

Survey on Mental Health Across Programs of Study in University

Mental Health Maniacs - Deanna King, Jim Moroney, Pooja Patel, Christopher Wilhite

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Packages

In order to better interpret the dataset, we utilize the **pander** package for table creation and manipulation. Likewise, we use **insert** other packages for insert reasoning.

```
library(pander)
```

Student Mental Health Data

All data required for this interpretation was obtained from the International Islamic University in Malaysia. This dataset is publicly available via Kaggle, and contains the following features:

- **Timestamp** - time at which the survey was completed
- **Choose your gender** - gender (male or female) of the participant
- **Age** - age of the participant at the time of survey completion
- **What is your course?** - program in which the participant is majoring
- **Your current year of Study** - how many years the participant has attended university
- **What is your CGPA?** - current grade point average (or the ratio of grade points earned to grade points attempted), calculated on a 0.0-4.0 scale
- **Marital Status** - describes whether or not the participant is married
- **Do you have Depression?** - states whether or not the participant has depression
- **Do you have Anxiety?** - states whether or not the participant has anxiety
- **Do you have Panic attacks?** - states whether or not the participant experiences panic attacks
- **Did you seek any specialist for a treatment?** - states whether or not the participant sought professional treatment for any mental health concerns

```
studentData_df <- read.csv(file="./StudentMentalHealth.csv")
#str(studentData_df)
summary(studentData_df)
```

```
##   Timestamp      Choose.your.gender      Age      What.is.your.course.
## Length:101      Length:101      Min.   :18.00      Length:101
## Class :character Class :character 1st Qu.:18.00      Class :character
## Mode  :character Mode  :character Median :19.00      Mode  :character
##                                     Mean  :20.53
##                                     3rd Qu.:23.00
##                                     Max.   :24.00
##                                     NA's   :1
## Your.current.year.of.Study What.is.your.CGPA. Marital.status
```

```
## Length:101          Length:101          Length:101
## Class :character     Class :character     Class :character
## Mode :character      Mode :character      Mode :character
##
##
##
##
## Do.you.have.Depression. Do.you.have.Anxiety. Do.you.have.Panic.attack.
## Length:101          Length:101          Length:101
## Class :character     Class :character     Class :character
## Mode :character      Mode :character      Mode :character
##
##
##
##
## Did.you.seek.any.specialist.for.a.treatment.
## Length:101
## Class :character
## Mode :character
##
##
##
##
```

```
#pander(studentData_df)
```

Data Cleaning

We thoroughly examined the data to ensure that no noisy or missing data values were present. More specifically, we ensured that no negative values existed in our numerical attributes (age, year of study, CGPA), and that no missing values were present in any tuple. Upon examination, only one column was found to have any missing data: Age. Though it is not particularly robust, we opted to fill in this missing data with a simple mean of the column.

```
studentData_df$Age[is.na(studentData_df$Age)] <- floor(mean(studentData_df$Age, na.rm=TRUE))
```

In order to further facilitate our analysis of this data, we deemed it appropriate to drop the Timestamp column, as it provided no relevant information to what we were looking for and seemed to be more of a vanity metric for the circumstances in which the data was originally acquired.

```
studentData_df = subset(studentData_df, select = -c(1))
summary(studentData_df)
```

```
## Choose.your.gender      Age          What.is.your.course.
## Length:101             Min.   :18.00   Length:101
## Class :character       1st Qu.:18.00   Class :character
## Mode :character        Median :19.00   Mode  :character
##                        Mean    :20.52
##                        3rd Qu.:23.00
##                        Max.    :24.00
## Your.current.year.of.Study What.is.your.CGPA. Marital.status
## Length:101                Length:101          Length:101
```

```
## Class :character          Class :character  Class :character
## Mode  :character          Mode  :character  Mode  :character
##
##
##
## Do.you.have.Depression. Do.you.have.Anxiety. Do.you.have.Panic.attack.
## Length:101                Length:101        Length:101
## Class :character          Class :character  Class :character
## Mode  :character          Mode  :character  Mode  :character
##
##
##
## Did.you.seek.any.specialist.for.a.treatment.
## Length:101
## Class :character
## Mode  :character
##
##
##
```

Due to the method in which this survey was conducted, some features of the data were able to be entered in an non-deterministic manner. The column `Your.current.year.of.Study` suffers from this the most, as random capitalization in the responses creates several different “bins” of responses for data that is otherwise meant to be the same. To fix this, we elected to simple cast all characters in this column to an uppercase state to remove any ambiguity.

```
studentData_df$Your.current.year.of.Study <- toupper(studentData_df$Your.current.year.of.Study)
```

Data Wrangling

Renaming Columns

Wrangling for the most part consisted of making the data look more presentable and easier to parse for our exploratory analysis and display purposes. Through some minor idiosyncrasies of the method through which this data was obtained, lengthy and oddly formatted names currently index most of our columns; for these reasons we gave the each column a less verbose name that still unambiguously indicated what data said column held.

- `Choose.your.gender` becomes simply `Gender`
- `Age` - age of the participant at the time of survey completion
- `What.is.your.course.` - is simplified into `Major`
- `Your.current.year.of.Study` - has been summarily shortened to `Year`
- `What.is.your.CGPA.` - similarly shortened to just `GPA`

The following attributes have been shortened to just their respective affects. It is assumed that the names are preceeded by, “is,” or, “has,” before each condition (i.e. “has Anxiety”).

- `Marital.status` becomes `Married`
- `Do.you.have.Depression.` becomes `Depressed`
- `Do.you.have.Anxiety.` becomes `Anxiety`
- `Do.you.have.Panic.attack.` becomes `Panic`
- `Did.you.seek.any.specialist.for.a.treatment.` becomes `Treatment`

With all of these, we were seeking the simplicity of single word names.

```
colnames(studentData_df)[colnames(studentData_df) == 'Choose.your.gender'] <- 'Gender'
colnames(studentData_df)[colnames(studentData_df) == 'What.is.your.course. '] <- 'Major'
colnames(studentData_df)[colnames(studentData_df) == 'Your.current.year.of.Study'] <- 'Year'
colnames(studentData_df)[colnames(studentData_df) == 'What.is.your.CGPA. '] <- 'GPA'
colnames(studentData_df)[colnames(studentData_df) == 'Marital.status'] <- 'Married'
colnames(studentData_df)[colnames(studentData_df) == 'Do.you.have.Depression. '] <- 'Depressed'
colnames(studentData_df)[colnames(studentData_df) == 'Do.you.have.Anxiety. '] <- 'Anxiety'
colnames(studentData_df)[colnames(studentData_df) == 'Do.you.have.Panic.attack. '] <- 'Panic'
colnames(studentData_df)[colnames(studentData_df) == 'Did.you.seek.any.specialist.for.a.treatment. '] <-
```

Categorizing ambiguous data

Given that we are looking for various correlations between Science, Technology, Engineering, and Mathematics (STEM) majors and the various mental health issues that might affect them, the detailed knowledge of what major a student is enrolled in doesn't interest us as data - we only care whether or not it's considered STEM. Unfortunately there is no easy algorithmic way to do this, we had considered using various “sounds-like” libraries and methods, but decided for a dataset this small that it'd be best to just manually build a new column by hand. This included looking for what the responses from the **Major** column in our dataset correlated to and simply populating a new column with “Yes” or “No” before adding it to our dataset. We added this column as **STEM**. We have included the first 5 rows as a sample of the data set, full data set is listed in Appendix A at the end of this document.

```
studentData_df['STEM'] <- c('Yes', 'No', 'Yes', 'No', 'Yes', 'Yes', 'No', 'Yes', 'No', 'No',
    'Yes', 'Yes', 'Yes', 'Yes', 'No', 'Yes', 'No', 'No', 'Yes', 'Yes',
    'Yes', 'Yes', 'Yes', 'Yes', 'Yes', 'No', 'Yes', 'Yes', 'Yes', 'Yes',
    'No', 'Yes', 'Yes', 'Yes', 'Yes', 'Yes', 'No', 'Yes', 'No', 'Yes',
    'Yes', 'Yes', 'No', 'Yes', 'No', 'Yes', 'Yes', 'Yes', 'Yes', 'Yes',
    'No', 'Yes', 'Yes', 'Yes', 'Yes', 'Yes', 'No', 'Yes', 'No', 'No', 'Yes',
    'Yes', 'No', 'Yes', 'Yes', 'Yes', 'Yes', 'Yes', 'No', 'Yes', 'Yes',
    'No', 'No', 'Yes', 'No', 'Yes', 'Yes', 'No', 'Yes', 'Yes', 'Yes',
    'No', 'Yes', 'Yes', 'No', 'No', 'No', 'Yes', 'Yes', 'No', 'No',
    'Yes')
pander(studentData_df[1:5,])
```

Table 1: Table continues below

Gender	Age	Major	Year	GPA	Married	Depressed
Female	18	Engineering	YEAR 1	3.00 - 3.49	No	Yes
Male	21	Islamic education	YEAR 2	3.00 - 3.49	No	No
Male	19	BIT	YEAR 1	3.00 - 3.49	No	Yes
Female	22	Laws	YEAR 3	3.00 - 3.49	Yes	Yes
Male	23	Mathematics	YEAR 4	3.00 - 3.49	No	No

Anxiety	Panic	Treatment	STEM
No	Yes	No	Yes
Yes	No	No	No
Yes	Yes	No	Yes

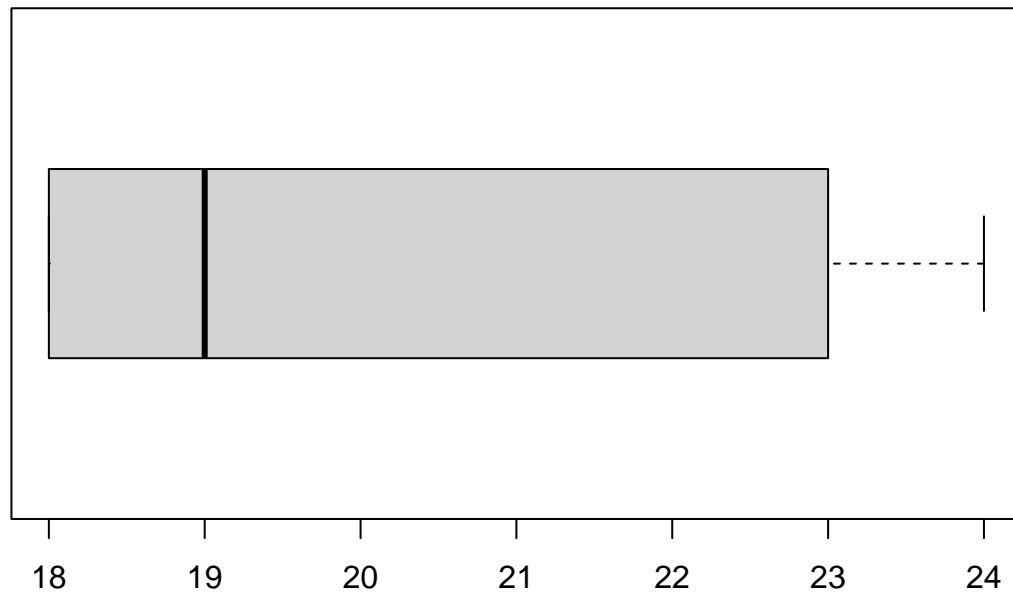
Anxiety	Panic	Treatment	STEM
No	No	No	No
No	No	No	Yes

Exploratory Data Analysis

Age Distribution

The following boxplot shows the distribution of each participant's age. The youngest participants are 18 years old, and the oldest are 24 years old. Given that our mean is 20.5247525, we can be assured that our data is fairly representative of the average college student.

```
boxplot(studentData_df$Age, horizontal = TRUE)
```



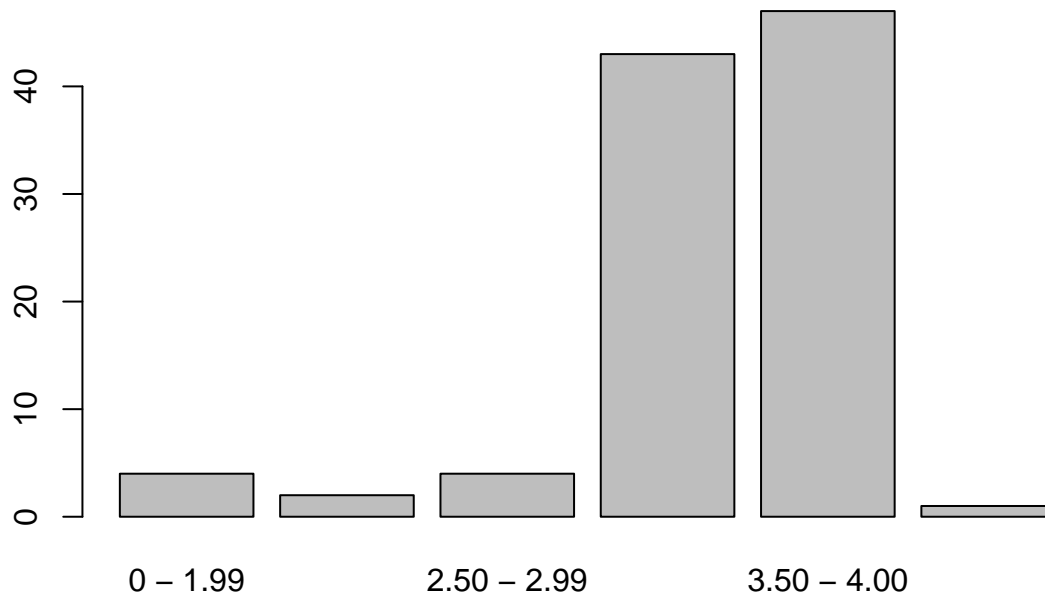
```
summary(studentData_df$Age)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  18.00  18.00   19.00   20.52  23.00   24.00
```

CGPA Distribution

The following histogram shows the frequency of each CGPA interval for participants. Most participants have a CGPA within the range of 3.00 - 3.49.

```
gpaTable <- table(studentData_df$GPA)
barplot(gpaTable)
```



A look at key data characteristics

Distribution of Gender and Major

Below we can see displayed in a contingency table two key aspects of our data set. Represented in the rows is the distribution of male and female students, with the columns showing how many of each are majoring in a STEM field or not. With the “Sum” features of this table we can see that nearly 75 percent of our student sample is female, with just over two thirds of all students majoring in some STEM field. This could indicate that we are not accurately representing both males and females with this data, this will be kept in mind moving forward.

```
genderSTEMtable <- addmargins(with(studentData_df, table(studentData_df$Gender, studentData_df$STEM)), k
pander(genderSTEMtable, style = "grid", caption = "STEM Majors by Gender")
```

Table 3: STEM Majors by Gender

	No	Yes	Sum
Female	28	47	75
Male	5	21	26

	No	Yes	Sum
Sum	33	68	101

The data we're working with indicates that 62.6666667% of all female students are in STEM, while 80.7692308% of all male students represented are majoring in some STEM field.

Depression by Gender and Major

Given that our data is so heavily skewed in samples toward females, it would be interesting to take a look at how self reported depression stacks up by both gender and major. Below is once again a contingency table that represents gender by row and whether or not the student reported as depressed by column.

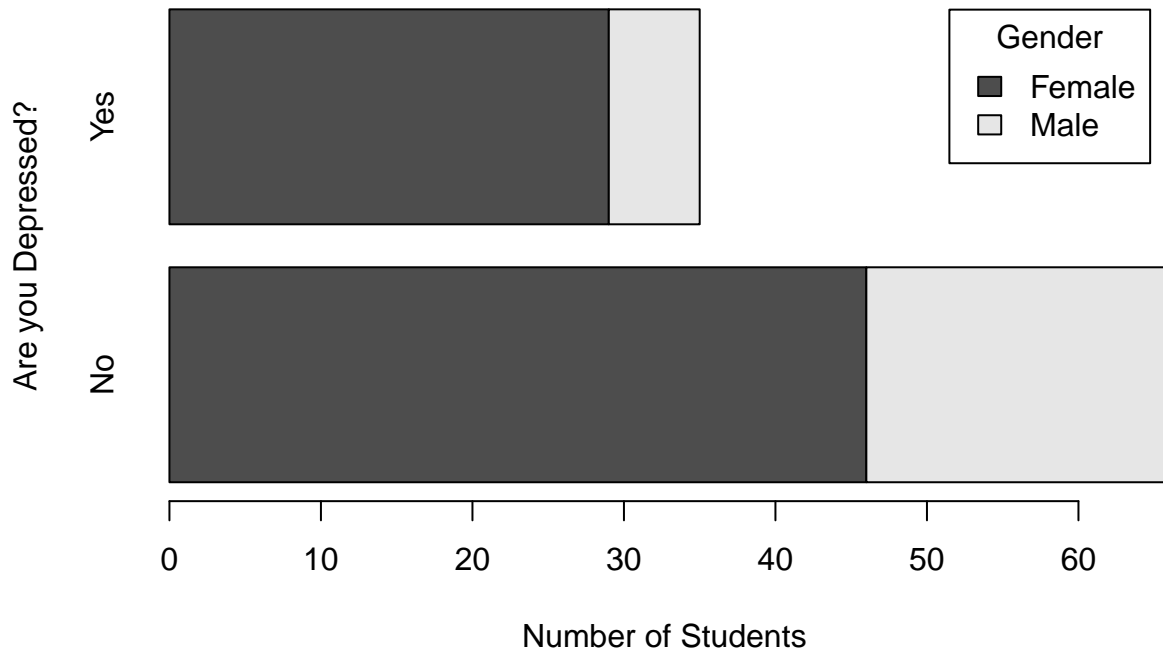
```
genderDepressedtable <- addmargins(with(studentData_df, table(studentData_df$Gender, studentData_df$Depressed)),
pander(genderDepressedtable, style = "grid", caption = "Depressed Students by Gender"))
```

Table 4: Depressed Students by Gender

	No	Yes	Sum
Female	46	29	75
Male	20	6	26
Sum	66	35	101

The data we're working with indicates that 38.6666667% of all female students reported as depressed, while 23.0769231% of all male students indicated in the survey that they are depressed.

```
barplot (with(studentData_df, table(studentData_df$Gender, studentData_df$Depressed)), horiz=TRUE, xlab=)
```



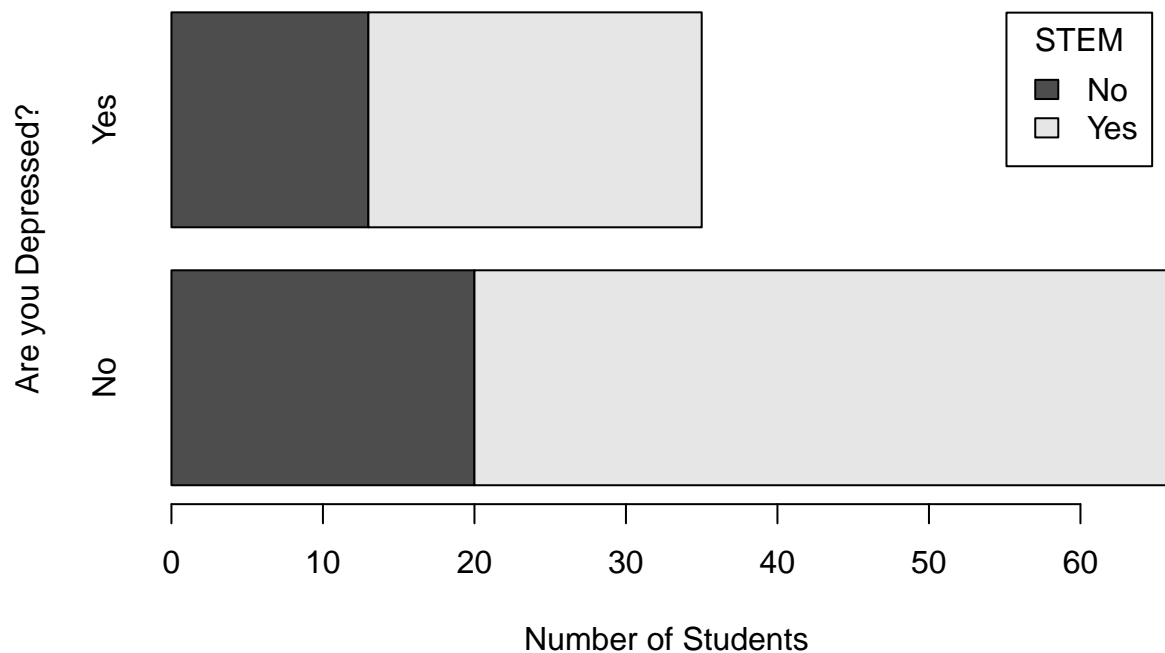
Perhaps a more relevant exploration of this data, especially for the purposes of this survey, would be the relationship between being a STEM major and reporting as Depressed. Our table below once again represents whether a student is depressed or not by column, but this time the rows give us the quality of being in a STEM related major.

```
stemDepressedtable <- addmargins(with(studentData_df, table(studentData_df$STEM, studentData_df$Depressed)))
pander(stemDepressedtable, style = "grid", caption = "Depressed Students by Major")
```

Table 5: Depressed Students by Major

	No	Yes	Sum
No	20	13	33
Yes	46	22	68
Sum	66	35	101

```
barplot (with(studentData_df, table(studentData_df$STEM, studentData_df$Depressed)), horiz=TRUE, xlab =
```

Something to do with gpa vs depression

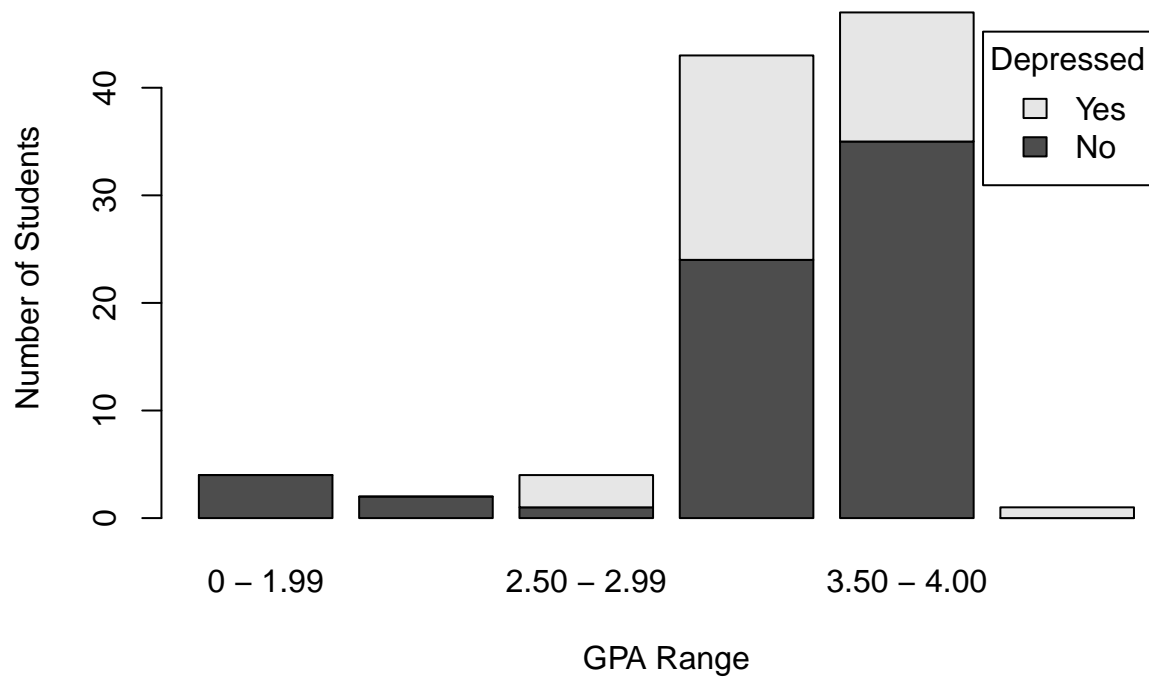
Jim - same thing as above, maybe a normal plot? stacked box plot, y depressed x gpa range

```
gpaDepressionTable <- with(studentData_df, table(studentData_df$GPA, studentData_df$Depressed), keepAttributes = TRUE)
pander(gpaDepressionTable, style = "grid", caption = "Depressed Students by GPA")
```

Table 6: Depressed Students by GPA

	No	Yes
0 - 1.99	4	0
2.00 - 2.49	2	0
2.50 - 2.99	1	3
3.00 - 3.49	24	19
3.50 - 4.00	35	12
3.50 - 4.00	0	1

```
barplot (t(gpaDepressionTable), horiz=FALSE, ylab = "Number of Students", xlab = "GPA Range", legend.text = "Depressed Students by GPA")
```



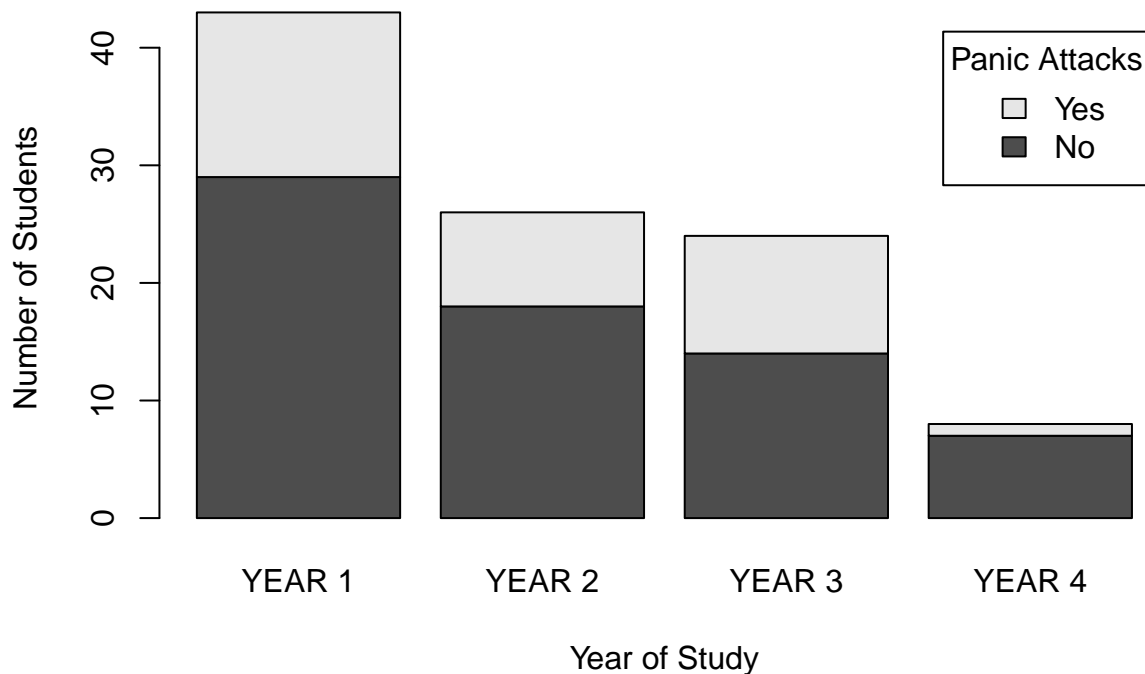
Something to do with year in school vs panic attacks

```
yearPanictable <- with(studentData_df, table(studentData_df$Year, studentData_df$Panic), keepAttrs = TRUE)
pander(yearPanictable, style = "grid", caption = "Panic in Students by Year")
```

Table 7: Panic in Students by Year

	No	Yes
YEAR 1	29	14
YEAR 2	18	8
YEAR 3	14	10
YEAR 4	7	1

```
barplot (t(yearPanictable), horiz=FALSE, ylab = "Number of Students", xlab = "Year of Study", legend.text = TRUE)
```



Conclusions

Should answer the following questions:

Are there any unexpected patterns or relationships in your data? Does there appear to be any cause/effect phenomena? Can you suggest hypotheses for these relationships? Which variables are important? Does the data contain any anomalies or outliers? What assumptions are you making about the data, and can you verify these speculations?

Jim - i can write this after all of the data has been wrangled and charts have been made :) thank you!! <3

Appendix A - Data

```
pander(studentData_df, title = "Mental Health in University Students", sub = "Samples obtained by the I
```

Table 8: Table continues below

Gender	Age	Major	Year	GPA	Married
Female	18	Engineering	YEAR 1	3.00 - 3.49	No
Male	21	Islamic education	YEAR 2	3.00 - 3.49	No
Male	19	BIT	YEAR 1	3.00 - 3.49	No
Female	22	Laws	YEAR 3	3.00 - 3.49	Yes
Male	23	Mathematics	YEAR 4	3.00 - 3.49	No

Gender	Age	Major	Year	GPA	Married
Male	19	Engineering	YEAR 2	3.50 - 4.00	No
Female	23	Pendidikan islam	YEAR 2	3.50 - 4.00	Yes
Female	18	BCS	YEAR 1	3.50 - 4.00	No
Female	19	Human Resources	YEAR 2	2.50 - 2.99	No
Male	18	Irkhs	YEAR 1	3.50 - 4.00	No
Female	20	Psychology	YEAR 1	3.50 - 4.00	No
Female	24	Engineering	YEAR 3	3.50 - 4.00	Yes
Female	18	BCS	YEAR 1	3.00 - 3.49	No
Male	19	Engineering	YEAR 1	3.00 - 3.49	No
Female	18	KENMS	YEAR 2	3.50 - 4.00	No
Male	24	BCS	YEAR 3	3.50 - 4.00	No
Female	24	Accounting	YEAR 3	3.00 - 3.49	No
Female	24	ENM	YEAR 4	3.00 - 3.49	Yes
Female	20	BIT	YEAR 2	3.50 - 4.00	No
Female	18	Marine science	YEAR 2	3.50 - 4.00	Yes
Female	19	Engineering	YEAR 1	3.00 - 3.49	No
Female	18	KOE	YEAR 2	3.00 - 3.49	No
Female	24	BCS	YEAR 1	3.50 - 4.00	No
Female	24	Engineering	YEAR 1	3.00 - 3.49	No
Female	23	BCS	YEAR 3	3.50 - 4.00	No
Female	18	Banking Studies	YEAR 1	3.50 - 4.00	No
Female	19	Engineering	YEAR 1	3.50 - 4.00	No
Male	18	Engineering	YEAR 2	3.00 - 3.49	Yes
Female	24	BIT	YEAR 3	3.50 - 4.00	Yes
Female	24	BCS	YEAR 4	3.50 - 4.00	No
Female	23	Business Administration	YEAR 2	3.00 - 3.49	No
Male	18	BCS	YEAR 2	3.00 - 3.49	No
Male	19	BCS	YEAR 1	3.50 - 4.00	No
Male	18	BCS	YEAR 2	3.50 - 4.00	Yes
Female	19	BIT	YEAR 1	3.00 - 3.49	No
Female	18	Engineering	YEAR 1	2.00 - 2.49	No
Female	18	Law	YEAR 3	3.00 - 3.49	No
Female	19	BIT	YEAR 1	2.50 - 2.99	No
Female	18	KIRKHS	YEAR 1	3.50 - 4.00	No
Female	24	Engineering	YEAR 2	2.50 - 2.99	Yes
Female	24	BIT	YEAR 3	3.00 - 3.49	No
Female	22	Engineering	YEAR 4	3.50 - 4.00	No
Female	20	Usuluddin	YEAR 2	3.00 - 3.49	No
Male	20	BIT	YEAR 1	0 - 1.99	No
Male	23	TAASL	YEAR 2	3.50 - 4.00	No
Male	18	BCS	YEAR 1	3.50 - 4.00	No
Female	19	Engineering	YEAR 1	3.50 - 4.00	No
Female	18	Engine	YEAR 4	3.50 - 4.00	No
Male	24	BCS	YEAR 2	3.00 - 3.49	No
Female	24	BCS	YEAR 3	3.50 - 4.00	No
Female	23	ALA	YEAR 1	2.50 - 2.99	Yes
Female	18	BCS	YEAR 2	3.50 - 4.00	No
Female	19	Biomedical science	YEAR 3	3.00 - 3.49	No
Female	20	koe	YEAR 3	3.00 - 3.49	Yes
Female	19	BCS	YEAR 1	3.50 - 4.00	No
Male	21	BCS	YEAR 1	3.00 - 3.49	No
Male	23	Kirkhs	YEAR 3	3.50 - 4.00	No

Gender	Age	Major	Year	GPA	Married
Female	20	BENL	YEAR 3	3.00 - 3.49	No
Female	18	BCS	YEAR 1	3.50 - 4.00	No
Female	23	Benl	YEAR 1	3.00 - 3.49	No
Female	18	IT	YEAR 3	3.00 - 3.49	No
Female	19	BCS	YEAR 1	3.50 - 4.00	No
Female	18	CTS	YEAR 1	3.50 - 4.00	No
Female	24	engin	YEAR 1	3.50 - 4.00	No
Female	24	Engine	YEAR 1	3.50 - 4.00	No
Female	23	Econs	YEAR 1	3.50 - 4.00	No
Female	18	KOE	YEAR 3	3.00 - 3.49	No
Male	19	MHSC	YEAR 3	3.00 - 3.49	Yes
Female	18	Malcom	YEAR 1	3.50 - 4.00	No
Female	24	Kop	YEAR 4	3.00 - 3.49	No
Female	24	Biomedical science	YEAR 1	3.00 - 3.49	No
Female	18	Laws	YEAR 3	3.50 - 4.00	No
Female	19	BIT	YEAR 3	3.00 - 3.49	Yes
Male	18	Biomedical science	YEAR 1	0 - 1.99	No
Male	24	BIT	YEAR 3	3.50 - 4.00	No
Female	24	KOE	YEAR 1	3.50 - 4.00	No
Female	23	Engineering	YEAR 1	3.00 - 3.49	No
Female	18	Human Sciences	YEAR 2	3.00 - 3.49	No
Female	19	Biotechnology	YEAR 3	0 - 1.99	No
Female	18	Engineering	YEAR 4	3.50 - 4.00	No
Female	24	Communication	YEAR 2	3.50 - 4.00	Yes
Female	24	Diploma Nursing	YEAR 2	3.50 - 4.00	No
Female	19	Engineering	YEAR 1	3.00 - 3.49	No
Female	19	Pendidikan Islam	YEAR 2	3.00 - 3.49	No
Male	23	Radiography	YEAR 1	3.00 - 3.49	No
Female	18	psychology	YEAR 1	3.50 - 4.00	No
Female	19	Fiqh fatwa	YEAR 3	3.00 - 3.49	No
Female	18	psychology	YEAR 1	3.50 - 4.00	No
Male	24	BIT	YEAR 1	3.00 - 3.49	No
Male	24	Engineering	YEAR 2	2.00 - 2.49	No
Female	23	DIPLOMA TESL	YEAR 3	3.50 - 4.00	No
Male	18	Koe	YEAR 2	3.00 - 3.49	No
Female	19	KOE	YEAR 2	3.00 - 3.49	Yes
Female	18	BENL	YEAR 1	3.00 - 3.49	No
Female	24	Fiqh	YEAR 3	0 - 1.99	No
Female	18	Islamic Education	YEAR 1	3.50 - 4.00	No
Female	21	BCS	YEAR 1	3.50 - 4.00	No
Male	18	Engineering	YEAR 2	3.00 - 3.49	No
Female	19	Nursing	YEAR 3	3.50 - 4.00	Yes
Female	23	Pendidikan Islam	YEAR 4	3.50 - 4.00	No
Male	20	Biomedical science	YEAR 2	3.00 - 3.49	No

Depressed	Anxiety	Panic	Treatment	STEM
Yes	No	Yes	No	Yes
No	Yes	No	No	No
Yes	Yes	Yes	No	Yes
Yes	No	No	No	No

Depressed	Anxiety	Panic	Treatment	STEM
No	No	No	No	Yes
No	No	Yes	No	Yes
Yes	No	Yes	No	No
No	Yes	No	No	Yes
No	No	No	No	No
No	Yes	Yes	No	No
No	No	No	No	Yes
Yes	No	No	No	Yes
Yes	No	No	No	Yes
No	No	No	No	Yes
No	Yes	No	No	No
No	No	No	No	Yes
No	No	No	No	No
Yes	Yes	Yes	No	No
No	Yes	No	No	Yes
Yes	Yes	Yes	No	Yes
No	No	Yes	No	Yes
No	No	No	No	Yes
No	No	No	No	Yes
No	No	No	No	Yes
Yes	Yes	Yes	No	Yes
No	No	No	No	No
No	No	No	No	Yes
Yes	Yes	No	No	Yes
Yes	Yes	Yes	Yes	Yes
No	No	No	No	Yes
No	No	No	No	No
No	No	No	No	Yes
No	No	No	No	Yes
No	No	Yes	No	Yes
Yes	Yes	No	Yes	Yes
Yes	Yes	Yes	No	Yes
No	No	No	No	Yes
Yes	Yes	No	No	No
Yes	Yes	Yes	No	Yes
No	No	No	No	No
Yes	No	Yes	Yes	Yes
No	Yes	No	No	Yes
No	No	No	No	Yes
No	No	No	No	Yes
No	No	Yes	No	No
No	Yes	Yes	No	Yes
No	Yes	No	No	Yes
No	No	No	No	Yes
Yes	No	No	No	Yes
No	No	Yes	No	Yes
Yes	No	Yes	Yes	No
No	Yes	No	No	Yes
No	No	No	No	Yes
Yes	Yes	Yes	No	Yes
Yes	No	Yes	Yes	Yes
No	No	No	No	Yes

Depressed	Anxiety	Panic	Treatment	STEM
No	No	No	No	No
Yes	Yes	No	No	No
No	No	No	No	Yes
No	No	No	No	No
No	No	Yes	No	Yes
No	No	No	No	Yes
No	No	Yes	No	Yes
No	No	Yes	No	Yes
No	No	No	No	Yes
Yes	Yes	No	No	No
No	Yes	No	No	Yes
Yes	No	Yes	No	No
Yes	No	No	No	No
No	Yes	No	No	Yes
No	No	No	No	Yes
No	No	Yes	No	No
Yes	No	No	No	Yes
No	No	No	No	Yes
No	Yes	No	No	Yes
No	Yes	Yes	No	Yes
Yes	No	No	No	Yes
No	No	Yes	No	No
No	No	No	No	Yes
No	No	No	No	Yes
Yes	Yes	Yes	No	No
No	No	No	No	No
Yes	Yes	No	No	Yes
No	No	No	No	No
No	No	No	No	Yes
Yes	Yes	No	Yes	Yes
No	No	No	No	No
Yes	Yes	Yes	No	Yes
No	Yes	No	No	Yes
No	No	Yes	No	Yes
No	No	Yes	No	No
No	Yes	No	No	Yes
Yes	No	No	No	Yes
Yes	No	No	No	No
No	No	Yes	No	No
No	No	No	No	No
No	Yes	No	No	Yes
Yes	Yes	No	No	Yes
Yes	No	Yes	No	No
No	No	No	No	No
No	No	No	No	Yes