our findings suggest that mental health students are feeling worse amounts of anxiety, depression, and burnout. Our algorithms in relation, or there are no statistical differences in levels of anxiety, depression, and burnout among the 5 years of dental students, but it is still important to keep researching and determining mental health status of dental students.

Our data shed light on other trends, including a difference in correlation of anxiety and burnout between 1st year and upperclassmen. This may be because 1st years are experiencing the stress for the first time. While all students report the same worst anxiety, 2nd, 3rd, and 4th years may experience it in a more lasting way as they are experiencing multiple years of compounded stress (which may lead to increased burnout).

Further research into how anxiety can be exacerbated by burnout and other corresponding mental health conditions may help us understand the mental health of dental students. Further research also may look to understand barriers to seeking counseling or therapy. On top of further research, it is also important that resources remain available to students who are struggling with mental health and could benefit from seeking out therapy.

Limitations

- Survey given during the COVID-19 pandemic, a stressor which students may not experiencing the same levels of stress as compared to students during a normal time
- Disproportionate number of responses from each year of dental students (Figure 1)
- Wide variation due to issues for some groups, making difficult to differentiate among
- Higher response rate was for D4s (21%)
- May be due to the busy schedule of D4s or increased "burnout"

References

1. American Dental Association. (2021). Well-being survey report of dentists. <https://www.adahq.org/2021/03/22/well-being-survey-report-of-dentists/>

2. World Health Organization. (2019). Mental health: Strengthening evidence and leadership. <https://www.who.int/publications-detail/mental-health-strengthening-evidence-and-leadership>

3. American Dental Association. (2021). Well-being survey report of dentists. <https://www.adahq.org/2021/03/22/well-being-survey-report-of-dentists/>

4. American Dental Association. (2021). Well-being survey report of dentists. <https://www.adahq.org/2021/03/22/well-being-survey-report-of-dentists/>

5. American Dental Association. (2021). Well-being survey report of dentists. <https://www.adahq.org/2021/03/22/well-being-survey-report-of-dentists/>

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9. American Dental Association. (2021). Well-being survey report of dentists. <https://www.adahq.org/2021/03/22/well-being-survey-report-of-dentists/>

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Navigation icons: back, forward, search, etc.

Survey Setup

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Several QR code posters were placed around the UNMC Dental College.

Students responding to the survey would answer a set of mental health questions from three questionnaires.

The project used data from last year and this year. Identifiable information was not stored, which means that if a student had taken the survey this year and last year, there is no way to tell.

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- Patient Health Questionnaire 9 (PHQ-9):
9-question survey designed to quickly
assess a respondent's risk of depression. 0
to 3 integer scale for each question.
- Burnout Mini-Z 1.0 Q3: Single question
asking survey respondents to report how
burned out they feel. 0 to 4 integer scale.
- Generalized Anxiety Disorder 7 (GAD-7):
7-question survey designed to quickly
assess a respondent's risk of generalized
anxiety disorder. 0 to 3 integer scale for
each question.

Patient Health Questionnaire (PHQ-9)

NAME: _____ DATE: _____

Over the last 2 weeks, how often have you been bothered by any of the following problems? (Mark "N/A" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so fidgety or restless that you have been moving or fidgeting a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

ADD COLUMNS:

Has anyone professional (for example, a doctor, nurse, or counselor) ever talked with you about your problems?

TOTAL: / 27

All of these scores are designed to be easily graded using a point system, where the points from each question are added together to get a total value.

D1, D2, D3, D4: Codes indicating what year in dental school a student is, similar to words like “Freshman” and “Senior”.

(2023–2024) / (2024–2025): Which academic year the survey was taken.

Responding to Client Goals

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Client Goals:

- Analysis should be valid and reasonable (as always).
- No expectation of any specific result; client just needed to perform a research project.
- No issue with complex methods, but would like to take time to understand the methods used.
- The results should be prepared for a presentation.

Actions:

- Be careful and transparent about validity conditions and choices.
- Prefer robust methods when possible.
- If equally valid, prefer the less complex method.
- Provide mini-lessons to explain methods.
- Summarize choices in short sentences for presentation.

Questions of Interest

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- In the 2024–2025 academic year, do any dental school grades show significant differences from each other across the three mental health measures? For example, is the average senior different from the average freshman?
- In terms of the three mental health metrics, is the average dental school student of a given grade different this year from last year? Are freshman this year less or more anxious on average?

All groups received at least 22 responses, except D4 in the 2023–2024 academic year, which was excluded due to small sample size.

	D1	D2	D3	D4	Total
2023-2024	25	29	22	12	88
2024-2025	35	23	32	26	116

Data Modification

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The DEs supplied two datasets, with surveys from both years.

The two files had to be converted to the same format, then compiled into one CSV file.

Timestamp	Year	Gender	PHQ-9 Q1
12/9/2024 11:47:52	D3	Female	Not at all
12/9/2024 11:58:13	D3	Female	More than half the days
12/9/2024 14:52:43	D1	Female	More than half the days
12/9/2024 14:52:45	D1	Female	Several days
1/7/2024 12:08:50	D4	Male	1
1/8/2024 14:33:15	D2	Male	0
1/8/2024 14:33:59	D3	Female	3
1/8/2024 14:34:58	D2	Female	1

Table: Combined survey table, with the PHQ-9 responses encoded in both numeric values (last year's data) and direct words selected (this year's data)

Six contrasts of interest:

- PHQ-9 Score: (D1 2025–2024) - (D1 2023–2025), (D3 2025–2024) - (D3 2023–2025)
- Burnout Score: (D1 2025–2024) - (D1 2023–2025), (D3 2025–2024) - (D3 2023–2025)
- GAD-7 Score: (D1 2025–2024) - (D1 2023–2025), (D3 2025–2024) - (D3 2023–2025)

Missing Question and Reporting

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One PHQ-9 question was missing, making it essentially PHQ-8.

9. Thoughts that you would be better off dead
or of hurting yourself in some way

I assumed due to ethical concerns, but made sure to let the DEs know that the change was made and recommended that they report this alteration.

Loading Check

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Our metrics are calculated by adding multiple responses. Although the researchers are interested in a pre-existing metric rather than summing several variables to make their own, it couldn't hurt to check the loadings on the variables.

Metric	Cronbach's Alpha
PHQ-9	0.85
BURN	Not Applicable
GAD-7	0.90

PHQ	MR1 Loading
1	0.739
2	0.768
3	0.515
4	0.723
5	0.624
6	0.764
7	0.664
8	0.419

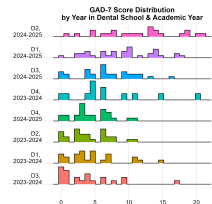
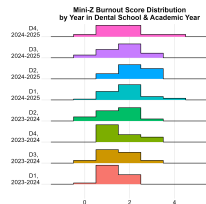
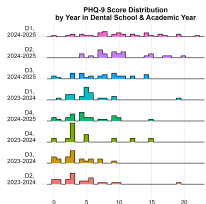
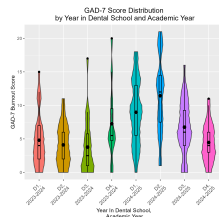
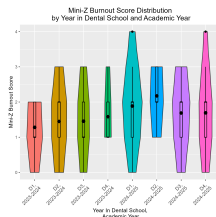
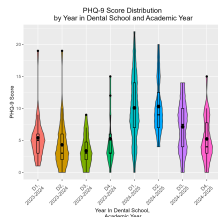
GAD	MR1 Loading
1	0.826
2	0.849
3	0.909
4	0.823
5	0.572
6	0.605
7	0.678

Alpha 0.70
Load 0.40

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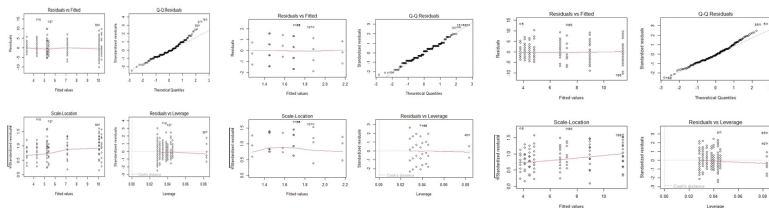
- PHQ-9: 0–3 each, 0–24 total
- Burnout Mini Z: 0–4 each, 0–4 total
- GAD-7: 0–3 each, 0–21 total



Assumption Checks

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	Levene	Shapiro	QQ
PHQ-9	0.04*	0.00*	Questionable
BURN	0.51	0.02*	Fine
GAD-7	0.04*	0.03*	Questionable

Summary Stats

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DENTALYR_NESTED	phq_mean	phq_median	phq_skew	phq_kurt	phq_var
D1.2024	5.4	5	2.31	9.99	12.42
D1.2025	10.09	10	0.24	2.49	27.61
D2.2024	4.31	3	1.97	8.19	15.01
D2.2025	10.30	9	0.66	2.61	18.86
D3.2024	3.36	3	0.55	2.61	6.59
D3.2025	7.13	7.5	0.02	2.08	16.31
D4.2024	5.25	3	1.13	3.10	19.84
D4.2025	5.23	4	0.77	3.36	12.66

DENTALYR_NESTED	burn_mean	burn_median	burn_skew	burn_var
D1.2024	1.28	1	0.14	0.29
D1.2025	1.89	2	0.50	0.75
D2.2024	1.45	2	-0.22	0.68
D2.2025	2.17	2	-0.25	0.51
D3.2024	1.45	1	0.15	0.64
D3.2025	1.69	2	-0.28	0.74
D4.2024	1.58	1	0.86	0.63
D4.2025	1.69	2	0.64	1.02

DENTALYR_NESTED	gad_mean	gad_median	gad_skew	gad_kurt	gad_var
D1.2024	4.8	4	0.93	3.18	16
D1.2025	8.97	9	0.09	2.11	22.56
D2.2024	4.10	4	0.45	2.37	9.91
D2.2025	11.43	12	-0.03	2.10	32.62
D3.2024	3.77	2.5	1.55	5.48	17.52
D3.2025	6.75	6	0.09	2.58	16.06
D4.2024	7.25	5	0.96	3.21	32.75
D4.2025	4.46	4	0.43	2.64	8.18

Subjective Judgment Call

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- Diagnostic plots are somewhat subjective.
- Tests that produce a numeric result are still somewhat subjective, as the tests of normality (Shapiro-Wilk) and unequal variances (Levene's test) are sometimes considered overly-conservative depending on the sample size.

Ultimately, I made the decision to NOT assume normality or equality of variance within groups.

Non-Parametric Issue

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- Originally, Kruskal Wallis and Dunns test were considered.
- This would substantially change the hypothesis we are interested in.
- Many non-parametric tests like KW are sensitive to distributional differences that are not the location, which causes further issues for the hypothesis.
- To stay consistent with the client's hypothesis, a different method would be required.

Bootstrapping and Adjustment Meeting

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- Bootstrapping was chosen as a non-parametric alternative that preserves the main idea the client is interested in testing.
- To reduce the family-wise error rate, a Bonferroni adjustment was used.
- The choice of bootstrap and the importance of adjusting the p-values was communicated to the client.

Between Years Results

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PHQ-9		
	Estimate	Adjusted P Value
D1(2023–2024) – D1(2024–2025)	-4.69	< 0.001***
D3(2023–2024) – D3(2024–2025)	-3.75	< 0.001***
Burnout Mini Z		
	Estimate	Adjusted P Value
D1(2023–2024) – D1(2024–2025)	-0.61	0.004**
D3(2023–2024) – D3(2024–2025)	-0.23	1.00
GAD-7		
	Estimate	Adjusted P Value
D1(2023–2024) – D1(2024–2025)	-4.17	< 0.001***
D3(2023–2024) – D3(2024–2025)	-2.98	0.048*

Table: Between-Year Differences for PHQ-9, Burnout, and GAD-7

Within 2024–2025 Results PHQ-9

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	Estimate	Adjusted P Value
D1–D2	-0.29	1.00
D1–D3	2.96	0.05* (rounded up)
D1–D4	4.85	< 0.001**
D2–D3	3.17	0.03*
D2–D4	5.07	< 0.001***
D3–D4	1.89	0.32

Table: Within-2024–2025 PHQ-9 Comparisons Between Grades

Within 2024–2025 Results GAD-7

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	Estimate	Adjusted P Value
D1–D2	-2.46	0.48
D1–D3	2.22	0.21
D1–D4	4.51	< 0.001***
D2–D3	4.68	0.003**
D2–D4	6.97	< 0.001**
D3–D4	2.29	0.06

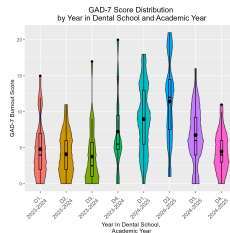
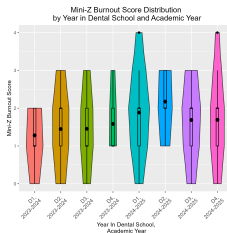
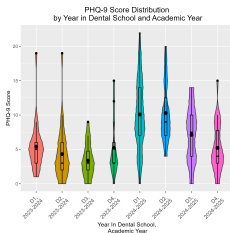
Table: Within-2024–2025 GAD-7 Comparisons Between Grades.
Note: no significant difference was found for the Burnout Mini Z within the 2024–2025 academic year.

Data and Results

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- PHQ-9: $D1 \neq D3, D1 \neq D4, D2 \neq D3, D2 \neq D4$
- GAD-7: $D1 \neq D4, D2 \neq D3, D2 \neq D4$
- PHQ-9: $D1(2023-2024) - D1(2024-2025) \neq 0, D3(2023-2024) - D3(2024-2025) \neq 0$
- Burnout: PHQ-9: $D1(2023-2024) - D1(2024-2025) \neq 0$
- GAD-7: PHQ-9: $D1(2023-2024) - D1(2024-2025) \neq 0, D3(2023-2024) - D3(2024-2025) \neq 0$



- Client very interested in understanding the methods used.
- Presentation not primarily on statistics, but responses to statistical questions were prepared in advance.
- Went over how to interpret p-values and the results in general.
- Discussed the error with the former poster interpretation (see below).

Conclusions

Our findings suggest that many dental students are feeling some amounts of anxiety, depression, and burnout. Our hypothesis is rejected, as there are no statistical differences in levels of anxiety, depression, and burnout among the 4 years of dental students, but it is still important to keep researching and determining mental health status of dental students.

Reflection on Subjective Choices

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- In hindsight, the assumption checking was a bit overconservative, particularly with the normality assumption. A simple Welch test would probably have been appropriate.
- Both clients seemed happy with the results and their presentation.
- In a good way, we over-prepared a bit. Statistical questions were apparently not asked during the presentation, and while the project did not require a reproducible code section, we decided to include it in their report.
- Overall, working with these clients was a positive experience.

Meetings List

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- January 28th - initial meeting
- January 31st - results for abstract
- February 13th - results for analysis
- February 20th - poster check in + prepare responses
- March 27th - discuss final analysis plan