

Mental Health Analysis: 2023-2026

Carson Trego

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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"	"COLUMNS.txt"
[3] "debug_means.py"	"doNotModifyJustRead"
[5] "inspect_data.py"	"prompt.txt"
[7] "qmdReport.pdf"	"qmdReport.qmd"
[9] "qmdReportSend.html"	"qmdReportSend.qmd"

```
[11] "qmdReportSend.rmarkdown" "qmdReportSend_files"
[13] "sensitivity_check.py"     "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
  <dtm>          <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 on
#   `Over the last 2 weeks, how often have you felt sad, low, down, depressed or hopeless?\nMark on
#   `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 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?"

[6] "Over the last 2 weeks, how often have you had trouble falling or staying asleep, or sleeping too much?"

[7] "Over the last 2 weeks, how often have you felt tired or had little energy?"

[8] "Over the last 2 weeks, how often have you had a poor appetite or overeaten?"

[9] "Over the last 2 weeks, how often have you felt bad about yourself, or that you are a failure or worthless?"

[10] "Over the last 2 weeks, how often have you had trouble concentrating on things, such as reading the newspaper, watching television, or listening to the radio?"

[11] "Over the last 2 weeks, how often have you moved or spoken so slowly that other people could have noticed?"

[12] "Using your definition of \"burnout\", please select one of the answers below:"

[13] "In the last 2 weeks, how often are you feeling nervous, anxious, or on edge?"

[14] "In the last 2 weeks, how often have you not been able to stop or control worrying?"

[15] "In the last 2 weeks, how often have you been worrying too much about different things?"

[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 it 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 only one oval."

[5] "Over the last 2 weeks, how often have you felt sad, low, down, depressed or hopeless?\nMark only one oval."

[6] "Over the last 2 weeks, how often have you had trouble falling or staying asleep, or sleeping too much?\nMark only one oval."

[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 oval."

[9] "Over the last 2 weeks, how often have you felt bad about yourself, or that you are a failure or worthless?\nMark only one oval."

[10] "Over the last 2 weeks, how often have you had trouble concentrating on things, such as reading?"

[11] "Over the last 2 weeks, how often have you moved or spoken so slowly that other people could be so fidgety or restless that you have been moving around a lot more than usual? \nMark only one oval."

[12] "Using your definition of \"burnout\", please select one of the answers below:\nMark only one oval."

[13] "In the last 2 weeks, how often are you feeling nervous, anxious, or on edge?\nMark only one oval."

[14] "In the last 2 weeks, how often have you not been able to stop or control worrying?\nMark only one oval."

[15] "In the last 2 weeks, how often have you been worrying too much about different things?\nMark only one oval."

[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 it is hard to sit still?\nMark only one oval."

[18] "In the last 2 weeks, how often have you become easily annoyed or irritable?\nMark only one oval."

[19] "In the last 2 weeks, how often have you felt afraid as if something awful might happen?\nMark only one oval."

[20] "Are you familiar with UNMC CAPS that offers in-person and Telehealth counseling services?\nMark only one oval."

[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 sleeping too much?"

[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 reading or watching TV?"

[8] "Over the last two weeks, how often have you moved or spoken so slowly that other people could be so fidgety or restless that you have been moving around a lot more than usual?"

[9] "Using your own definition of \"burnout\", please select one of the answers below:"

[10] "In the last two weeks, how often are you feeling nervous, anxious, or on edge?"

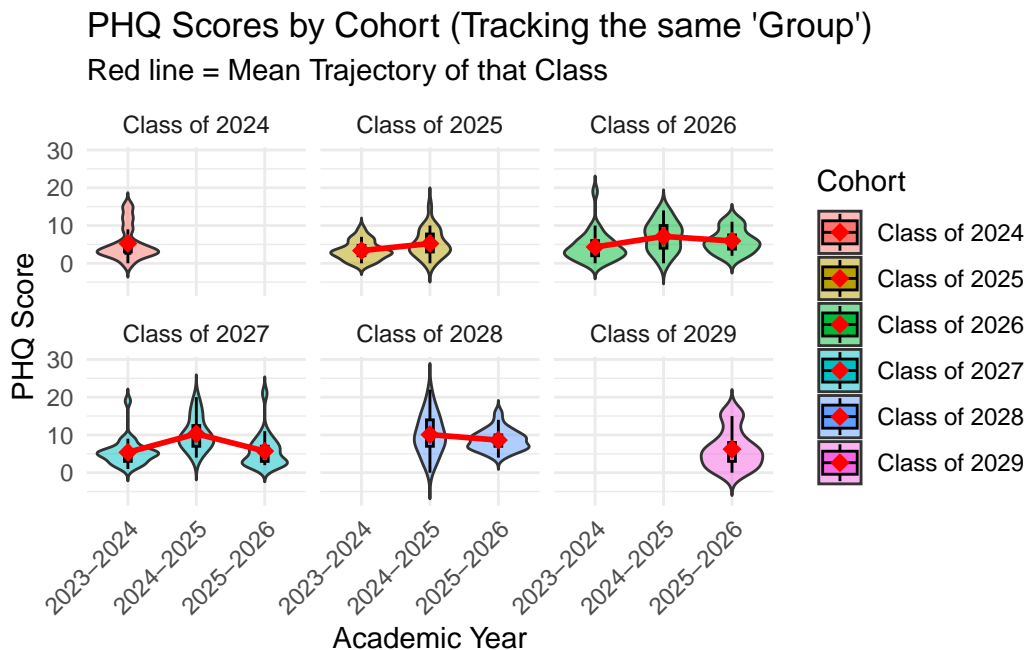
[11] "In the last two weeks, how often have you not been able to stop or control worrying?"

[12] "In the last two weeks, how often have you been worrying too much about different things?"
 [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?"
 [15] "In the last two weeks, how often have you become easily annoyed or irritable?"
 [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 too much?"
 [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 reading the newspaper or watching television?"
 [8] "Over the last two weeks, how often have you moved or spoken so slowly that other people could have noticed? Or, how often have you been so fidgety or restless that you have been moving around a lot more than usual?"

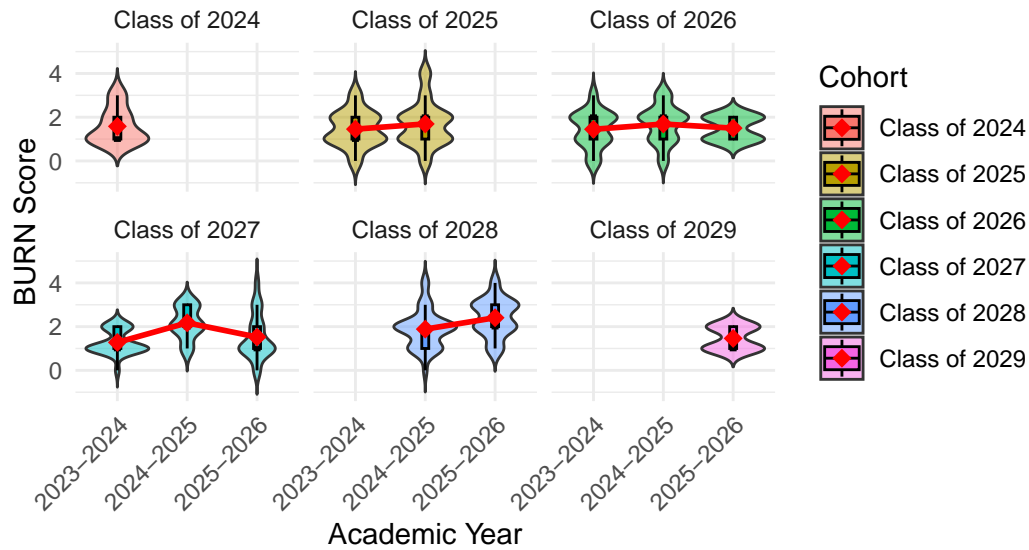
0.3 PLOTTING (IMPORTANT)

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



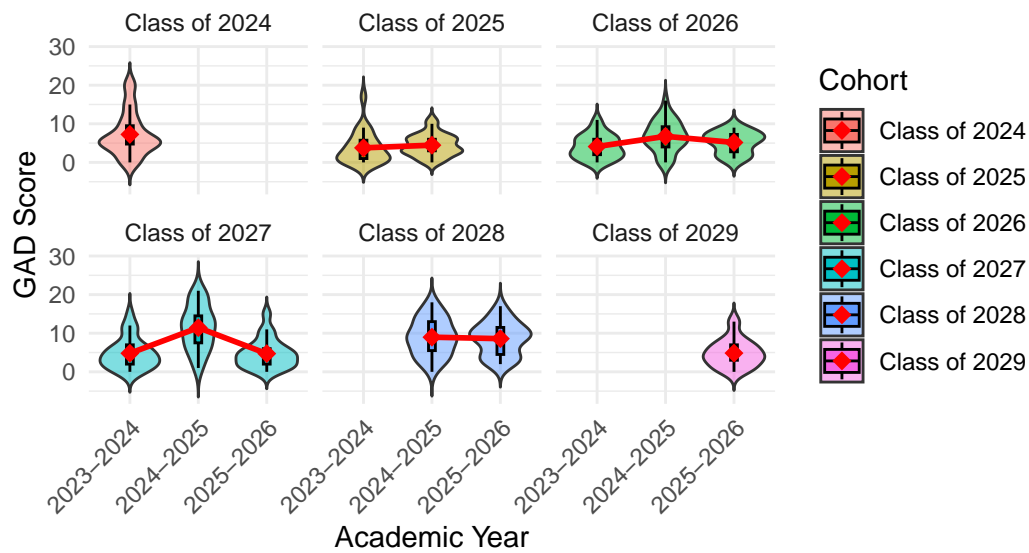
BURN Scores by Cohort

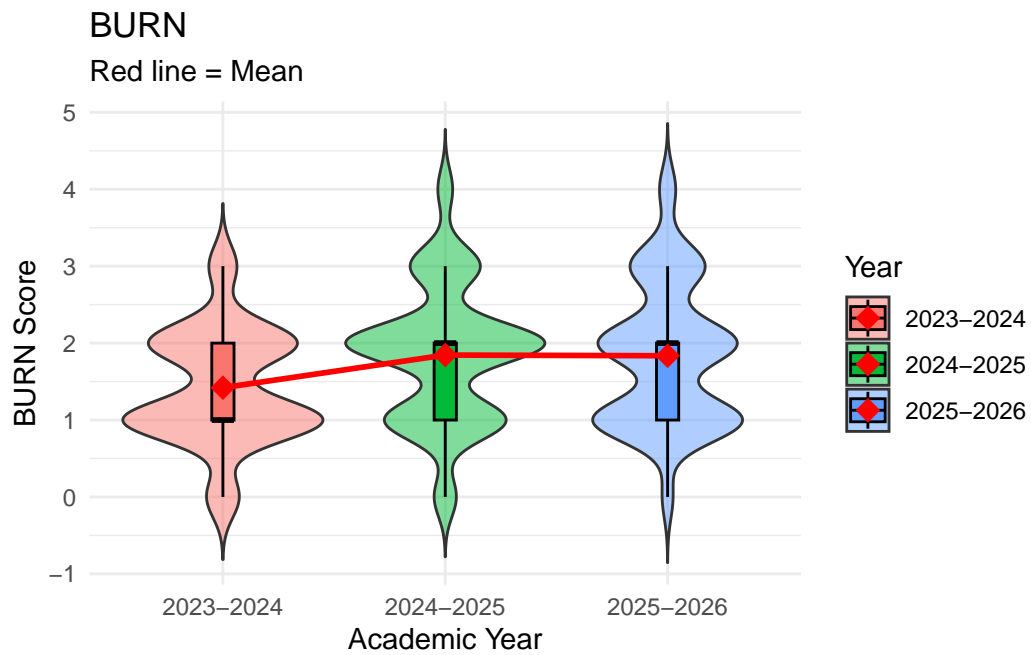
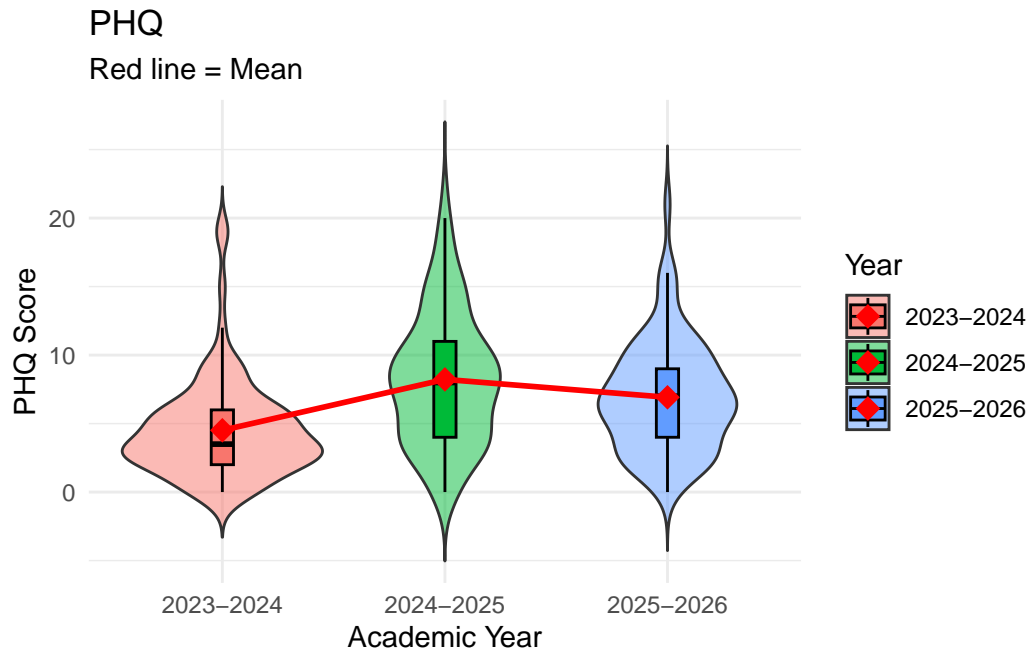
Red line = Mean Trajectory of that Class

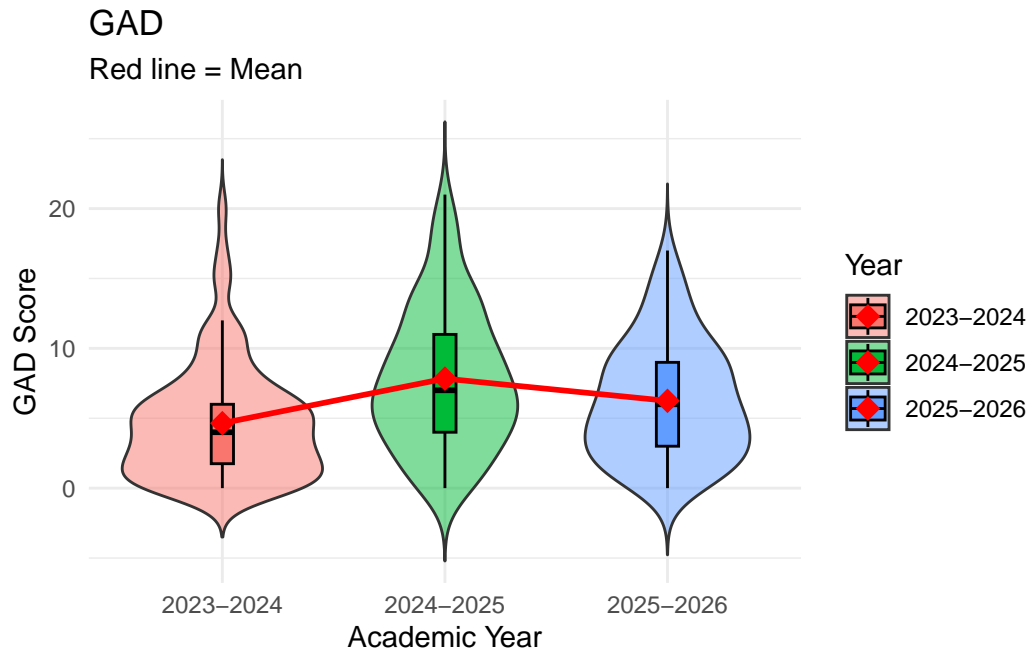


GAD Scores by Cohort

Red line = Mean Trajectory of that Class







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

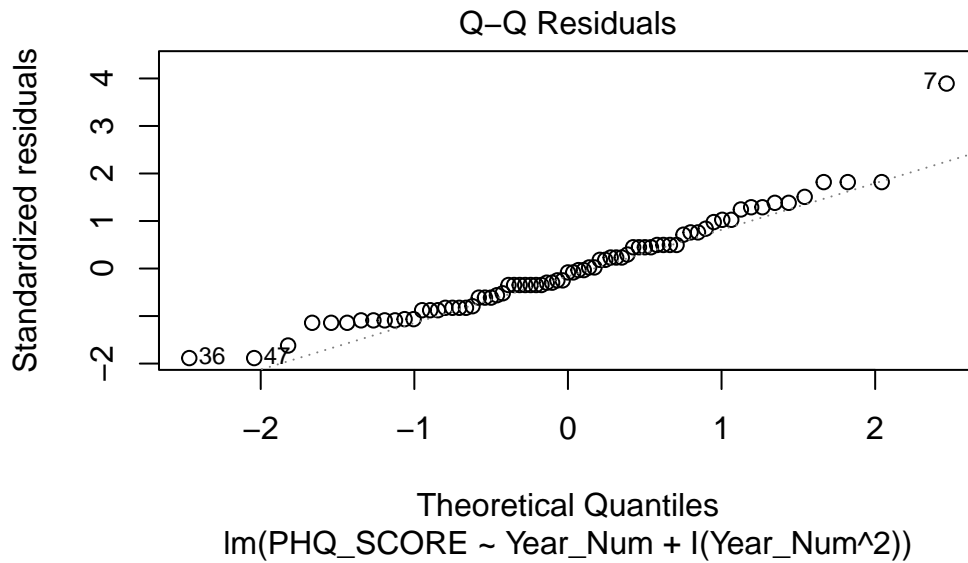
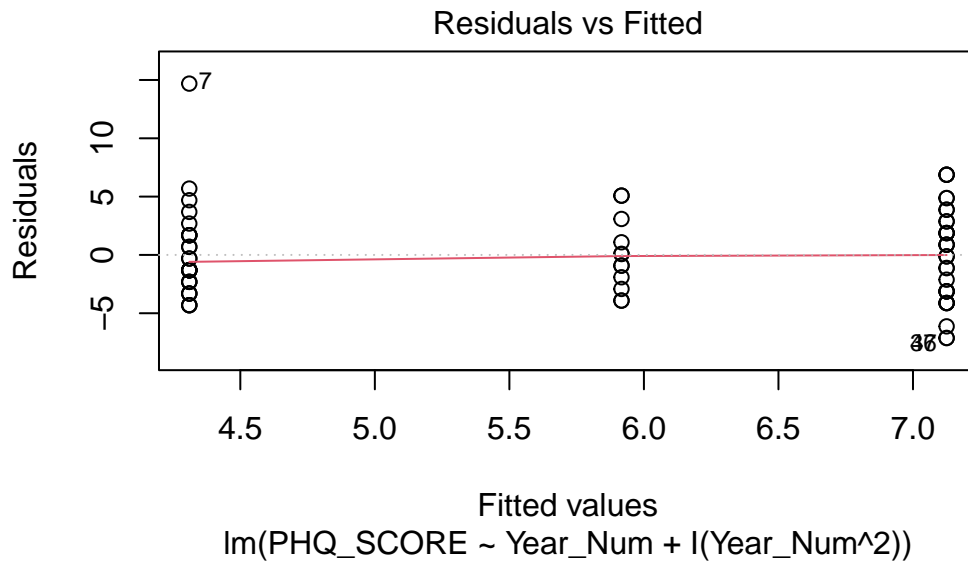
Coefficients:

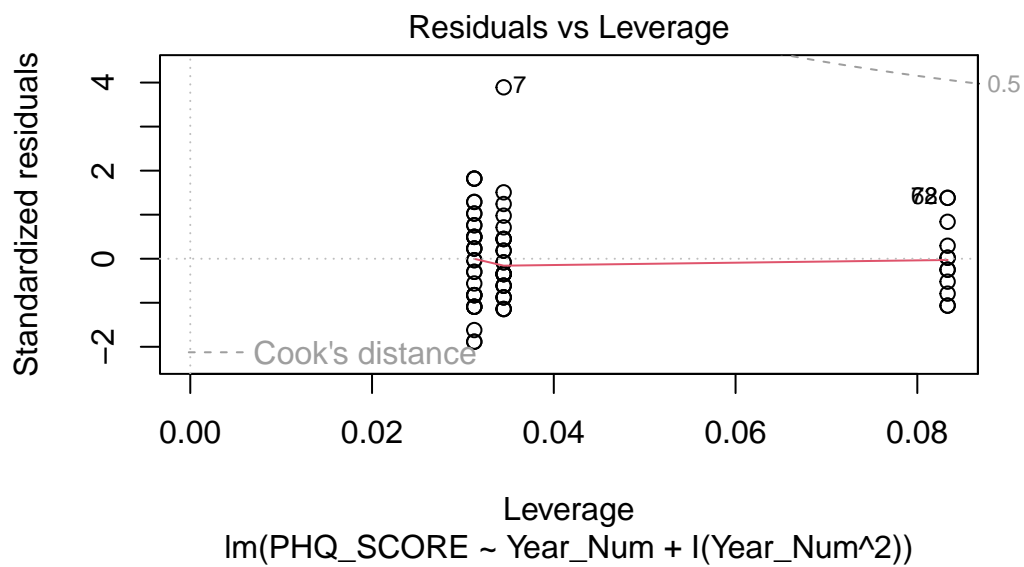
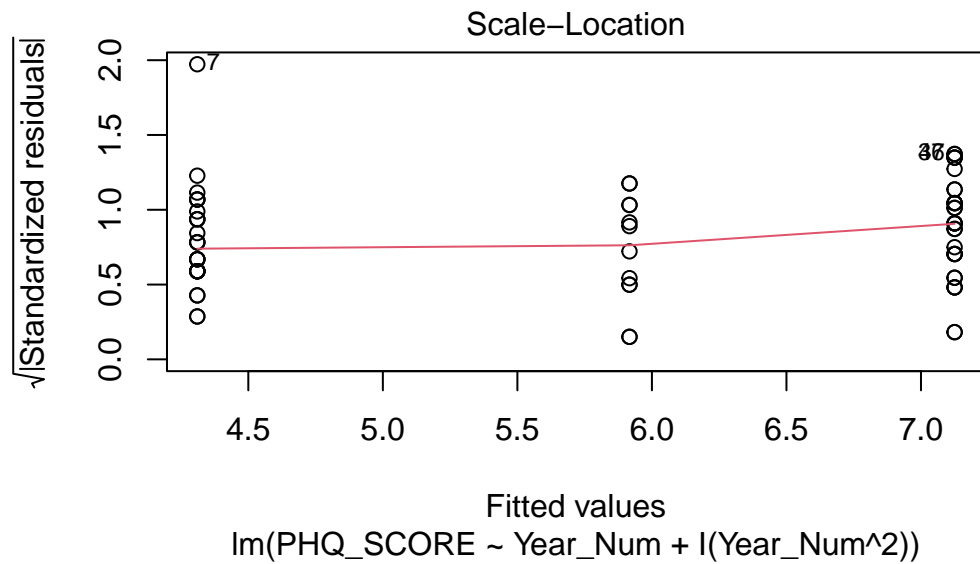
	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	4.3103	0.7132	6.044	6.56e-08	***
Year_Num	4.8261	1.8154	2.658	0.00972	**
I(Year_Num^2)	-2.0115	0.9463	-2.126	0.03706	*

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





[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	

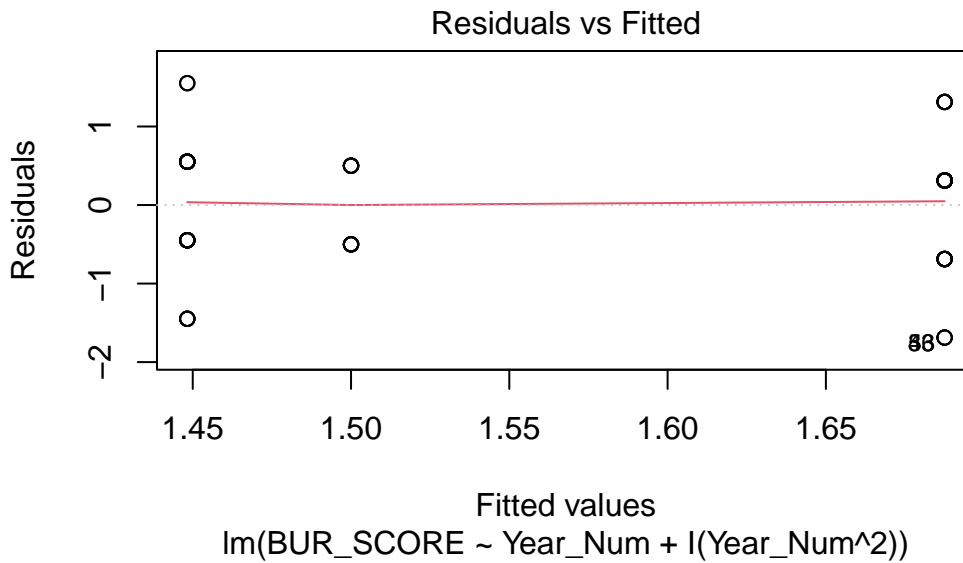
Signif. codes:

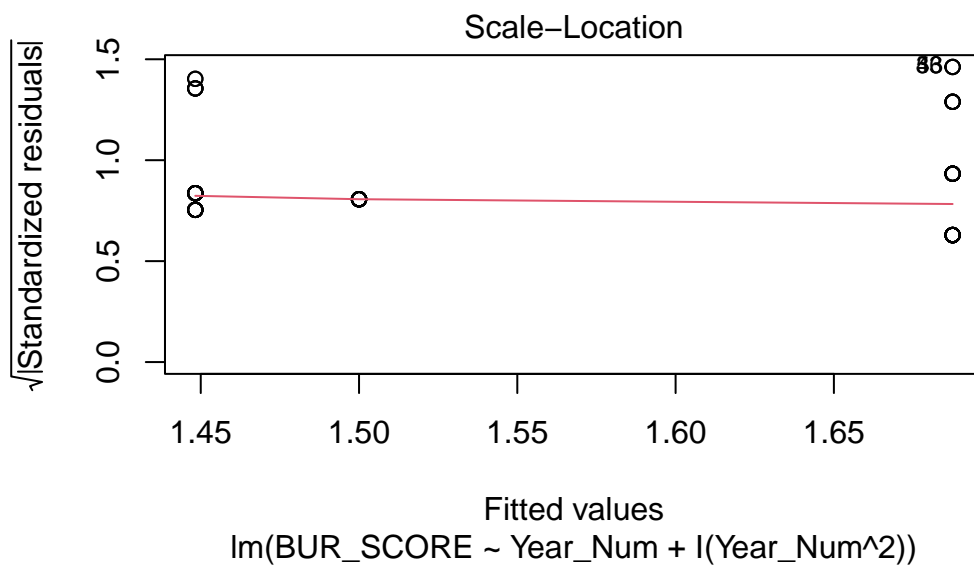
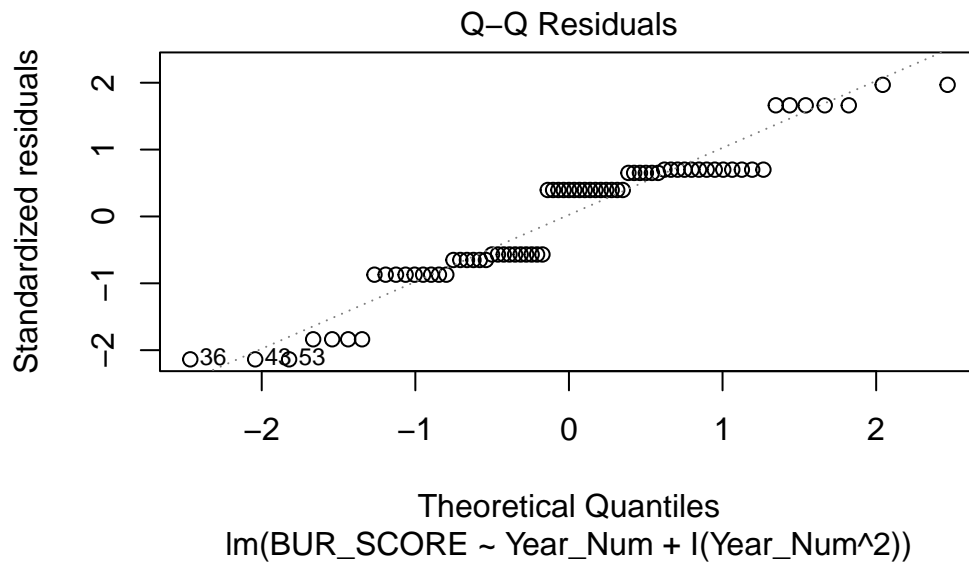
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

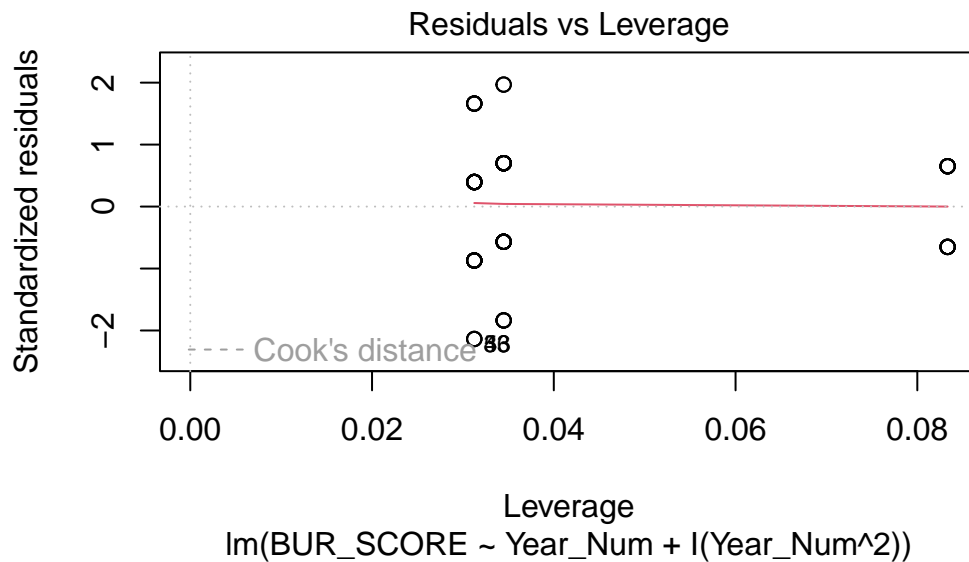
Residual standard error: 0.8022 on 70 degrees of freedom

Multiple R-squared: 0.02012, Adjusted R-squared: -0.007872

F-statistic: 0.7188 on 2 and 70 DF, p-value: 0.4909







```
[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	*

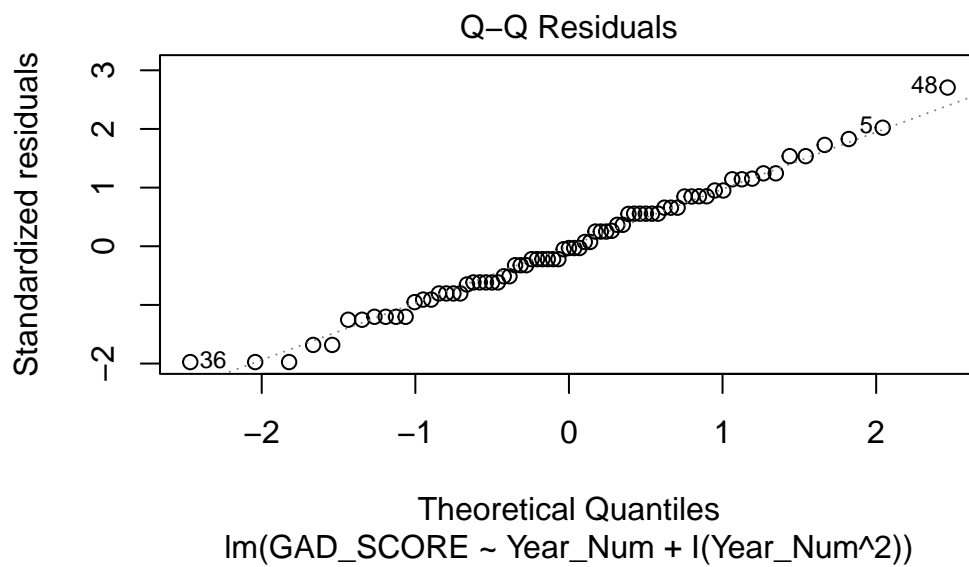
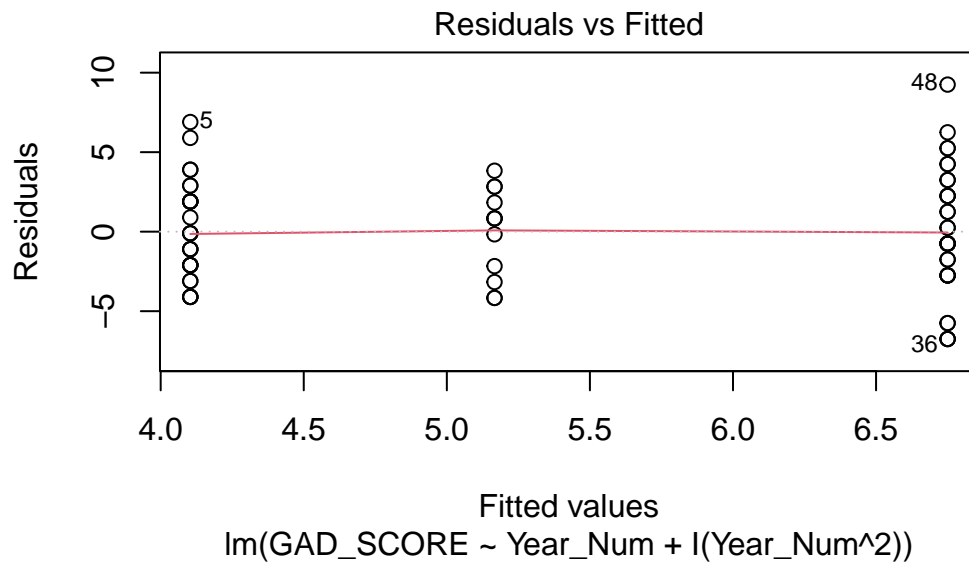
Signif. codes:

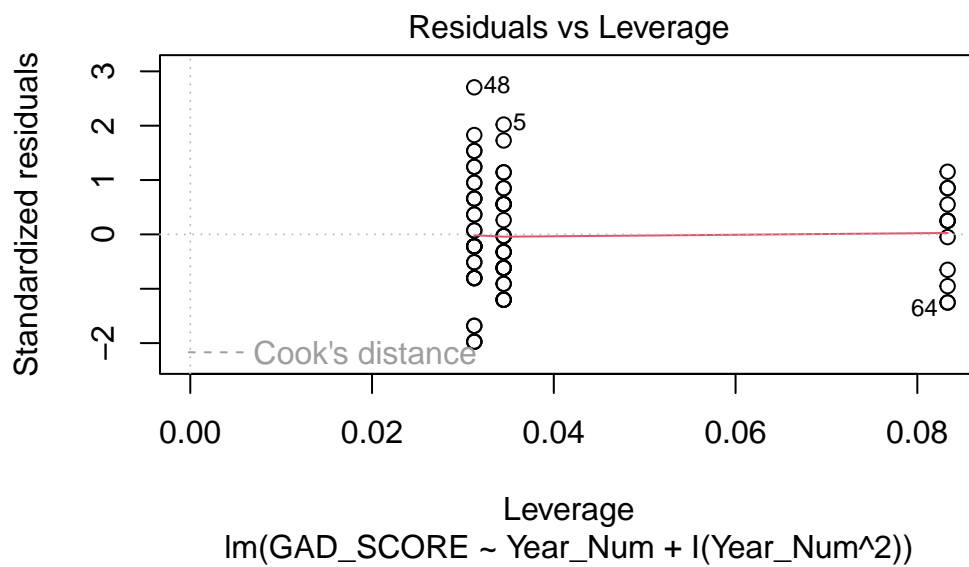
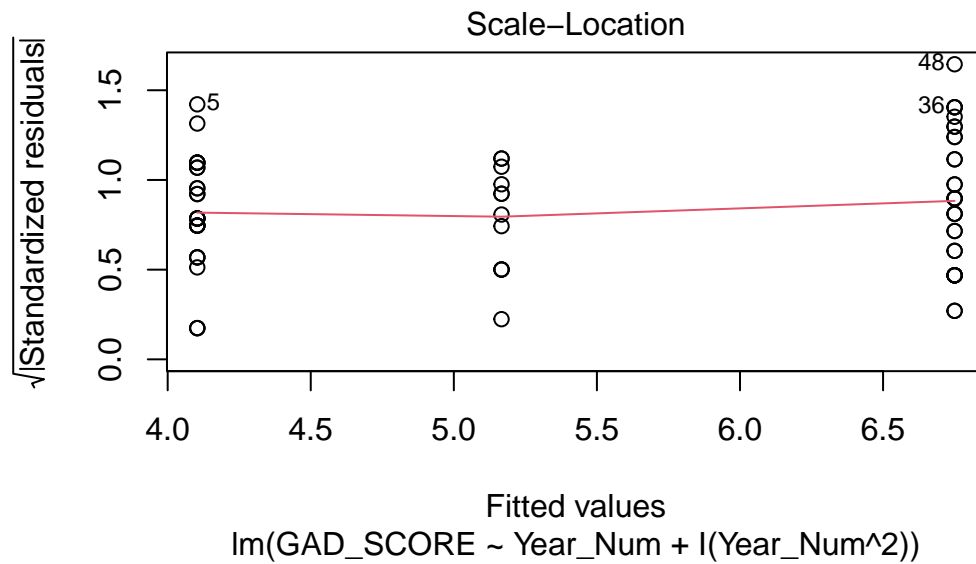
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

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





=====
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	***

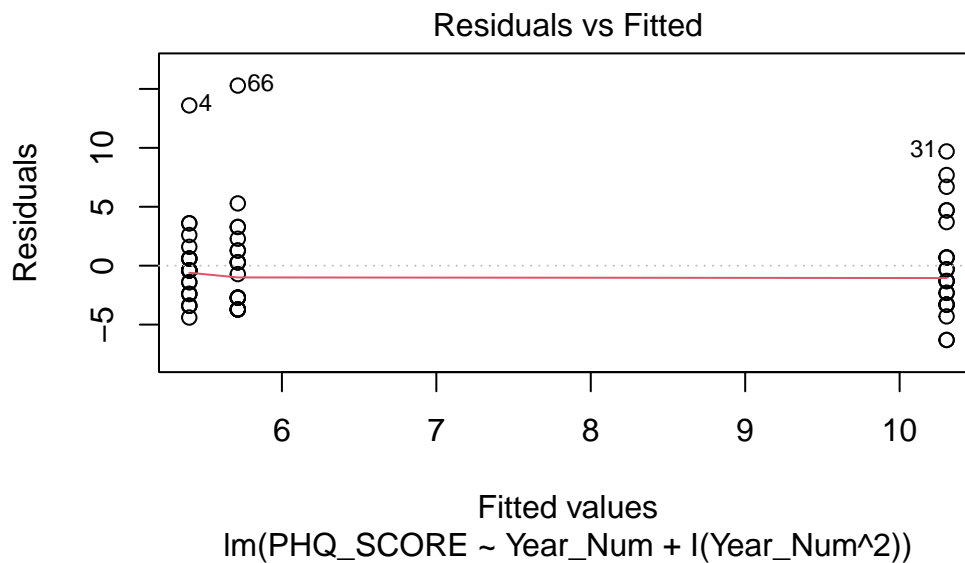
Signif. codes:

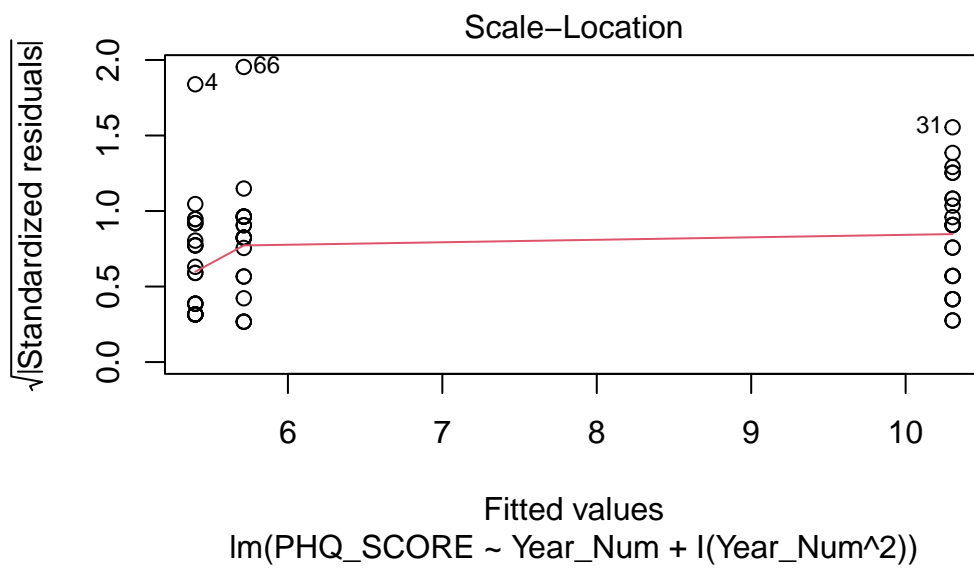
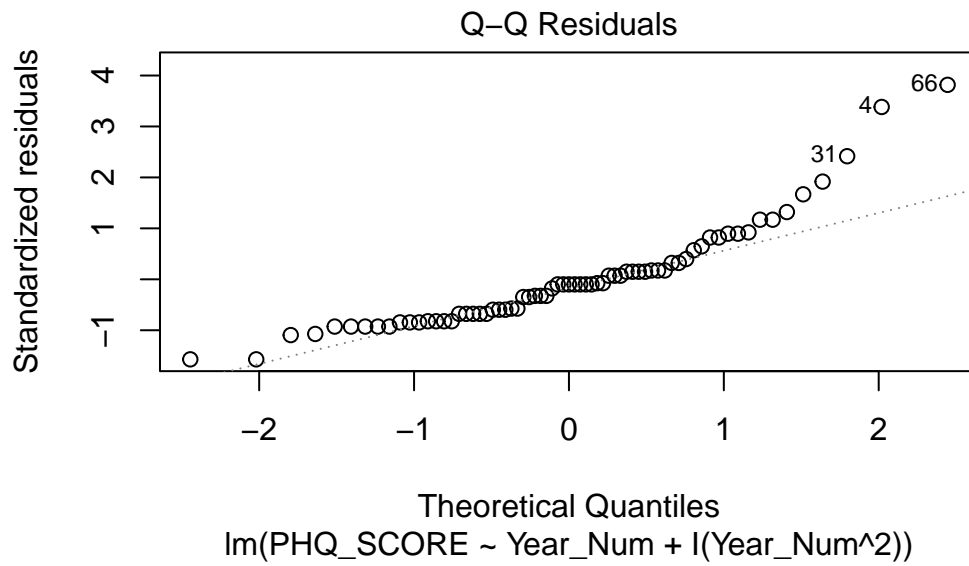
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

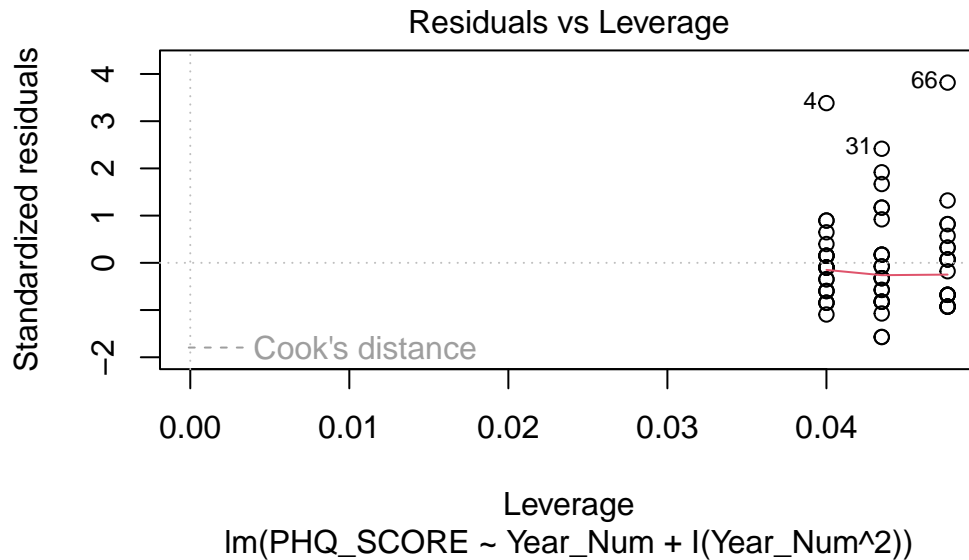
Residual standard error: 4.103 on 66 degrees of freedom

Multiple R-squared: 0.2388, Adjusted R-squared: 0.2158

F-statistic: 10.36 on 2 and 66 DF, p-value: 0.0001226







```
[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 ***

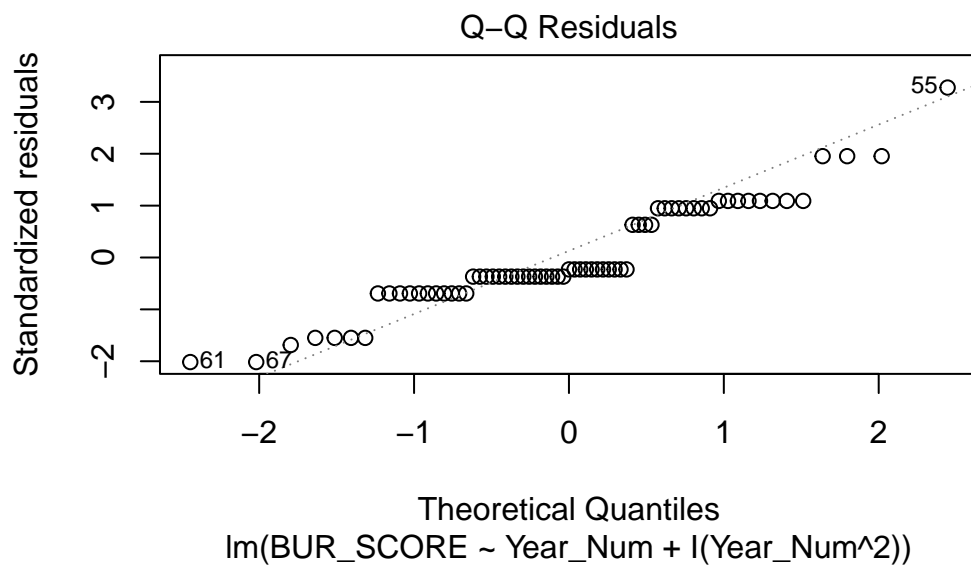
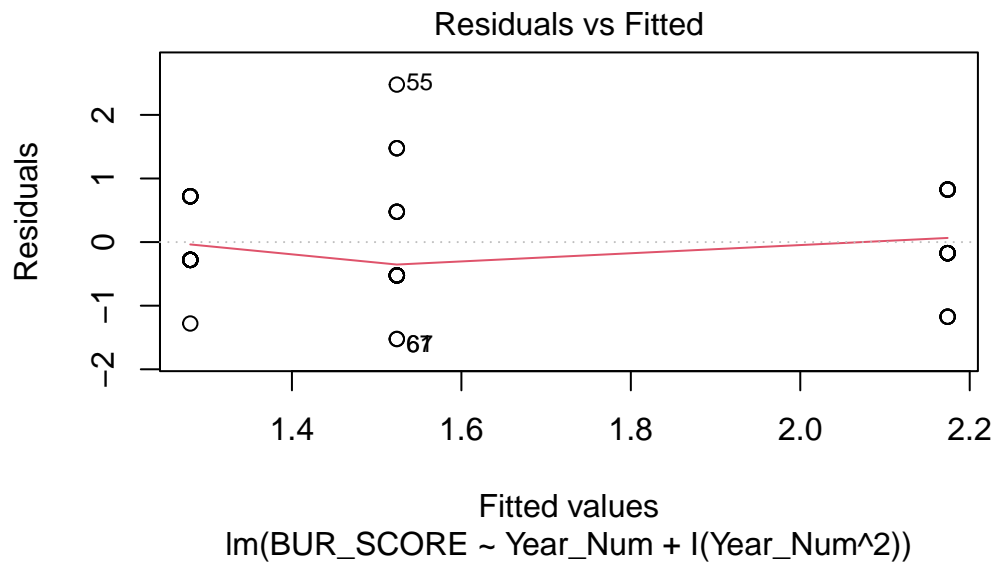
Signif. codes:

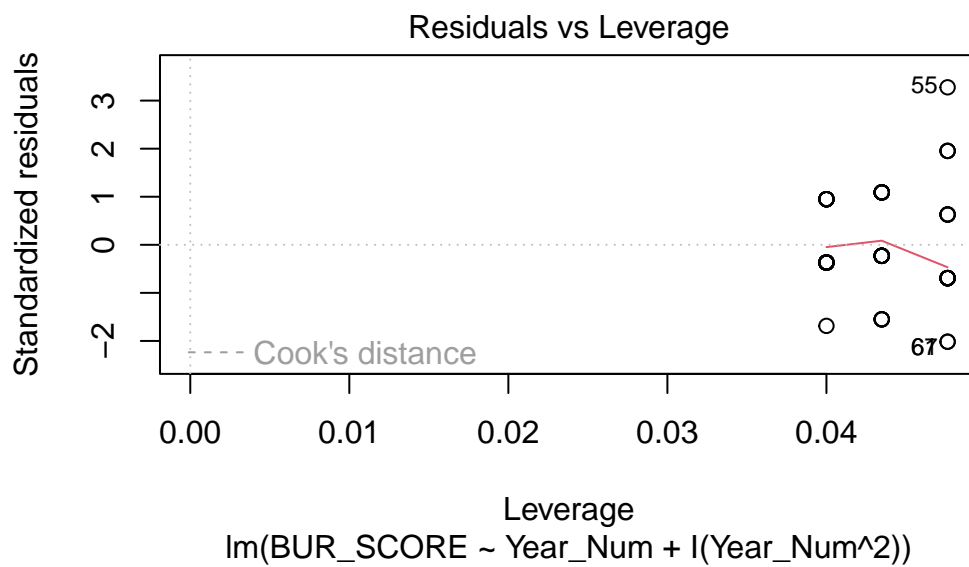
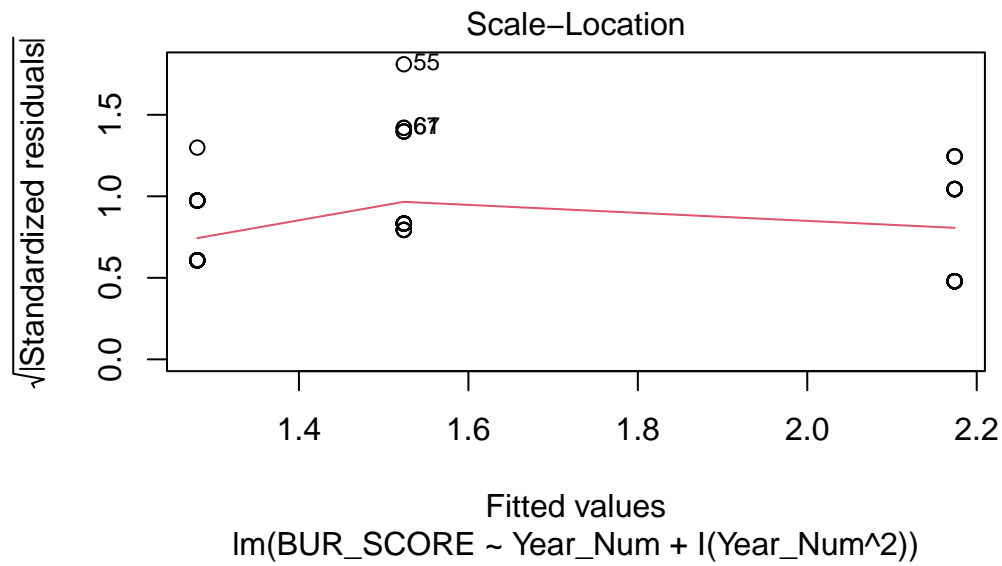
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

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





[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	***

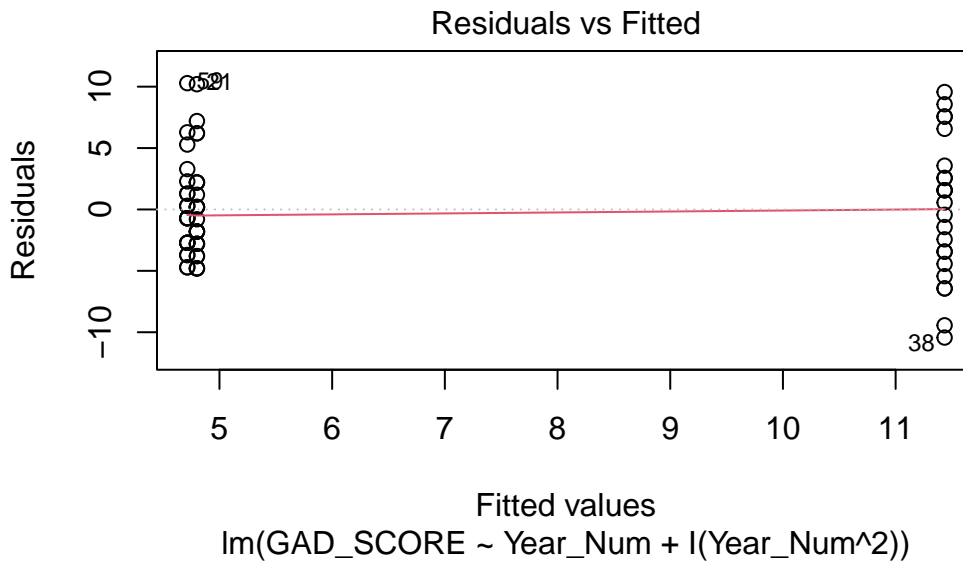
Signif. codes:

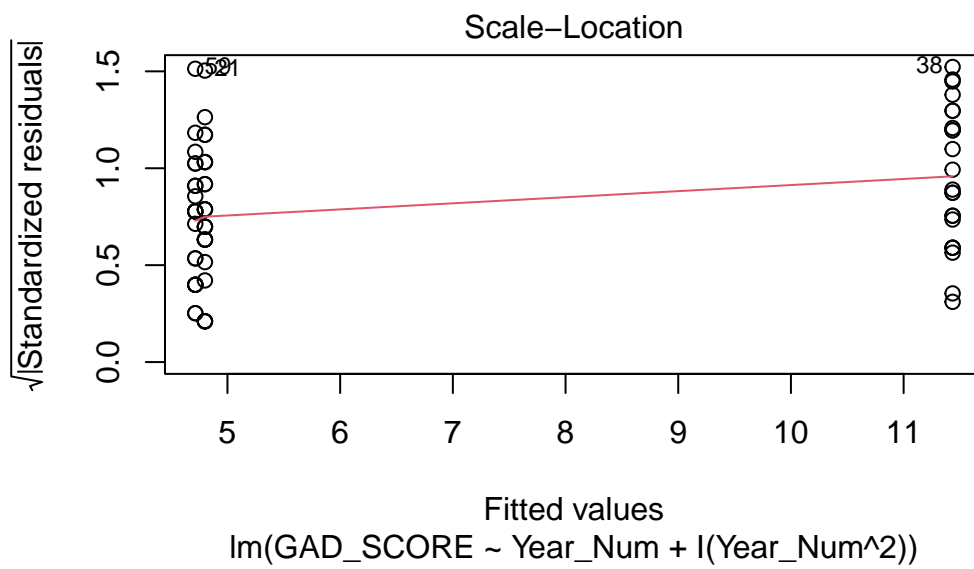
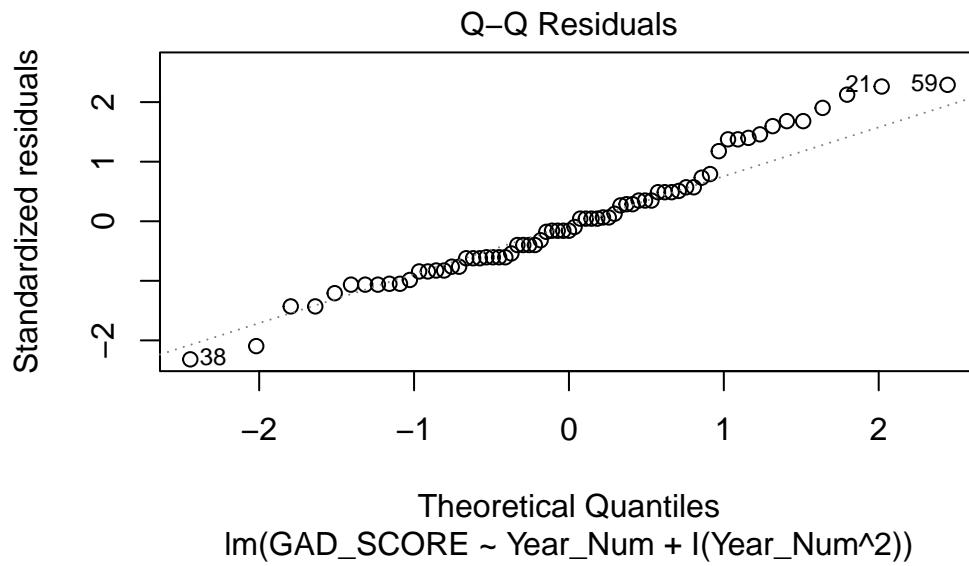
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

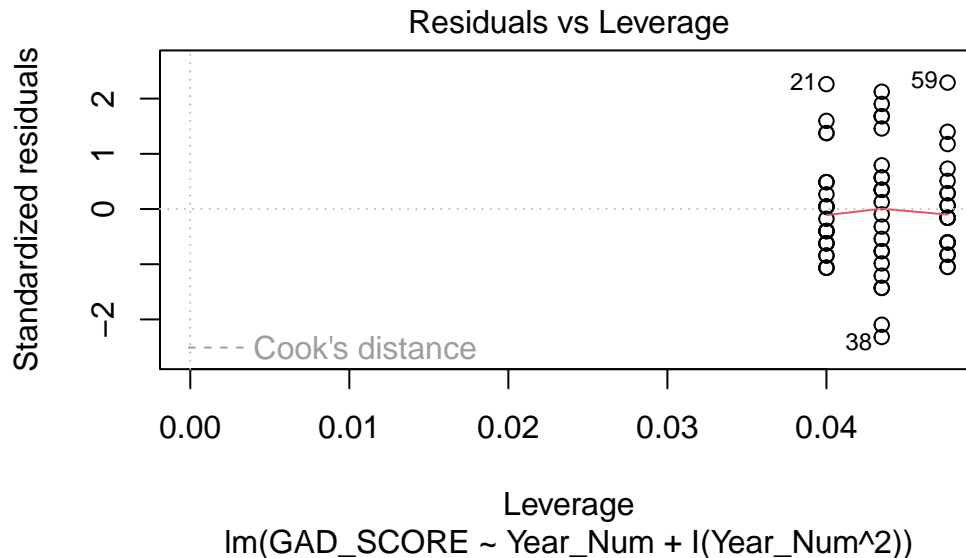
Residual standard error: 4.602 on 66 degrees of freedom

Multiple R-squared: 0.3282, Adjusted R-squared: 0.3079

F-statistic: 16.12 on 2 and 66 DF, p-value: 1.987e-06







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 family 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