Mental Health Analysis: 2023-2026

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2026-01-12

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0.1 DESCRIPTION

Across the last three years, three surveys were taken using almost the exact same methodology. Dental school students were asked to take a set of mental health surveys, and 3 metrics were scored (PHQ9,BURNOUT MINI Z,GAD7) Ids were not taken, and given the size of the school, it is very likely that many of the participants are the same people, so a person may have taken the quiz as a first year in the first survey, a second year in the second survey, and a third year in the third survey, and we would not be able to tell.

0.2 PREPARATION

We have separate files with separate schemes for how the data is recorded, and we need to modify the data to all be in the same format. This whole section is that process, but it contains no analysis or plotting. For information to put on the abstract, skip to the PLOTTING and ANALYSIS sections.

```
[1] "analysis_script.py"
[2] "BURN_Cohort_Square.png"
[3] "Burnout_GradeLevel_AllYears.png"
[4] "Burnout_Recent_Square.png"
[5] "COLUMNS.txt"
```

```
 [6] "debug_means.py"
 [7] "doNotModifyJustRead"
 [8] "GAD_Cohort_Square.png"
 [9] "GAD_GradeLevel_AllYears.png"
[10] "GAD_Recent_Square.png"
[11] "inspect_data.py"
[12] "PHQ_Cohort_Square.png"
[13] "PHQ_GradeLevel_AllYears.png"
[14] "PHQ_Recent_Square.png"
[15] "prompt.txt"
[16] "qmdReport.pdf"
[17] "qmdReport.qmd"
[18] "qmdReportSend.html"
[19] "qmdReportSend.pdf"
[20] "qmdReportSend.qmd"
[21] "qmdReportSend.rmarkdown"
[22] "qmdReportSend_files"
[23] "sensitivity_check.py"
[24] "sensitivity_check_v2.py"


# A tibble: 6 x 24
  Timestamp `Email Address` What year in dental school are~1
      <dbl> <lgl>           <chr>
1    45299. NA              D4
2    45300. NA              D2
3    45300. NA              D3
4    45300. NA              D2
5    45300. NA              D3
6    45300. NA              D2
# i abbreviated name:
#   1: `What year in dental school are you?`
# i 21 more variables: `What is your gender?` <chr>,
#  `Over the last two weeks, how often have you lost interest or pleasure in doing things?` <dbl>,
#  `Over the last two weeks, how often have you felt sad, low, down, depressed or hopeless?` <dbl>
#  `Over the last two weeks, how often have you had trouble falling or staying asleep, or sleeping
#  `Over the last two weeks, how often have you felt tired or had little energy?` <dbl>, ...


[1] "-------------------------"


# A tibble: 6 x 22
  Timestamp What year in dental sch~1 `What is your gender?`
      <dbl> <chr>                     <chr>
```

```
1    45635. D3                        Female
2    45635. D3                        Female
3    45636. D1                        Female
4    45636. D1                        Female
5    45636. D1                        Female
6    45636. D1                        Female
# i abbreviated name:
#   1: `What year in dental school are you?`
# i 19 more variables:
#  `Over the last two weeks, how often have you lost interest or pleasure in doing things?` <chr>,
#  `Over the last 2 weeks, how often have you felt sad, low, down, depressed or hopeless?` <chr>,
#  `Over the last 2 weeks, how often have you had trouble falling or staying asleep, or sleeping to
#  `Over the last 2 weeks, how often have you felt tired or had little energy?` <chr>, ...

[1] "-------------------------"

# A tibble: 6 x 23
  Timestamp           What year in dental school are you?\~1
  <dttm>              <chr>
1 2025-11-12 08:19:51 D3
2 2025-11-12 08:20:29 D3
3 2025-11-12 08:24:50 D2
4 2025-11-12 08:25:11 D2
5 2025-11-12 08:28:17 D3
6 2025-11-12 08:28:30 D4
# i abbreviated name:
#   1: `What year in dental school are you?\nMark only one oval.`
# i 21 more variables:
#   `What is your gender?\nMark only one oval.` <chr>,
#  `Over the last two weeks, how often have you lost interest or pleasure in doing things?\nMark or
#  `Over the last 2 weeks, how often have you felt sad, low, down, depressed or hopeless?\nMark onl
#  `Over the last 2 weeks, how often have you had trouble falling or staying asleep, or sleeping to

[1] "==========="

 [1] "Timestamp"
 [2] "Email Address"
 [3] "What year in dental school are you?"
 [4] "What is your gender?"
 [5] "Over the last two weeks, how often have you lost interest or pleasure in doing things?"
 [6] "Over the last two weeks, how often have you felt sad, low, down, depressed or hopeless?"
```

[7] "Over the last two weeks, how often have you had trouble falling or staying asleep, or sleepin
[8] "Over the last two weeks, how often have you felt tired or had little energy?"
[9] "Over the last two weeks, how often have you had a poor appetite or overeaten?"
[10] "Over the last two weeks, how often have you felt bad about yourself, or that you are a failure
[11] "Over the last two weeks, how often have you had trouble concentrating on things, such as read
[12] "Over the last two weeks, how often have you moved or spoken so slowly that other people could
being so figety or restless that you have been moving around a lot more than usual?"
[13] "Using your own definition of “burnout”, please select one of the answers below:"
[14] "In the last two weeks, how often are you feeling nervous, anxious, or on edge?"
[15] "In the last two weeks, how often have you not been able to stop or control worrying?"
[16] "In the last two weeks, how often have you been worrying too much about different things?"
[17] "In the last two weeks, how often have you had trouble relaxing?"
[18] "In the last two weeks, how often have you been so restless that it is hard to sit still?"
[19] "In the last two weeks, how often have you become easily annoyed or irritable?"
[20] "In the last two weeks, how often have you felt afraid as if something awful might happen?"
[21] "Are you aware that the UNMC College of Dentistry has on-site counseling services available?"
[22] "How likely are you to use the UNMC College of Dentistry on-
site counseling services?"
[23] "Do you know how to access the UNMC College of Dentistry on-
site counseling services?"
[24] "If you are struggling and in need of support, please refer to the following resources. UNMC C
7276 (crisis counselors available 24/7). UNL Counseling and Psychological Services: (402) 472-
7450 (available 24 hours) Suicide and crisis lifeline: 988. In case of an emergency, call 911."

[1] "Timestamp"
[2] "What year in dental school are you?"
[3] "What is your gender?"
[4] "Over the last two weeks, how often have you lost interest or pleasure in doing things?"
[5] "Over the last 2 weeks, how often have you felt sad, low, down, depressed or hopeless?"
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[16] "In the last 2 weeks, how often have you had trouble relaxing?"
[17] "In the last 2 weeks, how often have you been so restless that is is hard to sit still?"

```
[18] "In the last 2 weeks, how often have you become easily annoyed or irritable?"
[19] "In the last 2 weeks, how often have you felt afraid as if something awful might happen?"
[20] "Are you familiar with UNMC CAPS that offers in-person and Telehealth counseling services?"
[21] "How likely are you to use the CAPS counseling services, whether in-
person at UNL's main campus or virtually?"
[22] "Do you know how to access the UNMC CAPS counseling services?"


 [1] "Timestamp"
 [2] "What year in dental school are you?\nMark only one oval."
 [3] "What is your gender?\nMark only one oval."
 [4] "Over the last two weeks, how often have you lost interest or pleasure in doing things?\nMark
 [5] "Over the last 2 weeks, how often have you felt sad, low, down, depressed or hopeless?\nMark o
 [6] "Over the last 2 weeks, how often have you had trouble falling or staying asleep, or sleeping t
 [7] "Over the last 2 weeks, how often have you felt tired or had little energy?\nMark only one oval
 [8] "Over the last 2 weeks, how often have you had a poor appetite or overeaten?\nMark only one ova
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[10] "Over the last 2 weeks, how often have you had trouble concentrating on things, such as readir
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[15] "In the last 2 weeks, how often have you been worrying too much about different things?\nMark
[16] "In the last 2 weeks, how often have you had trouble relaxing?\nMark only one oval."
[17] "In the last 2 weeks, how often have you been so restless that is is hard to sit still?\nMark o
[18] "In the last 2 weeks, how often have you become easily annoyed or irritable?\nMark only one ov
[19] "In the last 2 weeks, how often have you felt afraid as if something awful might happen?\nMark
[20] "Are you familiar with UNMC CAPS that offers in-person and Telehealth counseling services?\nM
[21] "How likely are you to use the CAPS counseling services, whether in-
person at UNL's main campus or virtually? \nMark only one oval."
[22] "Do you know how to access the UNMC CAPS counseling services? \nMark only one oval."
[23] "@"


  0    1    2    3 <NA>
703  529  126   50    0


  0    1    2    3    4 <NA>
548  739  373  192    4    0
```

```
  0    1    2    3    4 <NA>
422  477  192   74    3    0
```

```
 [1] "Over the last two weeks, how often have you lost interest or pleasure in doing things?"
 [2] "Over the last two weeks, how often have you felt sad, low, down, depressed or hopeless?"
 [3] "Over the last two weeks, how often have you had trouble falling or staying asleep, or sleepin
 [4] "Over the last two weeks, how often have you felt tired or had little energy?"
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[13] "In the last two weeks, how often have you had trouble relaxing?"
[14] "In the last two weeks, how often have you been so restless that it is hard to sit still?"
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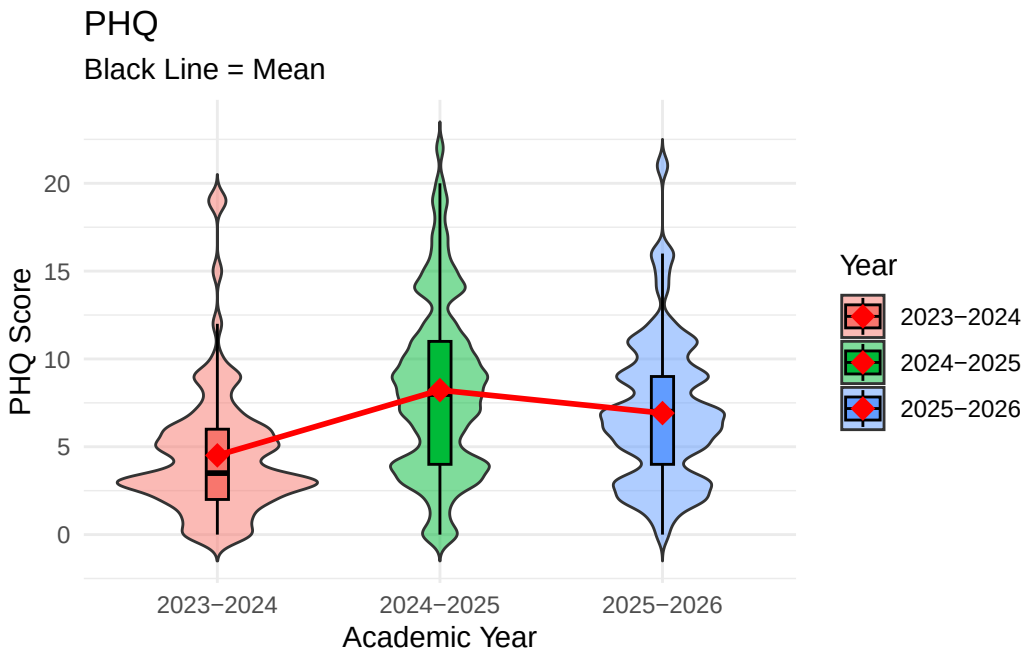
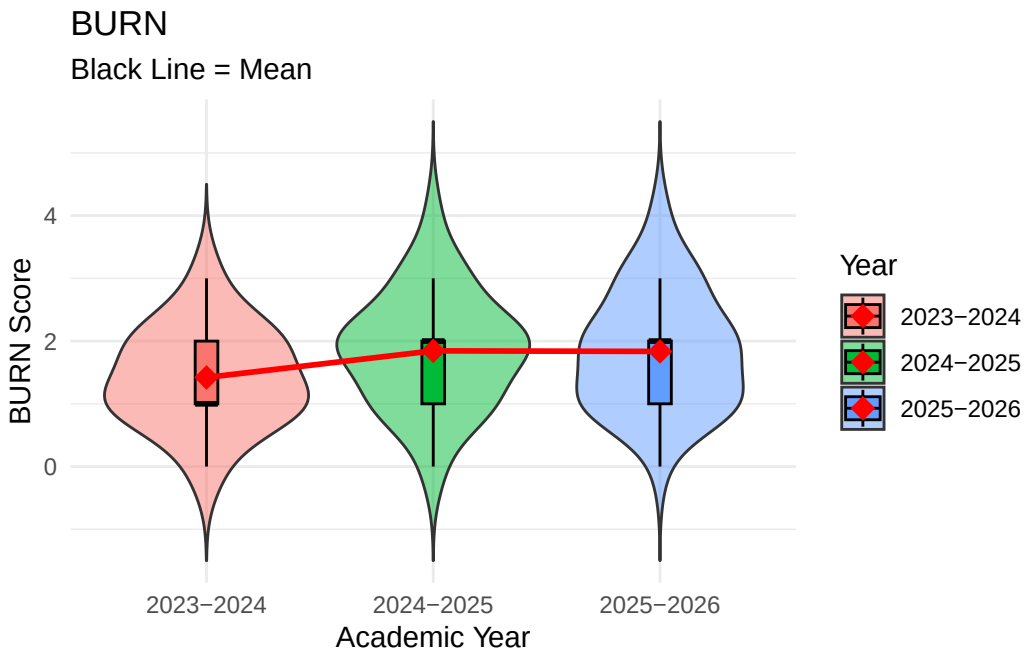
[16] "In the last two weeks, how often have you felt afraid as if something awful might happen?"
```

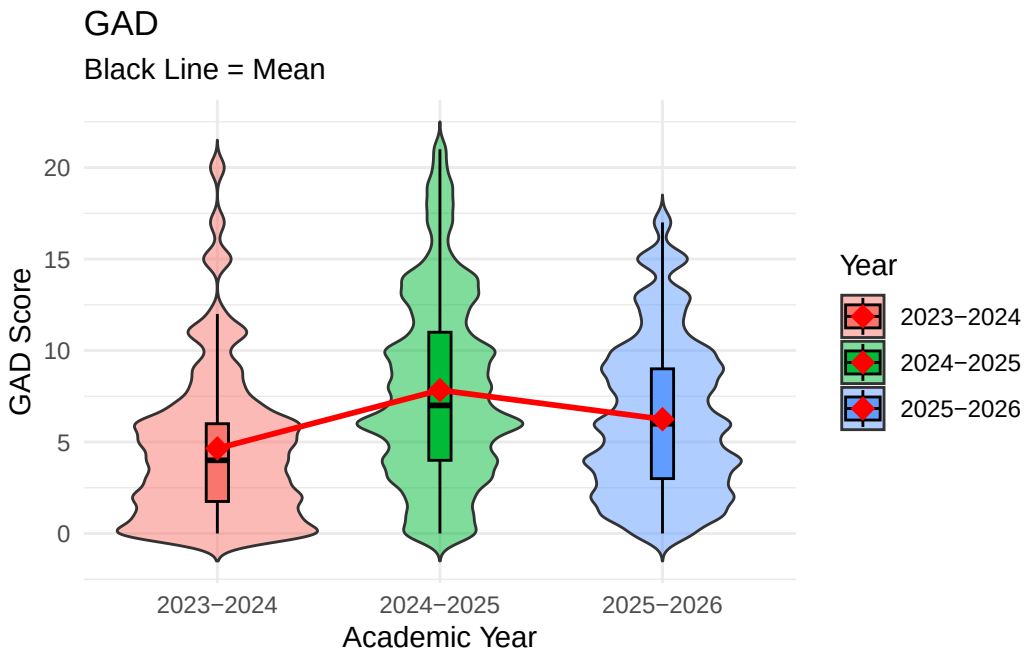
```
[1] "Over the last two weeks, how often have you lost interest or pleasure in doing things?"
[2] "Over the last two weeks, how often have you felt sad, low, down, depressed or hopeless?"
[3] "Over the last two weeks, how often have you had trouble falling or staying asleep, or sleeping
[4] "Over the last two weeks, how often have you felt tired or had little energy?"
[5] "Over the last two weeks, how often have you had a poor appetite or overeaten?"
[6] "Over the last two weeks, how often have you felt bad about yourself, or that you are a failure
[7] "Over the last two weeks, how often have you had trouble concentrating on things, such as readi
[8] "Over the last two weeks, how often have you moved or spoken so slowly that other people could
being so figety or restless that you have been moving around a lot more than usual?"
```

0.3 PLOTTING (IMPORTANT)

Now that we have done all of the data preparation, we have a single file (df_allYears) with all of the information. We can use this for plotting and


PHQ
Black Line = Mean
PHQ Score
20
15
10
5
0
2023–2024
2024–2025
2025–2026
Academic Year
Year
2023–2024
2024–2025
2025–2026


BURN
Black Line = Mean
BURN Score
4
2
0
2023–2024
2024–2025
2025–2026
Academic Year
Year
2023–2024
2024–2025
2025–2026



0.4 RAW ANALYSIS

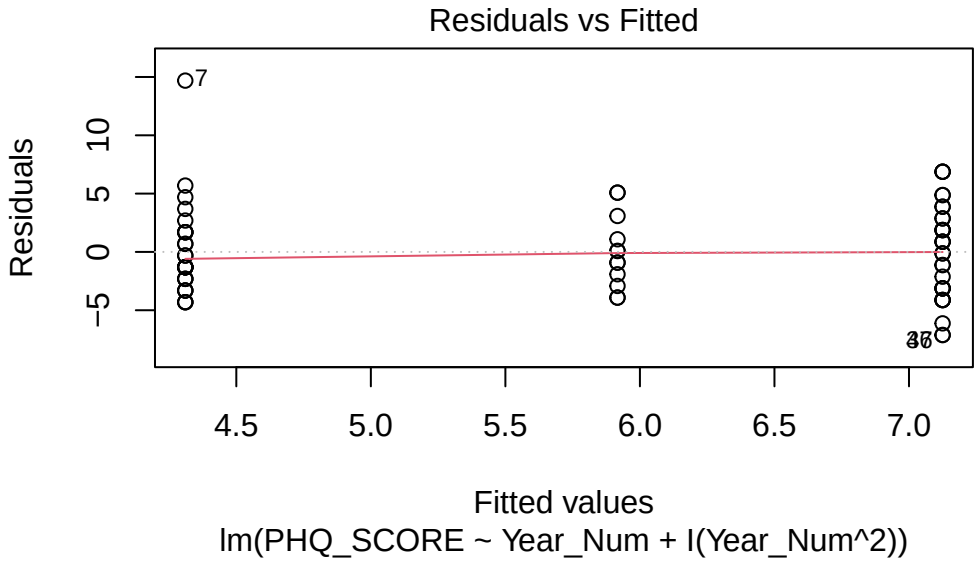
```
==================================
ANALYSIS FOR: Class of 2026
[1] "--PHQ--"

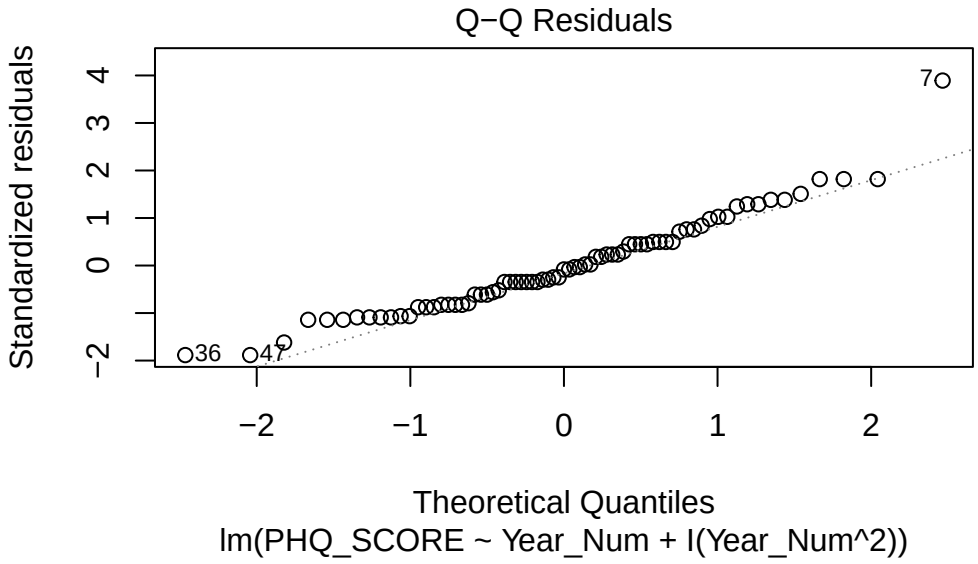
Call:
lm(formula = PHQ_SCORE ~ Year_Num + I(Year_Num^2), data = sub_data)

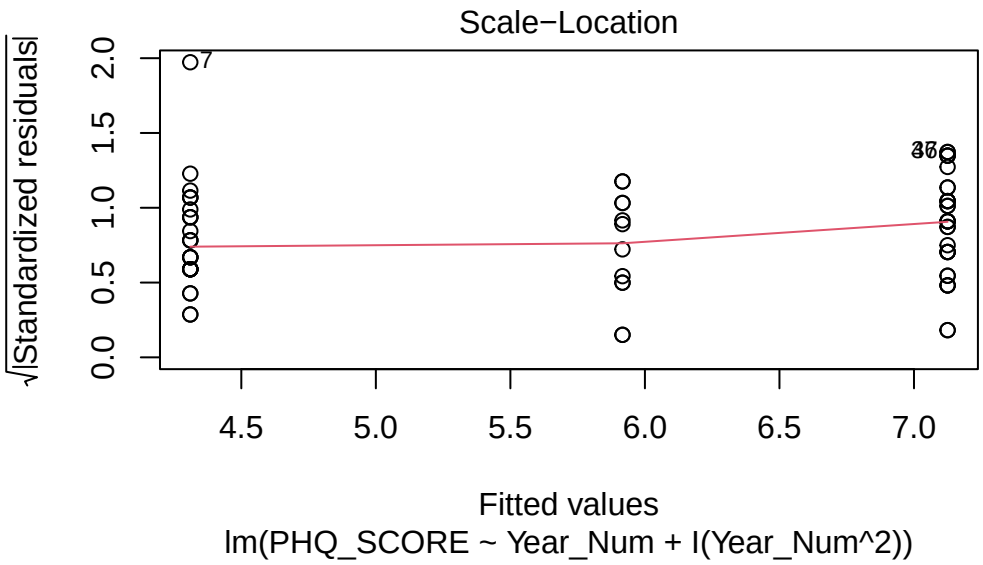
Residuals:
    Min      1Q  Median      3Q     Max
-7.1250 -3.1250 -0.3103  1.8750 14.6897

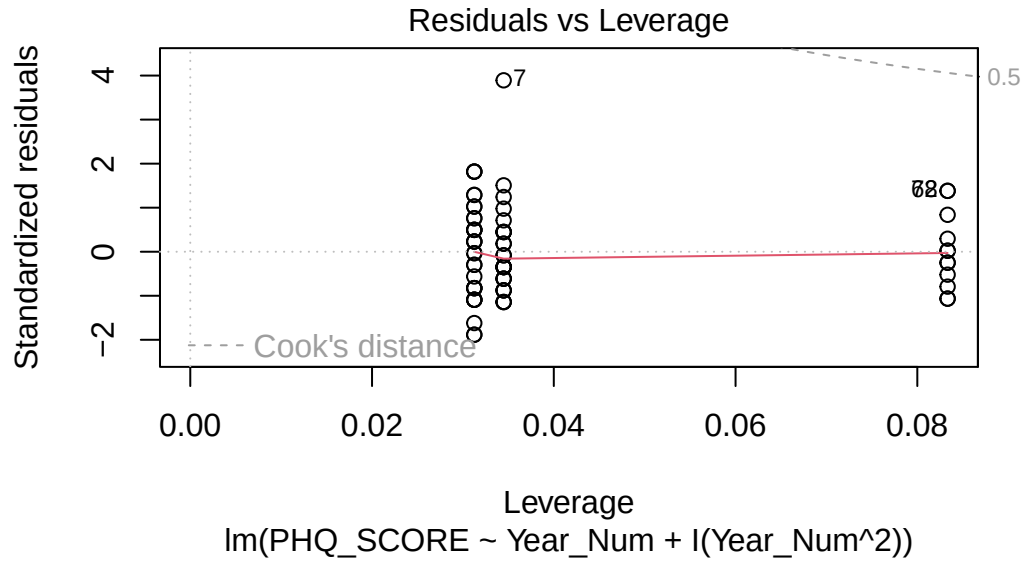
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)     4.3103     0.7132   6.044 6.56e-08 ***
Year_Num        4.8261     1.8154   2.658  0.00972 **
I(Year_Num^2)  -2.0115     0.9463  -2.126  0.03706 *
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 3.841 on 70 degrees of freedom
Multiple R-squared:  0.1046,    Adjusted R-squared:  0.07907
F-statistic: 4.091 on 2 and 70 DF,  p-value: 0.02088
```






Scale−Location
√|Standardized residuals|
0.0
0.5
1.0
1.5
2.0
7
4.5
5.0
5.5
6.0
6.5
7.0
Fitted values
lm(PHQ_SCORE ~ Year_Num + I(Year_Num^2))


Residuals vs Leverage
Standardized residuals
−2
0
2
4
7
0.5
Cook's distance
0.00
0.02
0.04
0.06
0.08
Leverage
lm(PHQ_SCORE ~ Year_Num + I(Year_Num^2))

```
[1] "--BUR--"

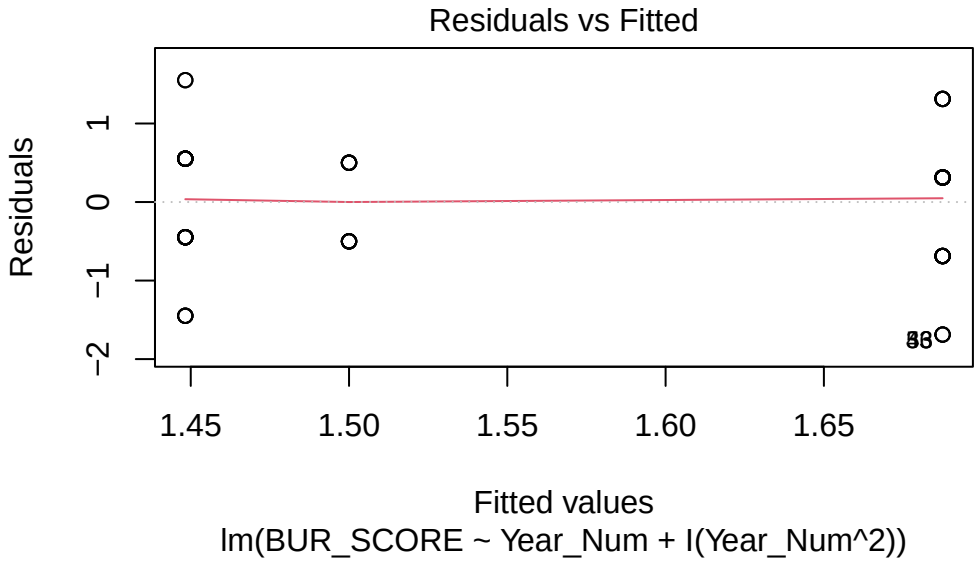
Call:
```

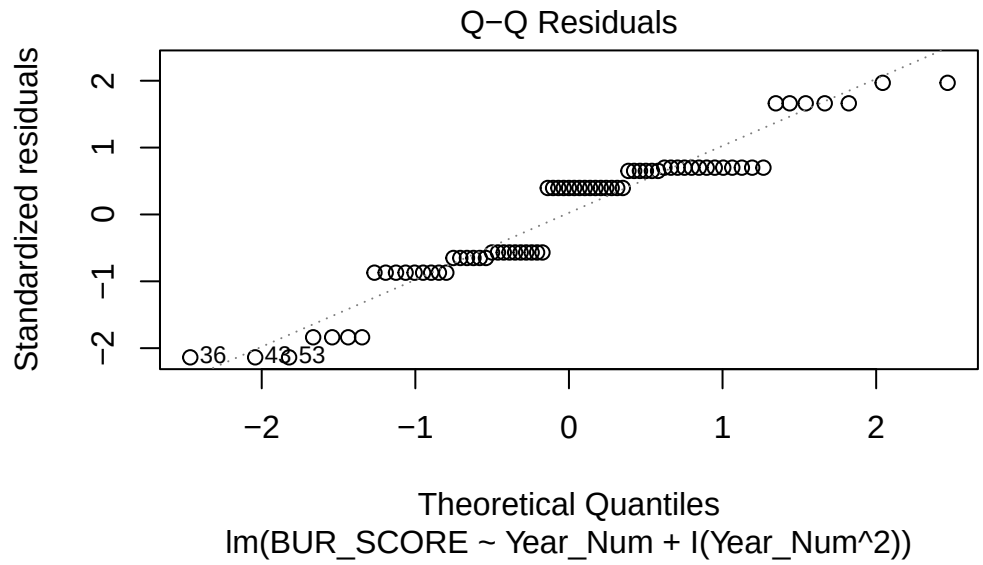
```
lm(formula = BUR_SCORE ~ Year_Num + I(Year_Num^2), data = sub_data)

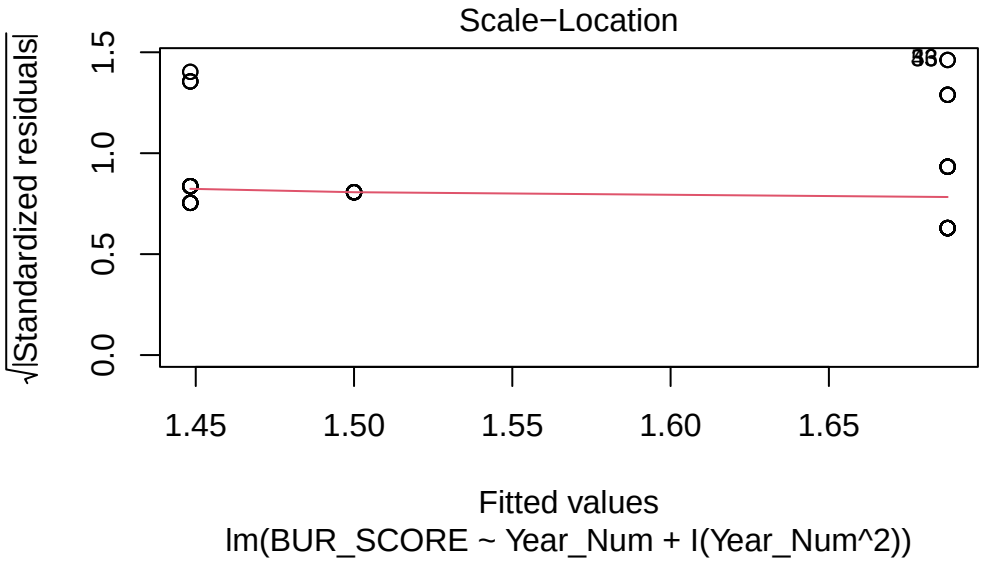
Residuals:
    Min      1Q  Median      3Q     Max
-1.6875 -0.5000  0.3125  0.5517  1.5517

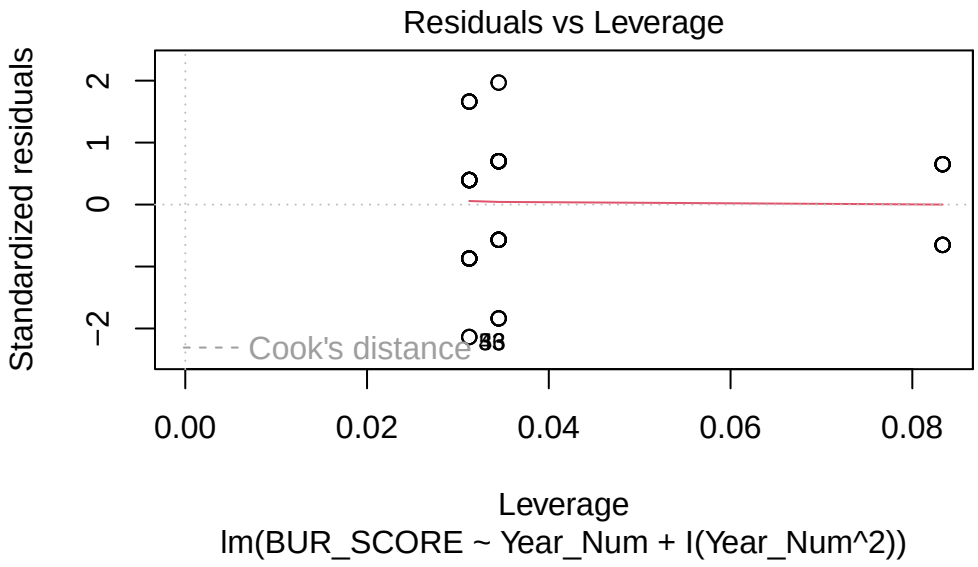
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)     1.4483     0.1490   9.722 1.27e-14 ***
Year_Num        0.4526     0.3792   1.194    0.237
I(Year_Num^2)  -0.2134     0.1976  -1.079    0.284
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8022 on 70 degrees of freedom
Multiple R-squared:  0.02012,   Adjusted R-squared:  -0.007872
F-statistic: 0.7188 on 2 and 70 DF,  p-value: 0.4909
```




Q−Q Residuals
Standardized residuals
−2
−1
0
1
2
36
48
53
Theoretical Quantiles
lm(BUR_SCORE ~ Year_Num + I(Year_Num^2))


Scale−Location
√|Standardized residuals|
0.0
0.5
1.0
1.5
1.45
1.50
1.55
1.60
1.65
Fitted values
lm(BUR_SCORE ~ Year_Num + I(Year_Num^2))



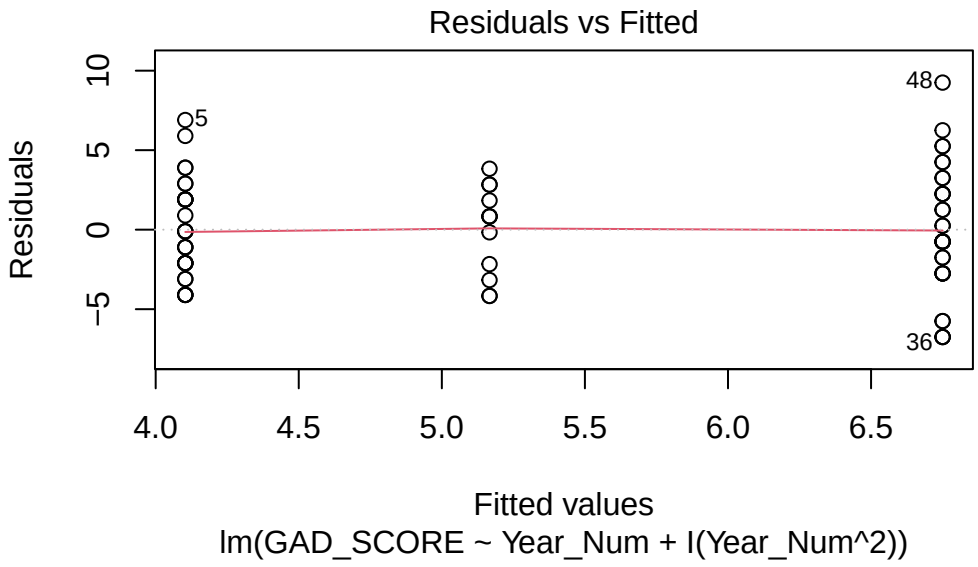

```
[1] "--GAD--"

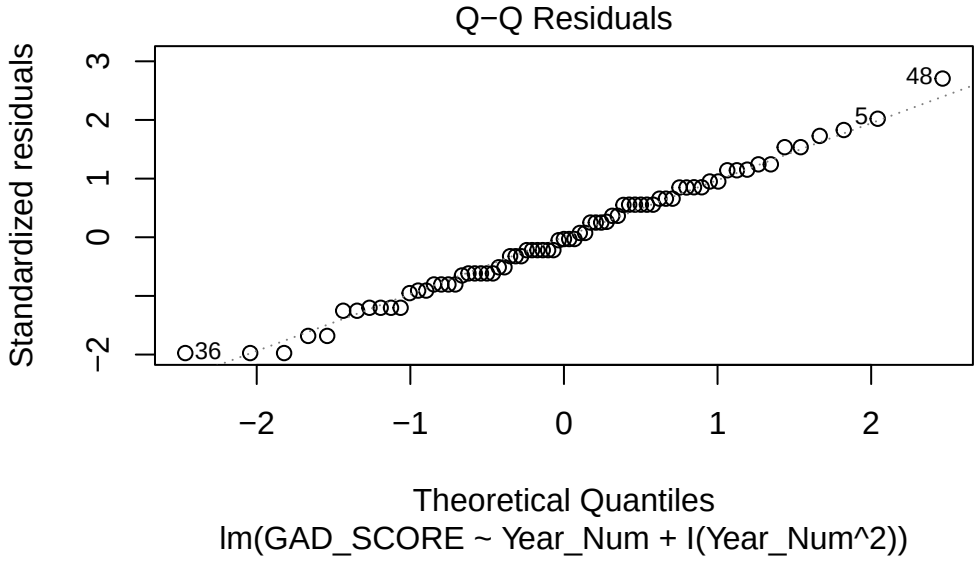
Call:
lm(formula = GAD_SCORE ~ Year_Num + I(Year_Num^2), data = sub_data)

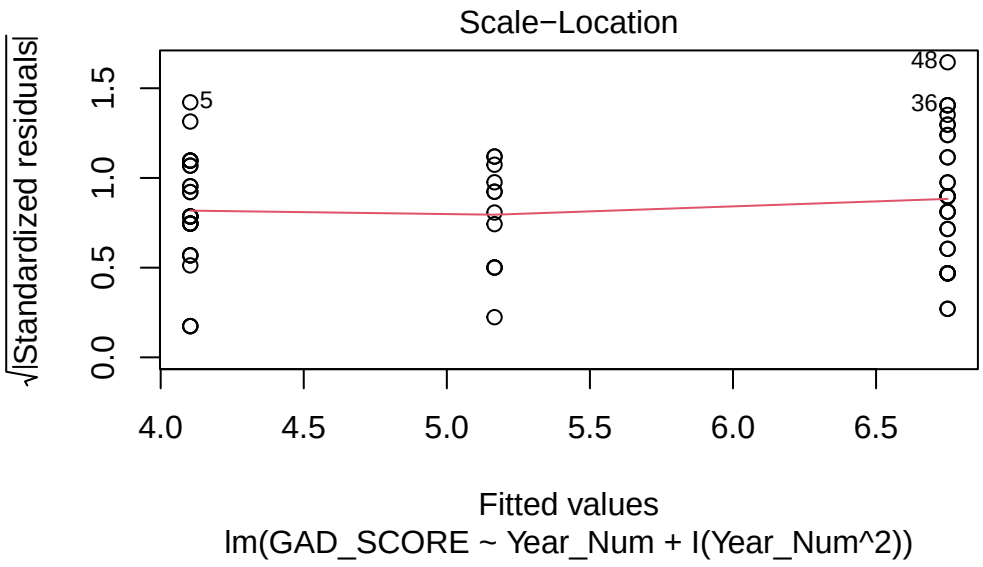
Residuals:
    Min      1Q  Median      3Q     Max
-6.7500 -2.1667 -0.1034  2.2500  9.2500

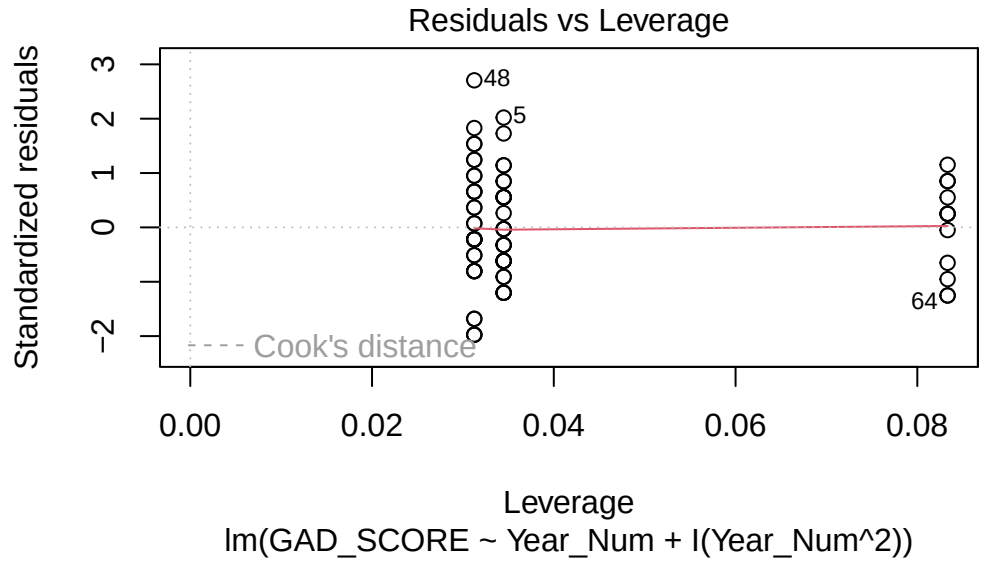
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)     4.1034     0.6449   6.363 1.77e-08 ***
Year_Num        4.7615     1.6416   2.900  0.00498 **
I(Year_Num^2)  -2.1149     0.8557  -2.472  0.01589 *
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.473 on 70 degrees of freedom
Multiple R-squared:  0.113, Adjusted R-squared:  0.0877
F-statistic: 4.461 on 2 and 70 DF,  p-value: 0.01502
```


Residuals vs Fitted
Residuals
10
5
0
−5
48
5
36
4.0
4.5
5.0
5.5
6.0
6.5
Fitted values
lm(GAD_SCORE ~ Year_Num + I(Year_Num^2))


Q−Q Residuals
Standardized residuals
3
2
1
0
−2
48
5
36
−2
−1
0
1
2
Theoretical Quantiles
lm(GAD_SCORE ~ Year_Num + I(Year_Num^2))





==========

ANALYSIS FOR: Class of 2027

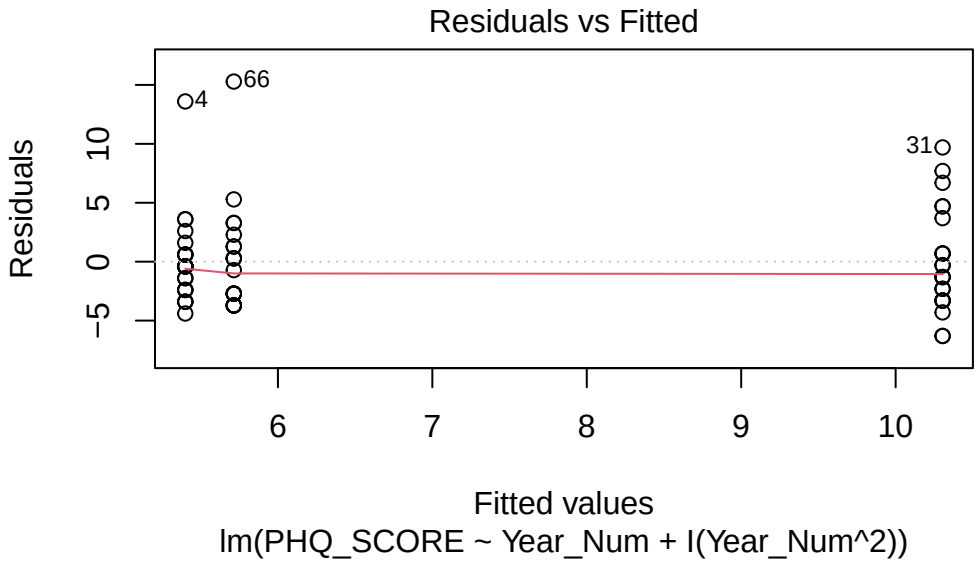
```
[1] "--PHQ--"

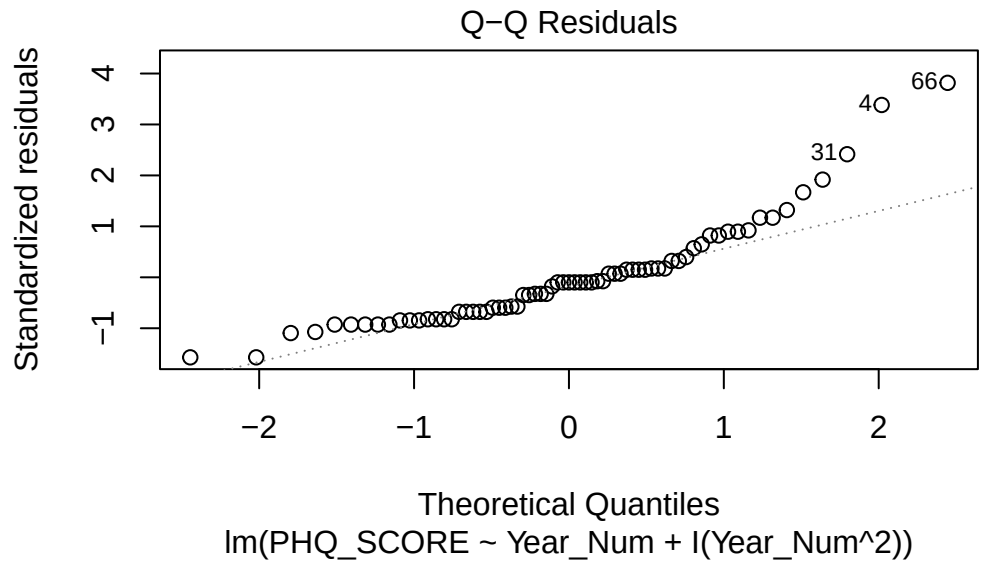
Call:
lm(formula = PHQ_SCORE ~ Year_Num + I(Year_Num^2), data = sub_data)

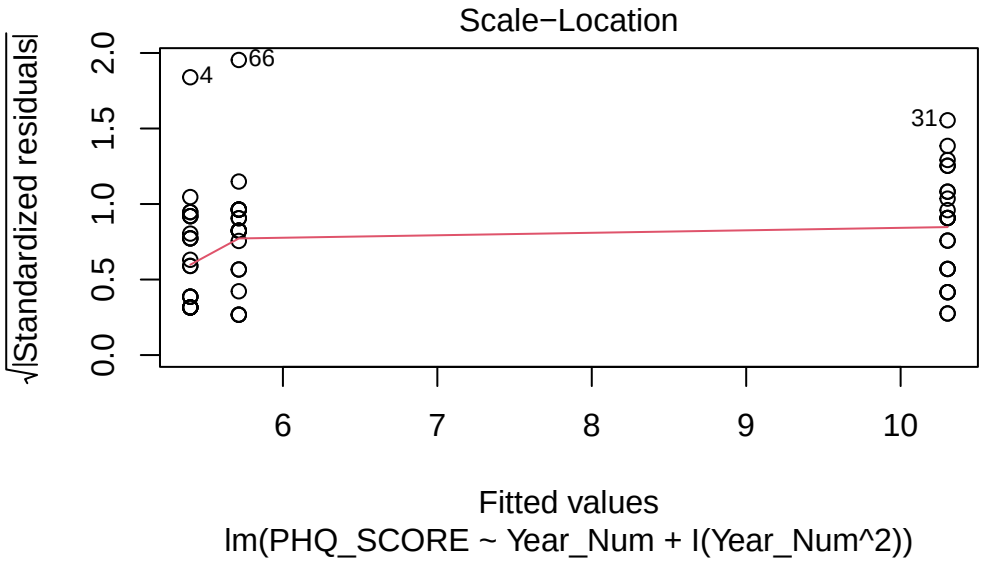
Residuals:
   Min     1Q Median     3Q    Max
-6.304 -2.714 -0.400  1.286 15.286

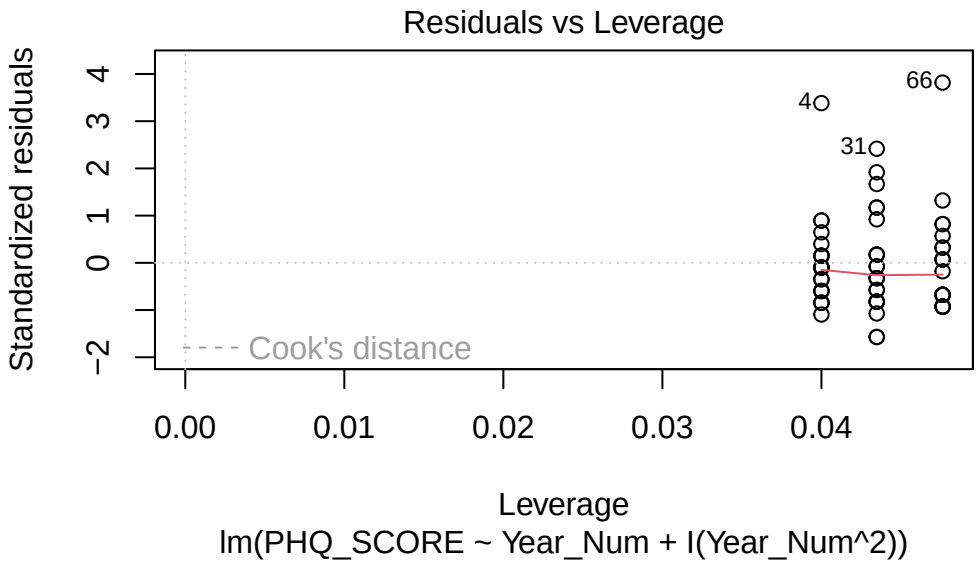
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)     5.4000     0.8206   6.580 8.97e-09 ***
Year_Num        9.6516     2.1549   4.479 3.05e-05 ***
I(Year_Num^2)  -4.7472     1.0492  -4.525 2.59e-05 ***
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.103 on 66 degrees of freedom
Multiple R-squared:  0.2388,    Adjusted R-squared:  0.2158
F-statistic: 10.36 on 2 and 66 DF,  p-value: 0.0001226
```




Q−Q Residuals
Standardized residuals
4
3
2
1
−1
66
4
31
−2
−1
0
1
2
Theoretical Quantiles
lm(PHQ_SCORE ~ Year_Num + I(Year_Num^2))


Scale−Location
√|Standardized residuals|
2.0
1.5
1.0
0.5
0.0
66
4
31
6
7
8
9
10
Fitted values
lm(PHQ_SCORE ~ Year_Num + I(Year_Num^2))



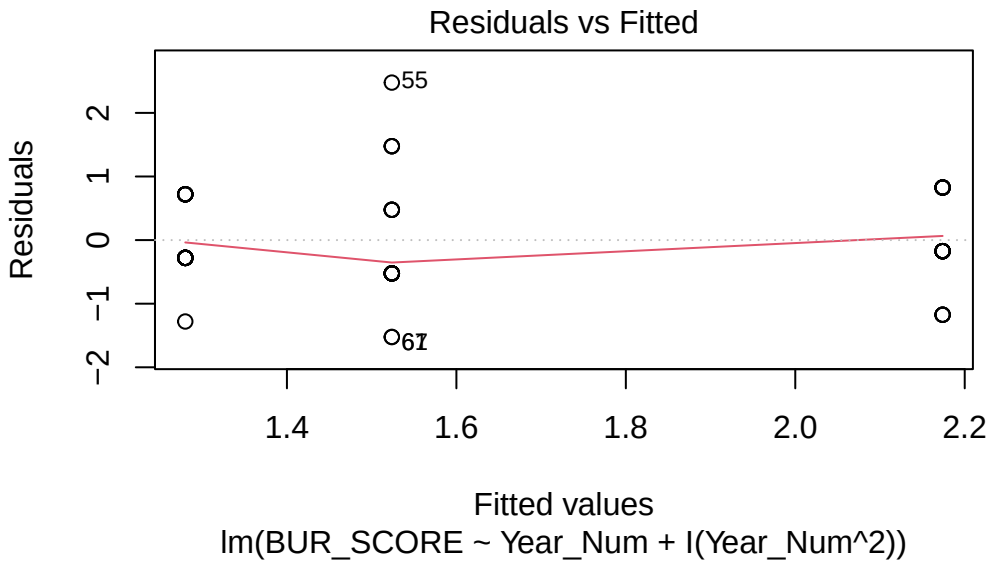

```
[1] "--BUR--"

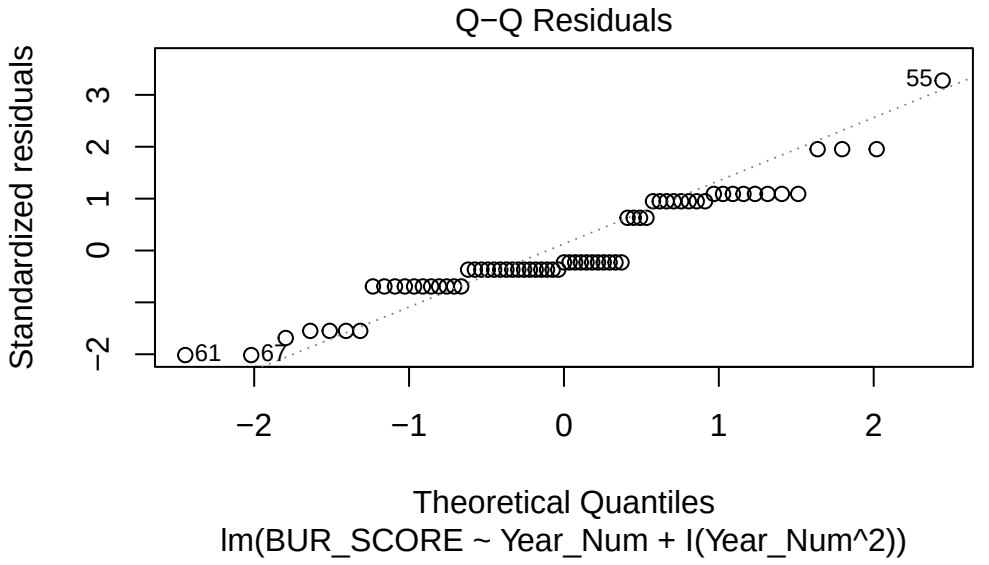
Call:
lm(formula = BUR_SCORE ~ Year_Num + I(Year_Num^2), data = sub_data)

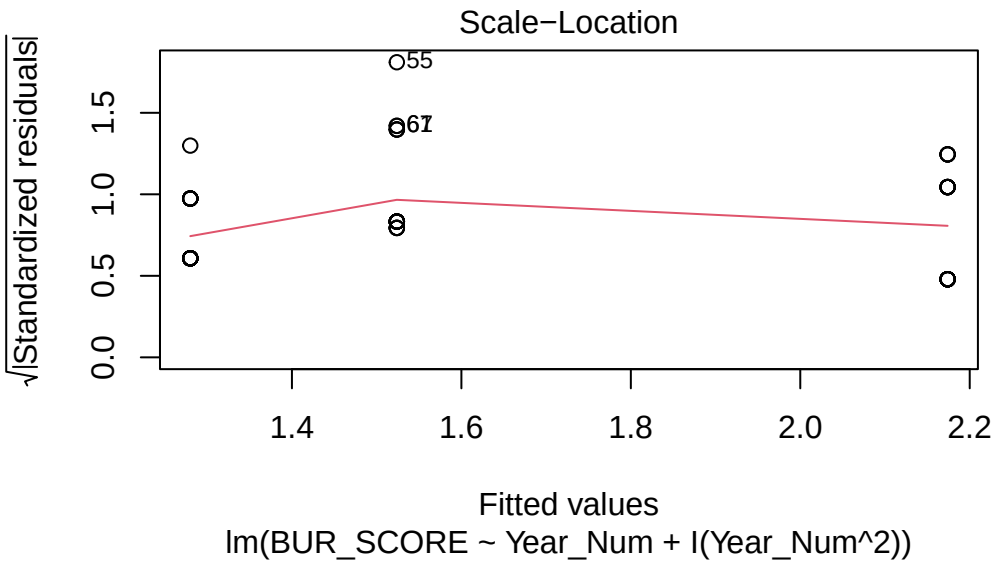
Residuals:
    Min      1Q  Median      3Q     Max
-1.5238 -0.5238 -0.1739  0.7200  2.4762

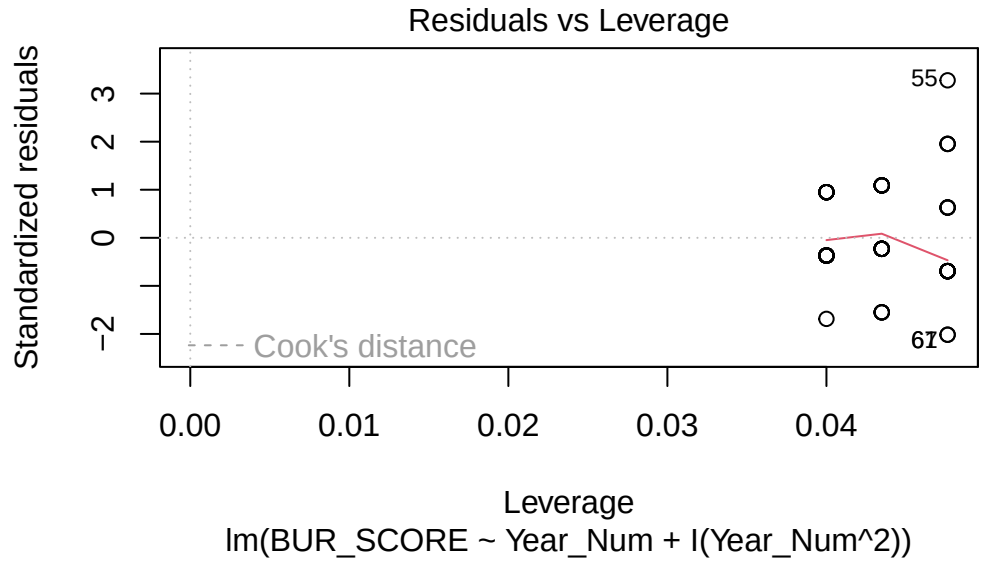
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)     1.2800     0.1549   8.264 8.92e-12 ***
Year_Num        1.6659     0.4067   4.096 0.000117 ***
I(Year_Num^2)  -0.7720     0.1980  -3.899 0.000229 ***
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7744 on 66 degrees of freedom
Multiple R-squared:  0.2028,    Adjusted R-squared:  0.1786
F-statistic: 8.395 on 2 and 66 DF,  p-value: 0.0005644
```


Residuals vs Fitted
Residuals
55
67
−2
−1
0
1
2
1.4
1.6
1.8
2.0
2.2
Fitted values
lm(BUR_SCORE ~ Year_Num + I(Year_Num^2))


Q−Q Residuals
Standardized residuals
55
61
67
−2
0
1
2
3
−2
−1
0
1
2
Theoretical Quantiles
lm(BUR_SCORE ~ Year_Num + I(Year_Num^2))


Scale−Location
√|Standardized residuals|
0.0
0.5
1.0
1.5
55
67
1.4
1.6
1.8
2.0
2.2
Fitted values
lm(BUR_SCORE ~ Year_Num + I(Year_Num^2))


Residuals vs Leverage
Standardized residuals
−2
0
1
2
3
55
67
Cook's distance
0.00
0.01
0.02
0.03
0.04
Leverage
lm(BUR_SCORE ~ Year_Num + I(Year_Num^2))

```
[1] "--GAD--"

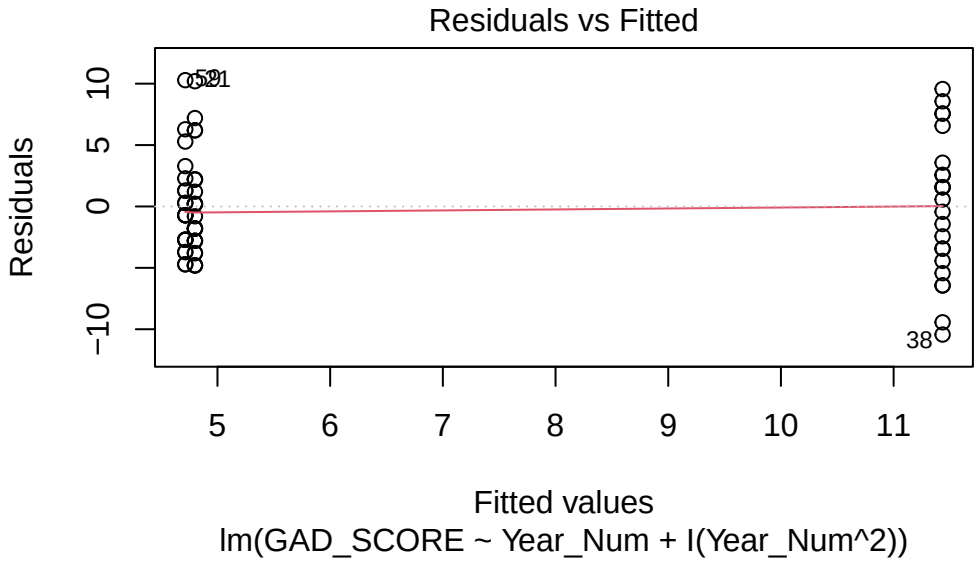
Call:
```

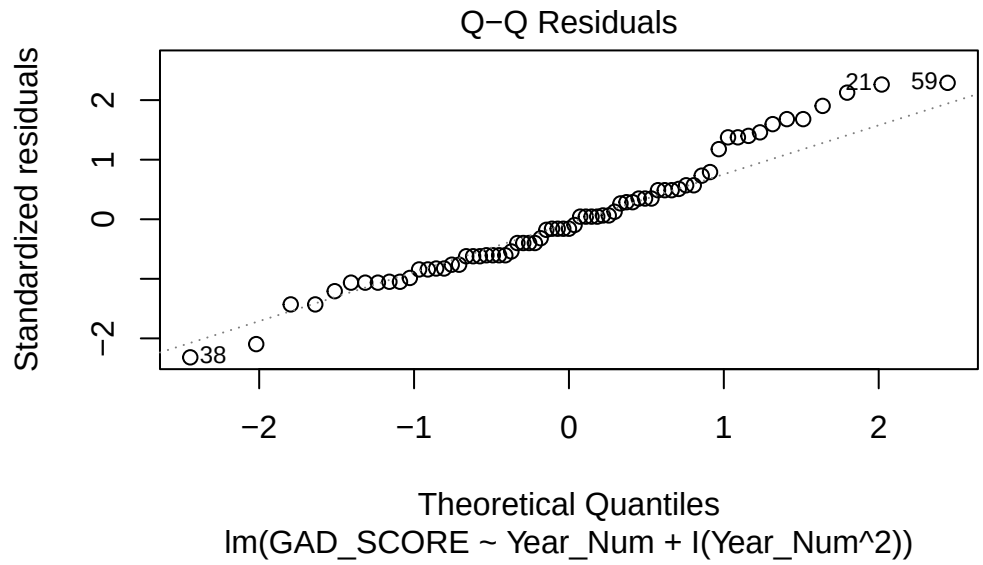
```
lm(formula = GAD_SCORE ~ Year_Num + I(Year_Num^2), data = sub_data)

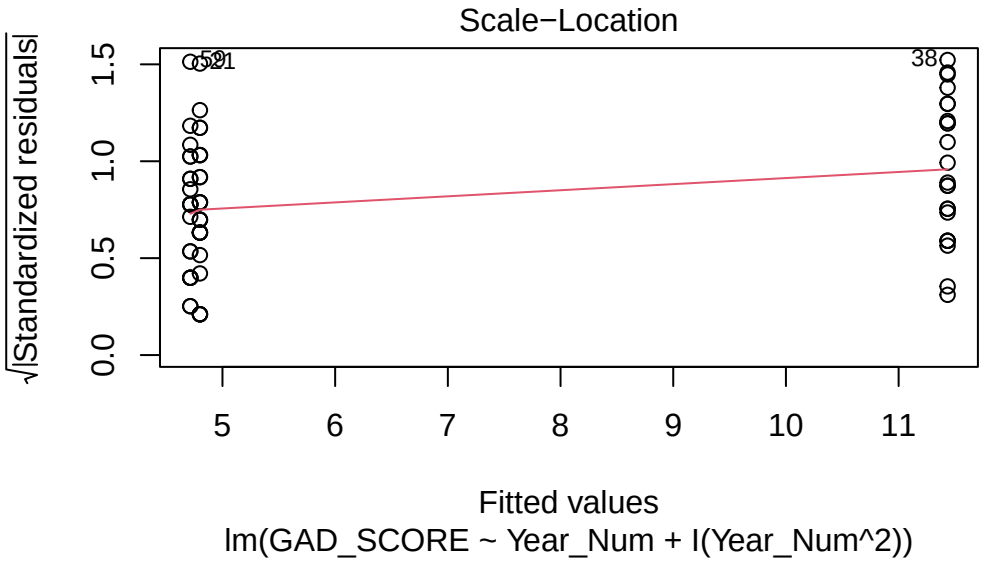
Residuals:
     Min       1Q   Median       3Q      Max
-10.4348  -2.8000  -0.7143   2.2000  10.2857

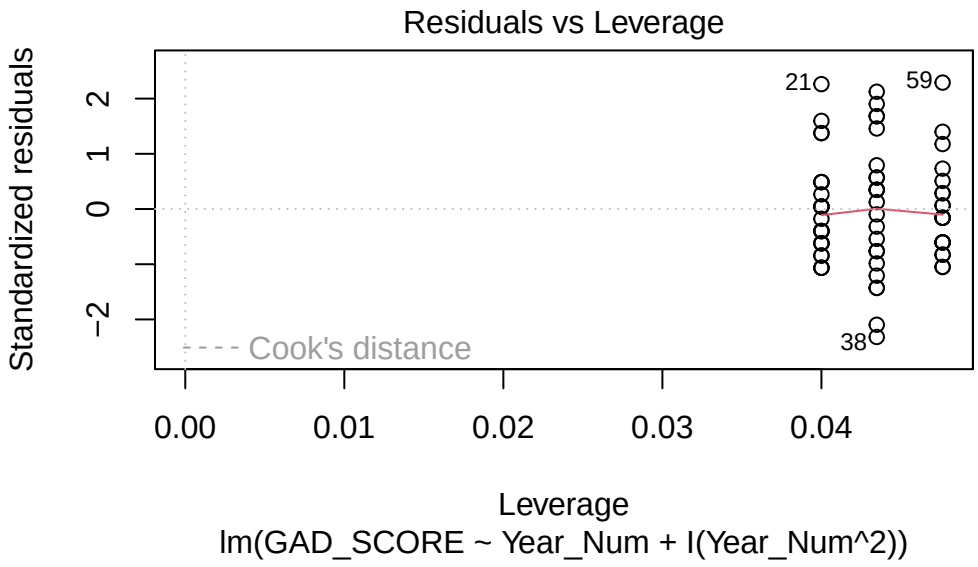
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)     4.8000     0.9205   5.215 1.99e-06 ***
Year_Num       13.3124     2.4170   5.508 6.43e-07 ***
I(Year_Num^2)  -6.6776     1.1768  -5.674 3.36e-07 ***
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.602 on 66 degrees of freedom
Multiple R-squared:  0.3282,    Adjusted R-squared:  0.3079
F-statistic: 16.12 on 2 and 66 DF,  p-value: 1.987e-06
```




Q−Q Residuals
Standardized residuals
21
59
38
−2
−1
0
1
2
Theoretical Quantiles
lm(GAD_SCORE ~ Year_Num + I(Year_Num^2))


Scale−Location
√|Standardized residuals|
52
21
38
0.0
0.5
1.0
1.5
5
6
7
8
9
10
11
Fitted values
lm(GAD_SCORE ~ Year_Num + I(Year_Num^2))




```
Call:
lm(formula = PHQ_SCORE ~ D_YEAR, data = df_recent)

Residuals:
    Min      1Q  Median      3Q     Max
-6.2308 -2.7143 -0.6296  1.3704 15.2857

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   6.2308     1.0715   5.815 1.72e-07 ***
D_YEARD2      2.3989     1.3042   1.839   0.0702 .
D_YEARD3     -0.5165     1.3634  -0.379   0.7060
D_YEARD4     -0.3141     1.5465  -0.203   0.8397
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.863 on 69 degrees of freedom
Multiple R-squared:  0.1103,    Adjusted R-squared:  0.07164
F-statistic: 2.852 on 3 and 69 DF,  p-value: 0.04353
```

```
Call:
lm(formula = BUR_SCORE ~ D_YEAR, data = df_recent)

Residuals:
    Min      1Q  Median      3Q     Max
-1.5238 -0.5000 -0.4074  0.5385  2.4762

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.46154    0.22642   6.455 1.27e-08 ***
D_YEARD2     0.94587    0.27559   3.432  0.00102 **
D_YEARD3     0.06227    0.28811   0.216  0.82952
D_YEARD4     0.03846    0.32682   0.118  0.90666
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8164 on 69 degrees of freedom
Multiple R-squared:  0.2339,    Adjusted R-squared:  0.2006
F-statistic: 7.022 on 3 and 69 DF,  p-value: 0.0003446



Call:
lm(formula = GAD_SCORE ~ D_YEAR, data = df_recent)

Residuals:
    Min      1Q  Median      3Q     Max
-6.5926 -2.7143  0.2857  2.1538 10.2857

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   4.8462     1.0612   4.567  2.1e-05 ***
D_YEARD2      3.7464     1.2917   2.900  0.00499 **
D_YEARD3     -0.1319     1.3503  -0.098  0.92249
D_YEARD4      0.3205     1.5317   0.209  0.83487
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.826 on 69 degrees of freedom
Multiple R-squared:  0.1903,    Adjusted R-squared:  0.1551
F-statistic: 5.405 on 3 and 69 DF,  p-value: 0.002124
```

```
[1] "--- KRUSKAL-WALLIS RESULTS (Holm Adjusted) ---"

    Outcome   Raw_P   Adj_P Signif
PHQ     PHQ 0.00515 0.00913      *
BUR     BUR 0.00058 0.00175      *
GAD     GAD 0.00456 0.00913      *

[1] "--- LINEAR MODEL RESULTS (Holm Adjusted) ---"

            Outcome   Raw_P   Adj_P Signif
PHQ.value PHQ.value 0.04353 0.04353      *
BUR.value BUR.value 0.00034 0.00103      *
GAD.value GAD.value 0.00212 0.00425      *


================================================

PAIRWISE COMPARISONS (2025-2026 Data)

Test: Pairwise Wilcoxon Rank Sum (Holm-Adjusted)

================================================


--- PHQ-9 Pairwise ---


    Pairwise comparisons using Wilcoxon rank sum test with continuity correction

data:  df_recent$PHQ_SCORE and df_recent$D_YEAR

   D1     D2     D3
D2 0.1629 -      -
D3 1.0000 0.0062 -
D4 1.0000 0.0742 1.0000

P value adjustment method: holm


--- Burnout Pairwise ---
```

```
    Pairwise comparisons using Wilcoxon rank sum test with continuity correction

data:  df_recent$BUR_SCORE and df_recent$D_YEAR

   D1     D2     D3
D2 0.0065 -      -
D3 1.0000 0.0105 -
D4 1.0000 0.0105 1.0000

P value adjustment method: holm


--- GAD-7 Pairwise ---


    Pairwise comparisons using Wilcoxon rank sum test with continuity correction

data:  df_recent$GAD_SCORE and df_recent$D_YEAR

   D1    D2    D3
D2 0.061 -     -
D3 1.000 0.018 -
D4 1.000 0.061 1.000

P value adjustment method: holm


Call:
lm(formula = PHQ_SCORE ~ D_YEAR, data = df_all_years_analysis)

Residuals:
    Min      1Q  Median      3Q     Max
-7.7945 -2.7945 -0.6267  2.4684 15.3733

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   7.7945     0.5170  15.076  < 2e-16 ***
D_YEARD2     -0.2629     0.7172  -0.367  0.71424
D_YEARD3     -2.1679     0.7263  -2.985  0.00309 **
D_YEARD4     -2.3945     0.8109  -2.953  0.00342 **
---
```

```
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.417 on 273 degrees of freedom
Multiple R-squared:  0.05549,   Adjusted R-squared:  0.04512
F-statistic: 5.347 on 3 and 273 DF,  p-value: 0.00136



Call:
lm(formula = BUR_SCORE ~ D_YEAR, data = df_all_years_analysis)

Residuals:
     Min       1Q   Median       3Q      Max
-1.98734 -0.60274  0.01266  0.42667  2.42667

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.60274    0.09983  16.055  < 2e-16 ***
D_YEARD2     0.38460    0.13847   2.778  0.00586 **
D_YEARD3    -0.02941    0.14023  -0.210  0.83406
D_YEARD4     0.01726    0.15657   0.110  0.91230
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8529 on 273 degrees of freedom
Multiple R-squared:  0.04206,   Adjusted R-squared:  0.03154
F-statistic: 3.996 on 3 and 273 DF,  p-value: 0.008277



Call:
lm(formula = GAD_SCORE ~ D_YEAR, data = df_all_years_analysis)

Residuals:
    Min      1Q  Median      3Q     Max
-7.7722 -3.7722 -0.3067  2.7000 14.7000

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   6.8082     0.5391  12.629   <2e-16 ***
D_YEARD2      0.9639     0.7478   1.289   0.1985
D_YEARD3     -1.5016     0.7573  -1.983   0.0484 *
```

```
D_YEARD4     -1.5082     0.8455  -1.784   0.0756 .
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.606 on 273 degrees of freedom
Multiple R-squared:  0.05097,   Adjusted R-squared:  0.04054
F-statistic: 4.887 on 3 and 273 DF,  p-value: 0.002515


[1] "--- KRUSKAL-WALLIS RESULTS (All Years Combined, Holm Adjusted) ---"


    Outcome   Raw_P   Adj_P Signif
PHQ     PHQ 0.00197 0.00590      *
BUR     BUR 0.00414 0.00828      *
GAD     GAD 0.00896 0.00896      *


[1] "--- LINEAR MODEL RESULTS (All Years Combined, Holm Adjusted) ---"


            Outcome   Raw_P   Adj_P Signif
PHQ.value PHQ.value 0.00136 0.00408      *
BUR.value BUR.value 0.00828 0.00828      *
GAD.value GAD.value 0.00251 0.00503      *



================================================


PAIRWISE COMPARISONS (All Years Combined)


Test: Pairwise Wilcoxon Rank Sum (Holm-Adjusted)


================================================



--- PHQ-9 Pairwise ---
```

```
    Pairwise comparisons using Wilcoxon rank sum test with continuity correction

data:  df_all_years_analysis$PHQ_SCORE and df_all_years_analysis$D_YEAR

   D1    D2    D3
D2 1.000 -     -
D3 0.039 0.027 -
D4 0.039 0.027 1.000

P value adjustment method: holm


--- Burnout Pairwise ---


    Pairwise comparisons using Wilcoxon rank sum test with continuity correction

data:  df_all_years_analysis$BUR_SCORE and df_all_years_analysis$D_YEAR

   D1    D2    D3
D2 0.013 -     -
D3 1.000 0.018 -
D4 1.000 0.037 1.000

P value adjustment method: holm

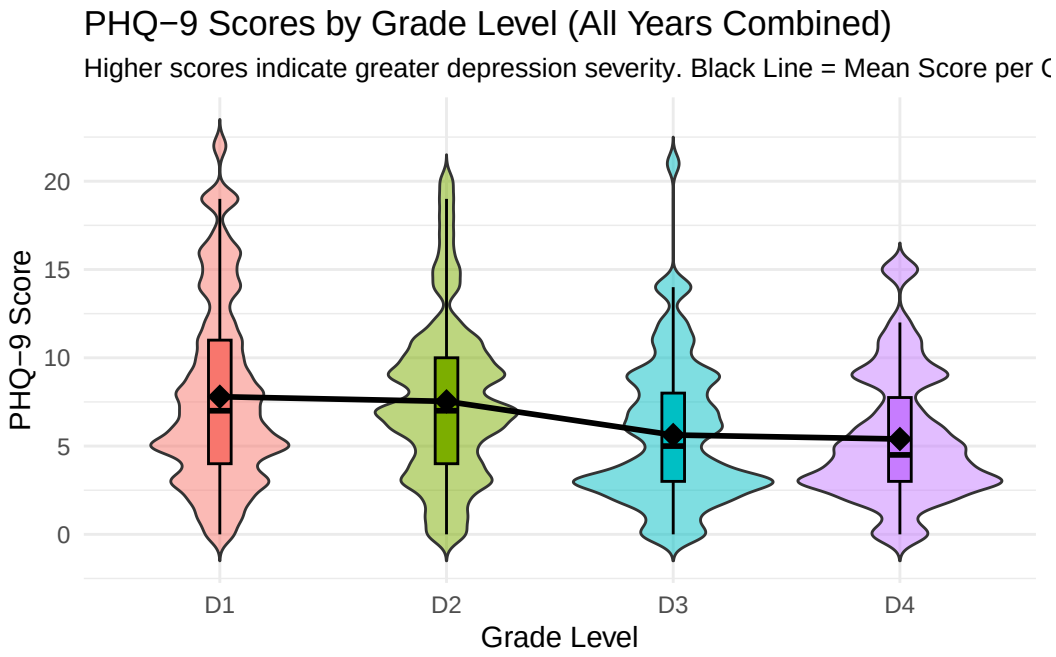

--- GAD-7 Pairwise ---

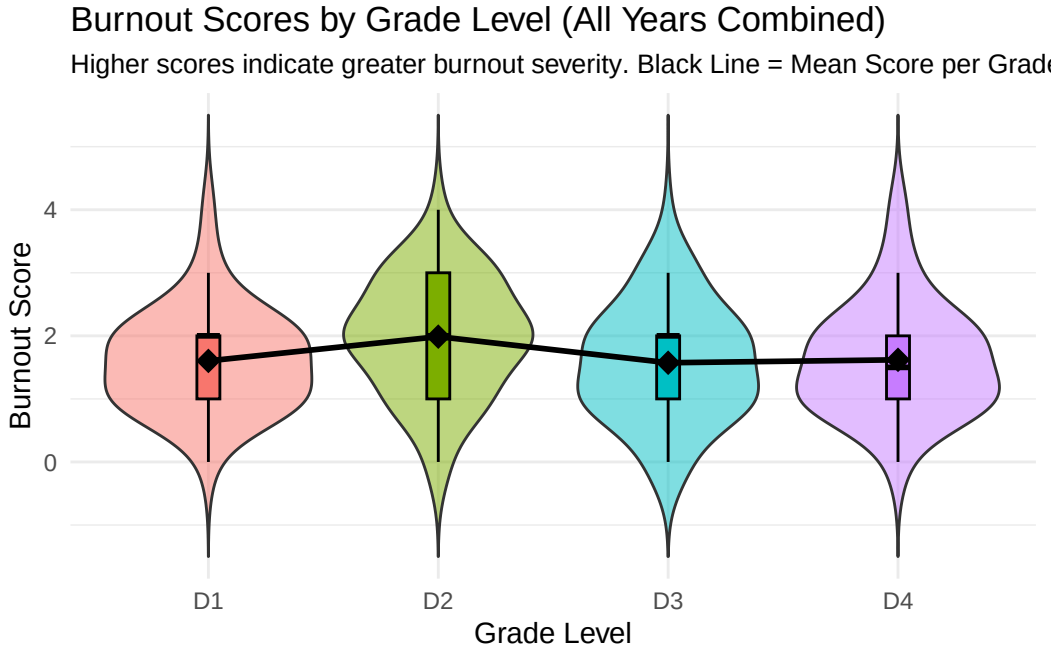

    Pairwise comparisons using Wilcoxon rank sum test with continuity correction

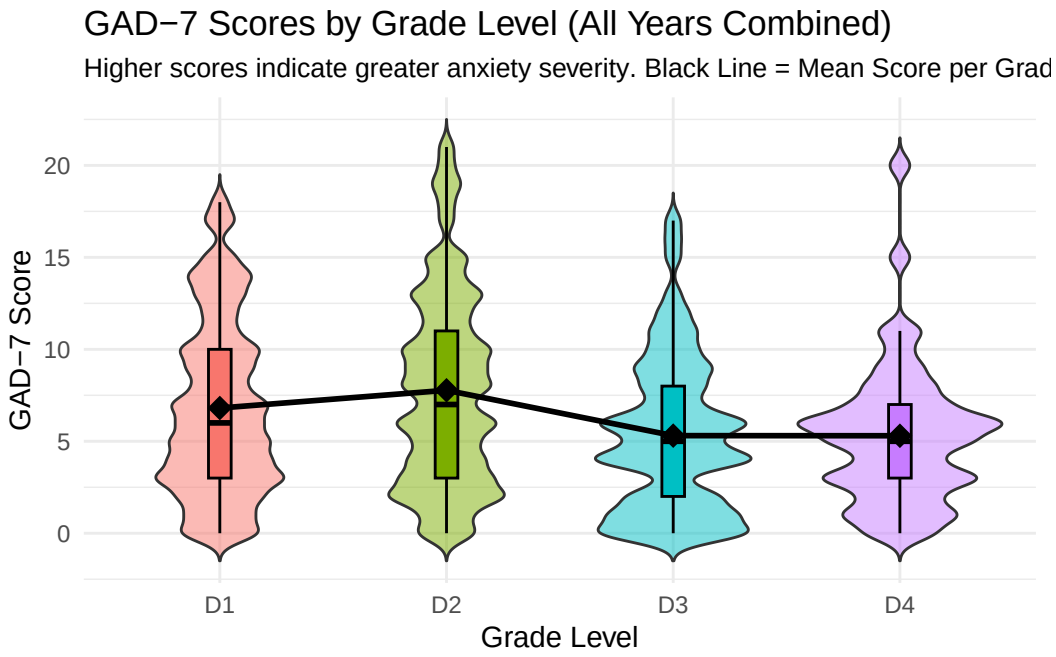
data:  df_all_years_analysis$GAD_SCORE and df_all_years_analysis$D_YEAR

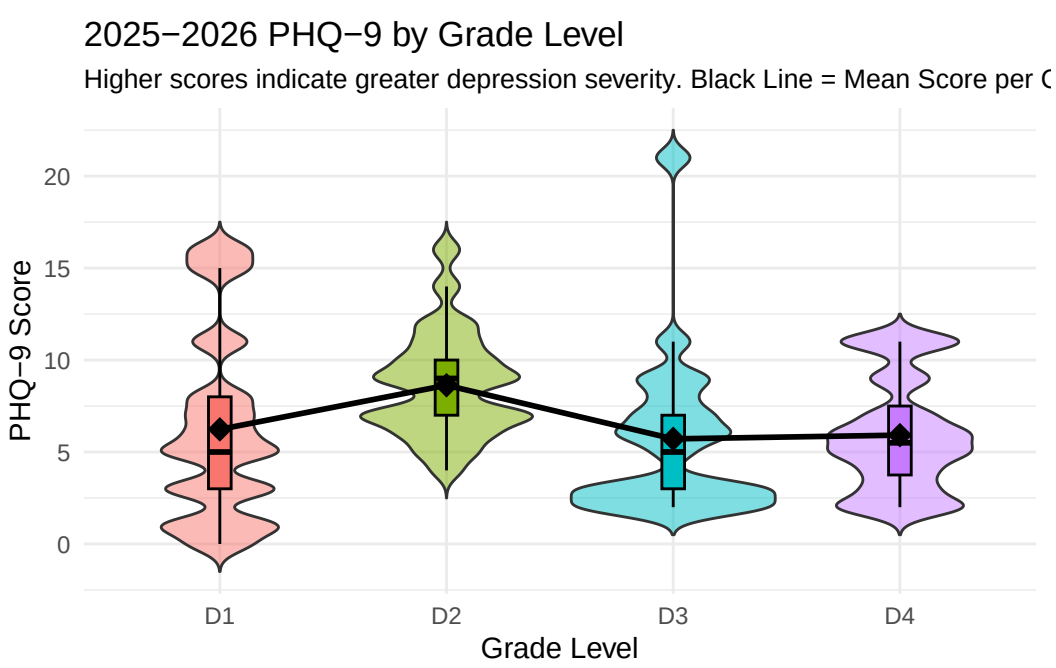
   D1    D2    D3
D2 0.621 -     -
D3 0.255 0.021 -
D4 0.321 0.043 0.893

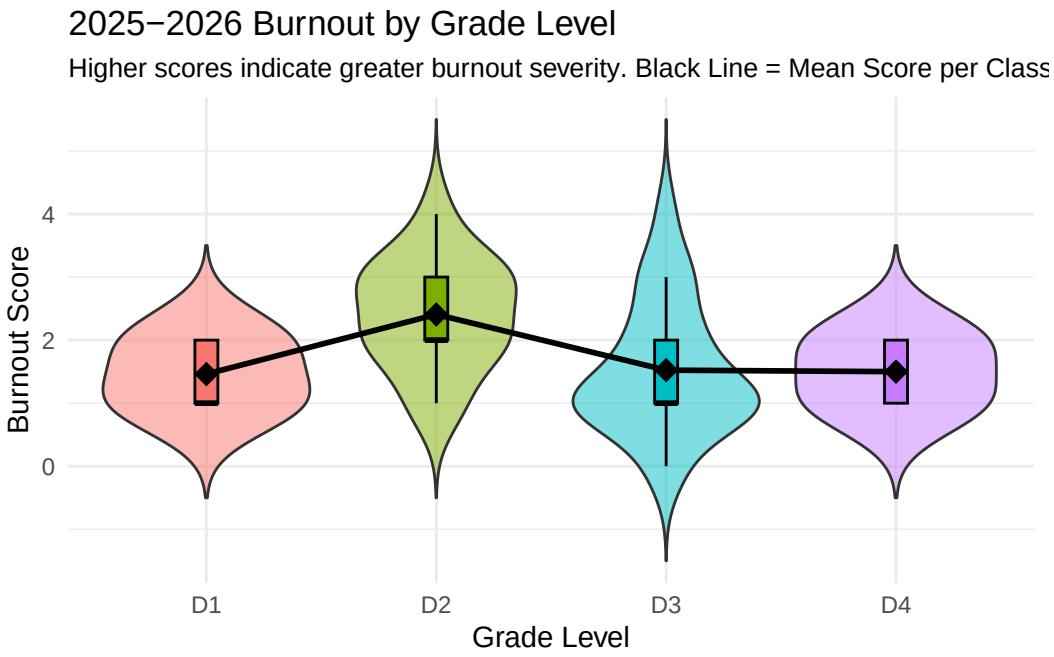
P value adjustment method: holm
```

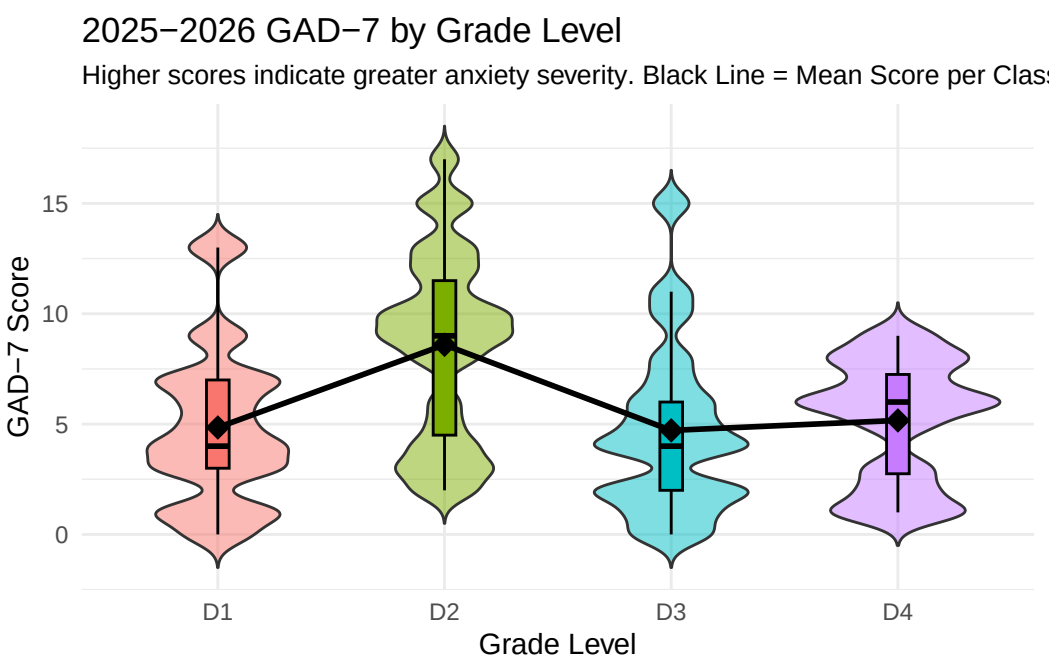

PHQ−9 Scores by Grade Level (All Years Combined)
Higher scores indicate greater depression severity. Black Line = Mean Score per G
PHQ−9 Score
20
15
10
5
0
D1
D2
D3
D4
Grade Level


Burnout Scores by Grade Level (All Years Combined)
Higher scores indicate greater burnout severity. Black Line = Mean Score per Grad
Burnout Score
4
2
0
D1
D2
D3
D4
Grade Level


GAD−7 Scores by Grade Level (All Years Combined)
Higher scores indicate greater anxiety severity. Black Line = Mean Score per Grad
GAD−7 Score
20
15
10
5
0
D1
D2
D3
D4
Grade Level


2025−2026 PHQ−9 by Grade Level
Higher scores indicate greater depression severity. Black Line = Mean Score per C
PHQ−9 Score
20
15
10
5
0
D1
D2
D3
D4
Grade Level


2025−2026 Burnout by Grade Level
Higher scores indicate greater burnout severity. Black Line = Mean Score per Class
Burnout Score
4
2
0
D1
D2
D3
D4
Grade Level


2025−2026 GAD−7 by Grade Level
Higher scores indicate greater anxiety severity. Black Line = Mean Score per Class
GAD−7 Score
15
10
5
0
D1
D2
D3
D4
Grade Level

0.5 SUMMARY (IMPORTANT)

We specifically look at two cohorts, the class of 2026 and 2027. Both the classes had significant negative squared terms for study year for the PHQ and GAD scores*, and significant positive terms for the non squared terms study year. The class of 2026 did not have a statistically significant coefficients for the burnout score, but class of 2027 did, and they also had a negative squared term and positive non squared term.

- note, one significant result (class of 2026 phq squared term) was not significant after doing anti-p-hacking adjustments

TLDR: - people got much worse last year - this year the two cohorts were a bit better than last year in terms of depression (phq) and anxiety (gad), but the scores are still worse than the first year. Evidence for the same pattern for burnout was only found for the class of 2027.

Here are the results from the models

ANALYSIS FOR: Class of 2026

PHQ Coefficients: Estimate Std. Error t value Pr(>|t|)
(Intercept) 4.3103 0.7132 6.044 6.56e-08 ***Year_Num 4.8261 1.8154 2.658 0.00972*** *SIGNIF*
I(Year_Num^2) -2.0115 0.9463 -2.126 0.03706
(note, after correcting for the familiy wise error rate)

BUR Coefficients: Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.4483 0.1490 9.722 1.27e-14 *** Year_Num 0.4526 0.3792 1.194 0.237
I(Year_Num^2) -0.2134 0.1976 -1.079 0.284

GAD Coefficients: Estimate Std. Error t value Pr(>|t|)
(Intercept) 4.1034 0.6449 6.363 1.77e-08 ***Year_Num 4.7615 1.6416 2.900 0.00498*** *SIGNIF*
I(Year_Num^2) -2.1149 0.8557 -2.472 0.01589 SIGNIF

ANALYSIS FOR: Class of 2027

PHQ Coefficients: Estimate Std. Error t value Pr(>|t|)
(Intercept) 5.4000 0.8206 6.580 8.97e-09 ***Year_Num 9.6516 2.1549 4.479 3.05e-05*** SIGNIF
I(Year_Num^2) -4.7472 1.0492 -4.525 2.59e-05 *** SIGNIF

BUR Coefficients: Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.2800 0.1549 8.264 8.92e-12 ***Year_Num 1.6659 0.4067 4.096 0.000117*** SIGNIF
I(Year_Num^2) -0.7720 0.1980 -3.899 0.000229 *** SIGNIF

GAD Coefficients: Estimate Std. Error t value Pr(>|t|)
(Intercept) 4.8000 0.9205 5.215 1.99e-06 ***Year_Num 13.3124 2.4170 5.508 6.43e-07*** SIGNIF
I(Year_Num^2) -6.6776 1.1768 -5.674 3.36e-07 *** SIGNIF

```
================================================

FIRST vs LAST YEAR COMPARISON

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ANALYSIS FOR: Class of 2026
[1] "--PHQ (First vs Last)--"

Call:
lm(formula = PHQ_SCORE ~ Year_Num, data = sub_data)

Residuals:
    Min      1Q  Median      3Q     Max
-4.3103 -2.3103 -0.9167  1.6897 14.6897

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   4.3103     0.6827   6.314  1.9e-07 ***
Year_Num      0.8032     0.6310   1.273    0.211
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.676 on 39 degrees of freedom
Multiple R-squared:  0.03989,   Adjusted R-squared:  0.01527
F-statistic:  1.62 on 1 and 39 DF,  p-value: 0.2106

[1] "--BUR (First vs Last)--"

Call:
lm(formula = BUR_SCORE ~ Year_Num, data = sub_data)

Residuals:
    Min      1Q  Median      3Q     Max
-1.4483 -0.4483  0.5000  0.5517  1.5517

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
```

```
(Intercept)  1.44828    0.14002   10.34 9.74e-13 ***
Year_Num     0.02586    0.12940    0.20    0.843
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.754 on 39 degrees of freedom
Multiple R-squared:  0.001023,  Adjusted R-squared:  -0.02459
F-statistic: 0.03994 on 1 and 39 DF,  p-value: 0.8426

[1] "--GAD (First vs Last)--"

Call:
lm(formula = GAD_SCORE ~ Year_Num, data = sub_data)

Residuals:
    Min      1Q  Median      3Q     Max
-4.1667 -2.1034 -0.1034  1.8966  6.8966

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   4.1034     0.5534   7.415 5.81e-09 ***
Year_Num      0.5316     0.5114   1.039    0.305
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.98 on 39 degrees of freedom
Multiple R-squared:  0.02696,   Adjusted R-squared:  0.002006
F-statistic:  1.08 on 1 and 39 DF,  p-value: 0.305


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ANALYSIS FOR: Class of 2027
[1] "--PHQ (First vs Last)--"

Call:
lm(formula = PHQ_SCORE ~ Year_Num, data = sub_data)

Residuals:
   Min     1Q Median     3Q    Max
-4.400 -2.714 -0.400  1.114 15.286
```

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   5.4000     0.7956   6.787 2.35e-08 ***
Year_Num      0.1571     0.5888   0.267    0.791
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.978 on 44 degrees of freedom
Multiple R-squared:  0.001616,  Adjusted R-squared:  -0.02107
F-statistic: 0.07124 on 1 and 44 DF,  p-value: 0.7908

[1] "--BUR (First vs Last)--"

Call:
lm(formula = BUR_SCORE ~ Year_Num, data = sub_data)

Residuals:
    Min      1Q  Median      3Q     Max
-1.5238 -0.5238 -0.2800  0.6591  2.4762

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   1.2800     0.1603   7.983 4.26e-10 ***
Year_Num      0.1219     0.1187   1.027     0.31
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.8017 on 44 degrees of freedom
Multiple R-squared:  0.02343,   Adjusted R-squared:  0.001234
F-statistic: 1.056 on 1 and 44 DF,  p-value: 0.3098

[1] "--GAD (First vs Last)--"

Call:
lm(formula = GAD_SCORE ~ Year_Num, data = sub_data)

Residuals:
    Min      1Q  Median      3Q     Max
-4.8000 -2.7786 -0.7143  1.9714 10.2857

Coefficients:
```

```
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  4.80000    0.78641   6.104 2.38e-07 ***
Year_Num    -0.04286    0.58195  -0.074    0.942
---
Signif. codes:
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.932 on 44 degrees of freedom
Multiple R-squared:  0.0001232, Adjusted R-squared:  -0.0226
F-statistic: 0.005423 on 1 and 44 DF,  p-value: 0.9416



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ANALYSIS FOR: Class of 2026
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Call:
lm(formula = PHQ_SCORE ~ Year_Num + D_YEAR, data = sub_data)

Residuals:
    Min      1Q  Median      3Q     Max
-4.3103 -2.3103 -0.9167  1.6897 14.6897

Coefficients: (1 not defined because of singularities)
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   4.3103     0.6827   6.314  1.9e-07 ***
Year_Num      0.8032     0.6310   1.273    0.211
D_YEARD4          NA         NA      NA       NA
---
Signif. codes:
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D_YEARD4          NA         NA      NA       NA    
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Coefficients: (1 not defined because of singularities)
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(Intercept)   5.4000     0.7956   6.787 2.35e-08 ***
Year_Num      0.1571     0.5888   0.267    0.791
D_YEARD3          NA         NA      NA       NA
---
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F-statistic: 0.07124 on 1 and 44 DF,  p-value: 0.7908

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lm(formula = BUR_SCORE ~ Year_Num + D_YEAR, data = sub_data)

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Year_Num    -0.04286    0.58195  -0.074    0.942
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