

Bipolar Disorder and Mood Stabilisers

An NLP exploration of the two main subtypes of bipolar disorder with regards to Reddit posts on mood stabilisers

Eric Lim



b i p o l a r
d i s o r d e r

Bipolar at a glance

The World

46 million
of the world's population

Singapore

0.82%
of Singaporeans

1.07%
of Singaporeans aged 20-24
years old

The United States

0.68%
of the U.S. population

0.96%
of the U.S population
aged 20-24 years old

**For bipolar
individuals,
suicide is a
problem.**

Suicide is the leading cause of premature death.

Bipolar Disorder – Fact Sheet, Treatment Advocacy Center

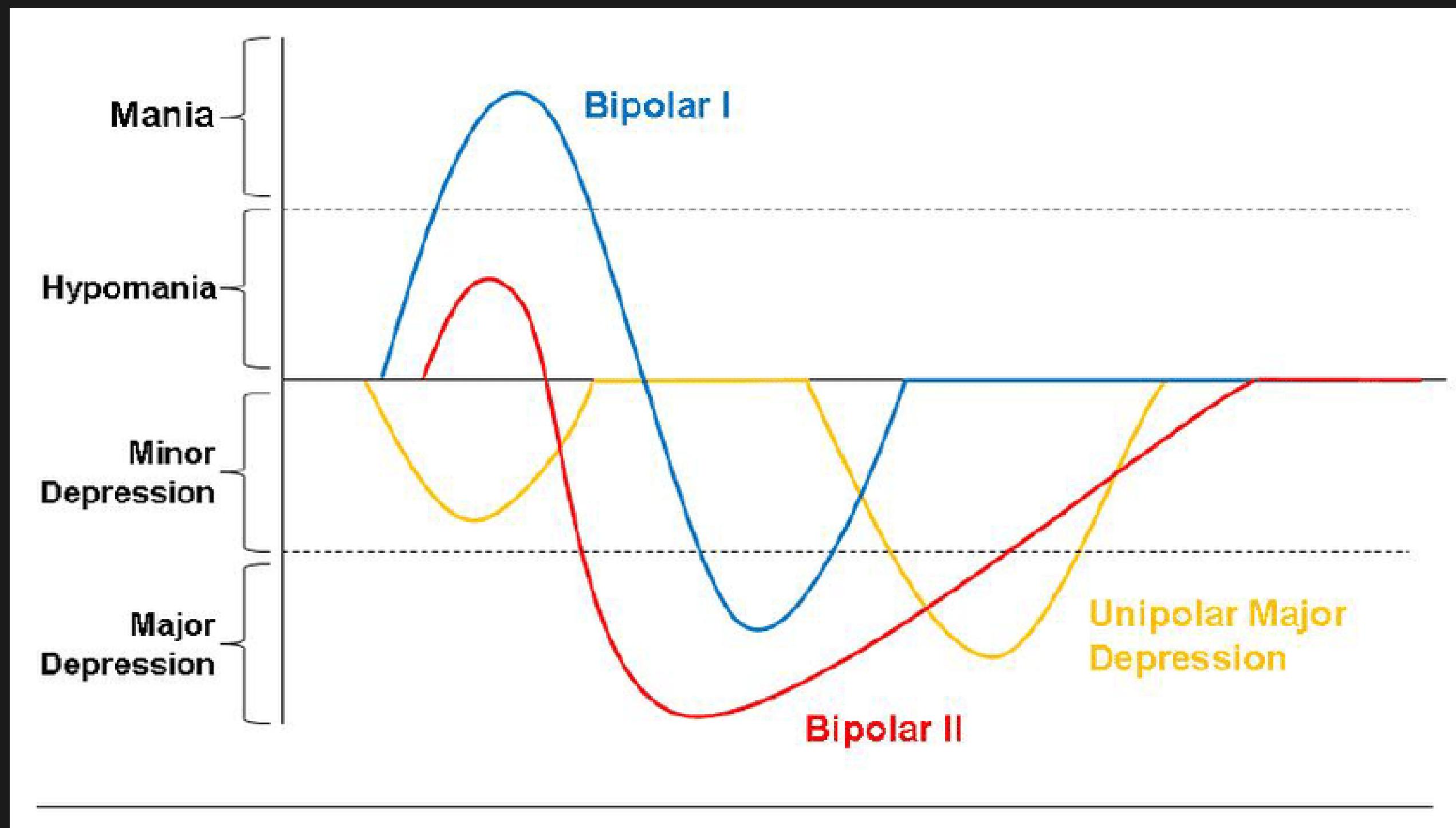
The rate is 10–30 times higher than the corresponding suicide rate in the general population.

Suicide Risk in Bipolar Disorder: A Brief Review. Medicina. 2019.

There is double the risk of death from all causes as compared to the general population.

A systematic review and meta-analysis of premature mortality in bipolar affective disorder. Acta psychiatrica Scandinavica. 2015.

Bipolar Subtypes



Lithium

A salt, lithium carbonate. Used since 1948.

.....

Lamotrigine (Lamictal)

An anticonvulsant. Originally used to treat seizures.

Mood Stabilisers

The mainstay of bipolar treatment

.....

Quetiapine (Seroquel)

An antipsychotic. Also used to treat schizophrenia.

What does one do?

There are a number of paths for individuals with bipolar.

Seek professional help

Combination of medication
and therapy

Misdiagnosis is common

Join communities

Online, such as the r/bipolar
subreddit

In-person support groups

Remain untreated

Stigma

Cost

The Project

To explore the 2 **bipolar** subtypes in the context of 3 main **mood stabilisers**

NLP ANALYSES OF POSTS
FROM R/BIPOLAR

Posts containing the words 'lithium', 'lamotrigine'/'lamictal',
'quetiapine'/'seroquel'

Of these, only posts where the author explicitly declared their bipolar subtype

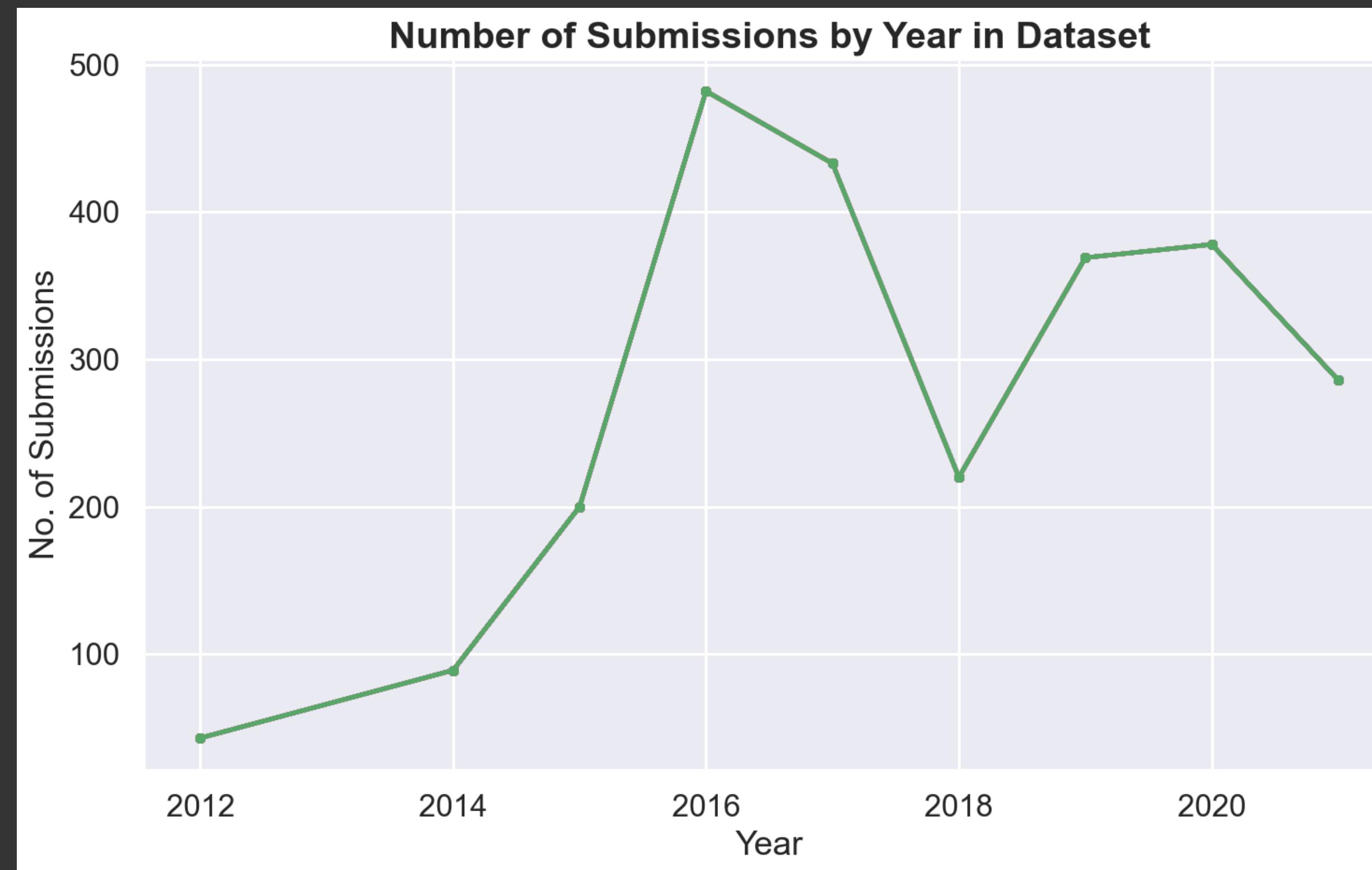
CLASSIFICATION OF POSTS
ACCORDING TO SUBTYPE
(MIN. 70% ACCURACY)

Authors have only declared their subtype for ~10% of posts on r/bipolar

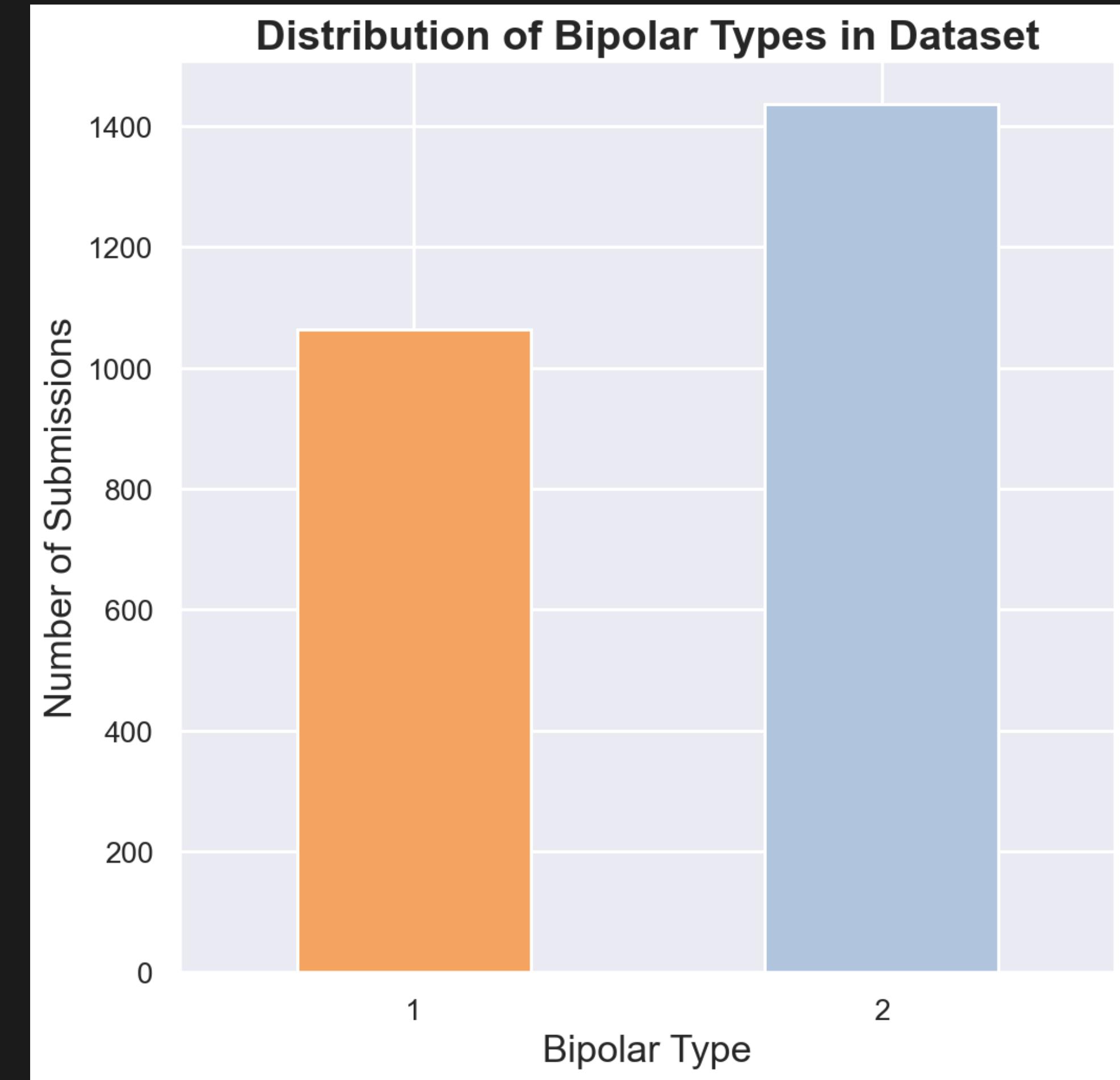
TARGET AUDIENCE

The project is expected to benefit clinicians and potentially individuals with the disorder

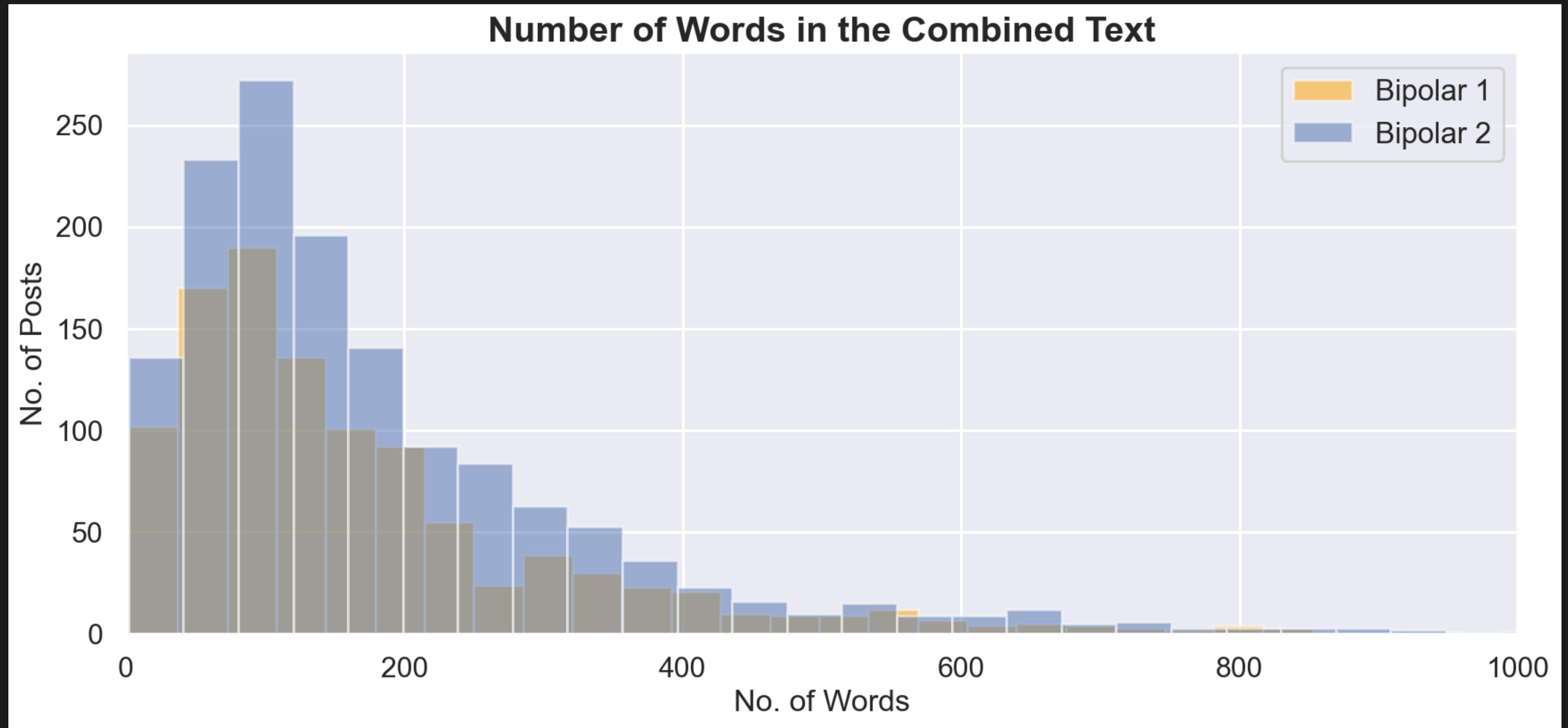
Submissions by Year



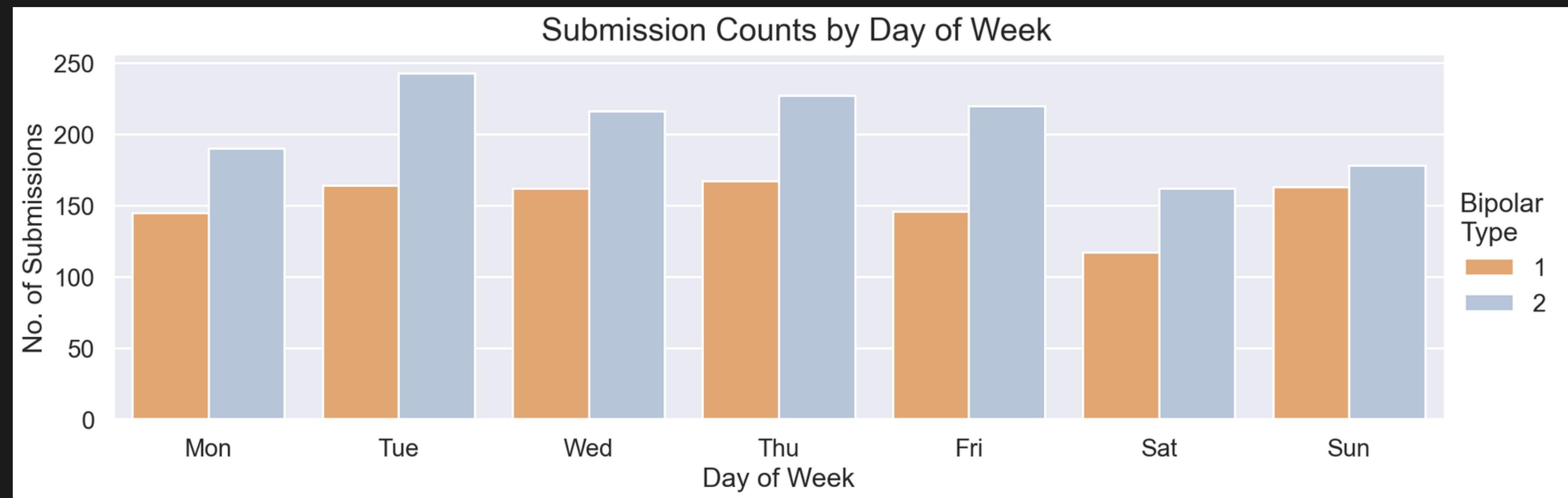
Bipolar Subtypes



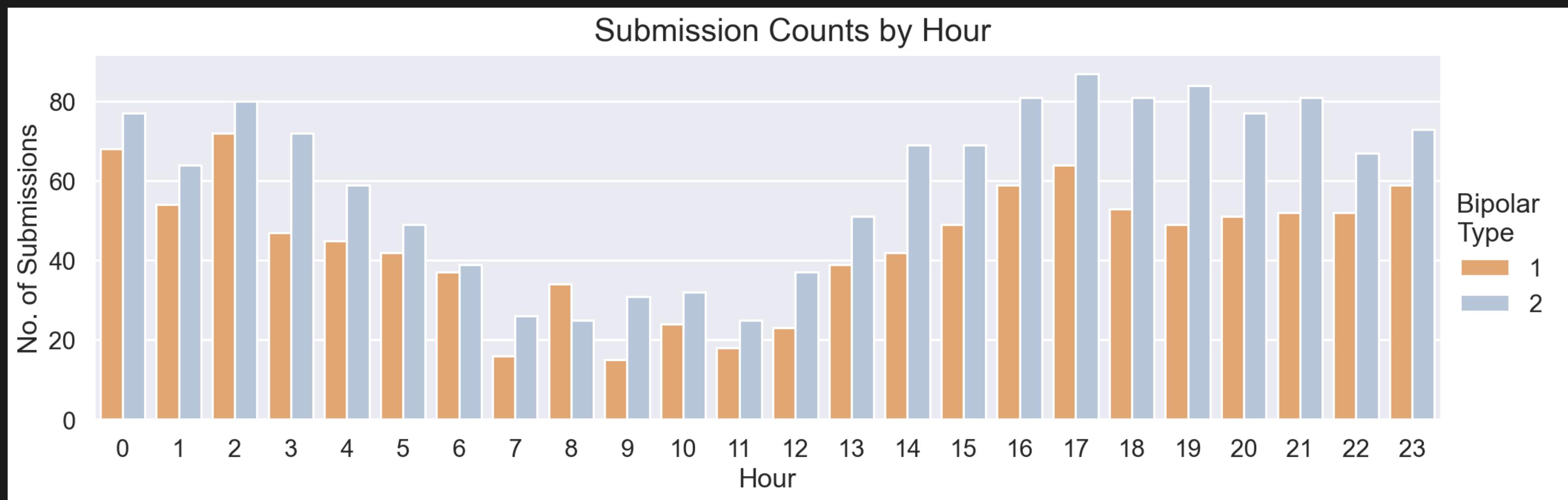
Length of text



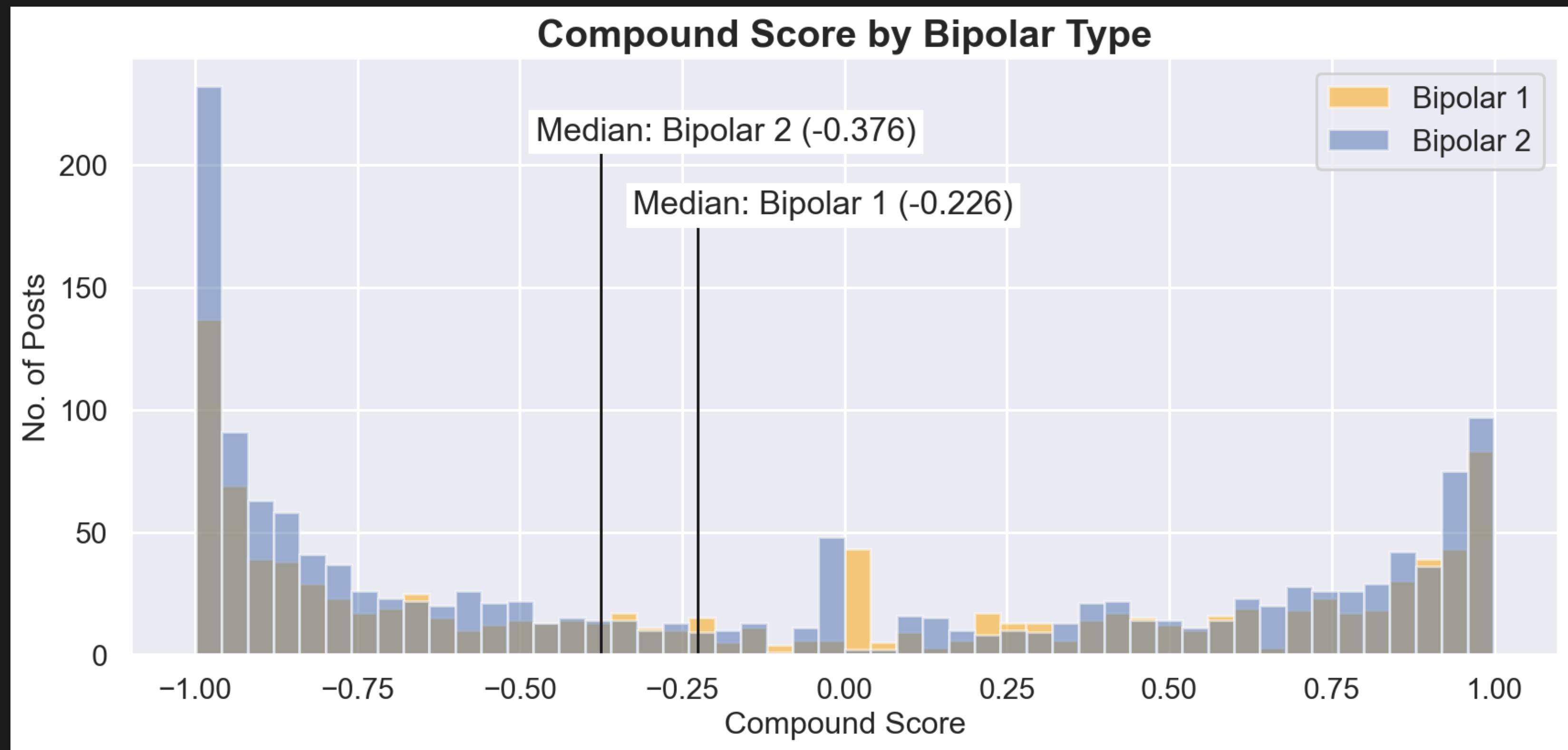
Counts by Day of Week



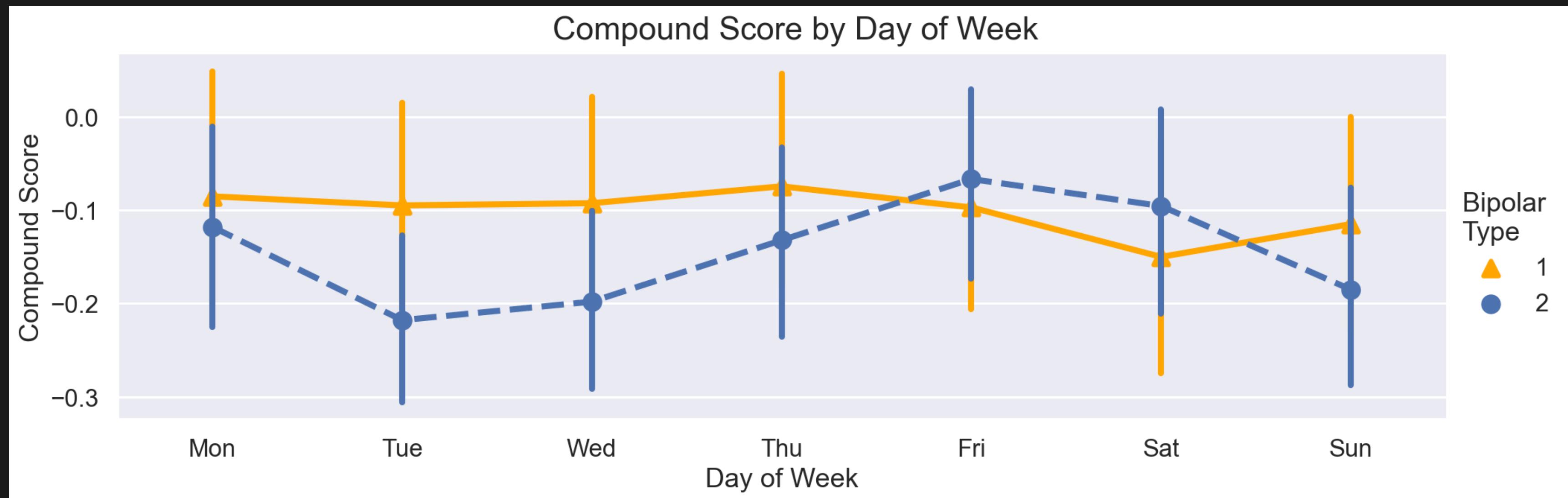
Counts by Hour



Sentiment Analysis



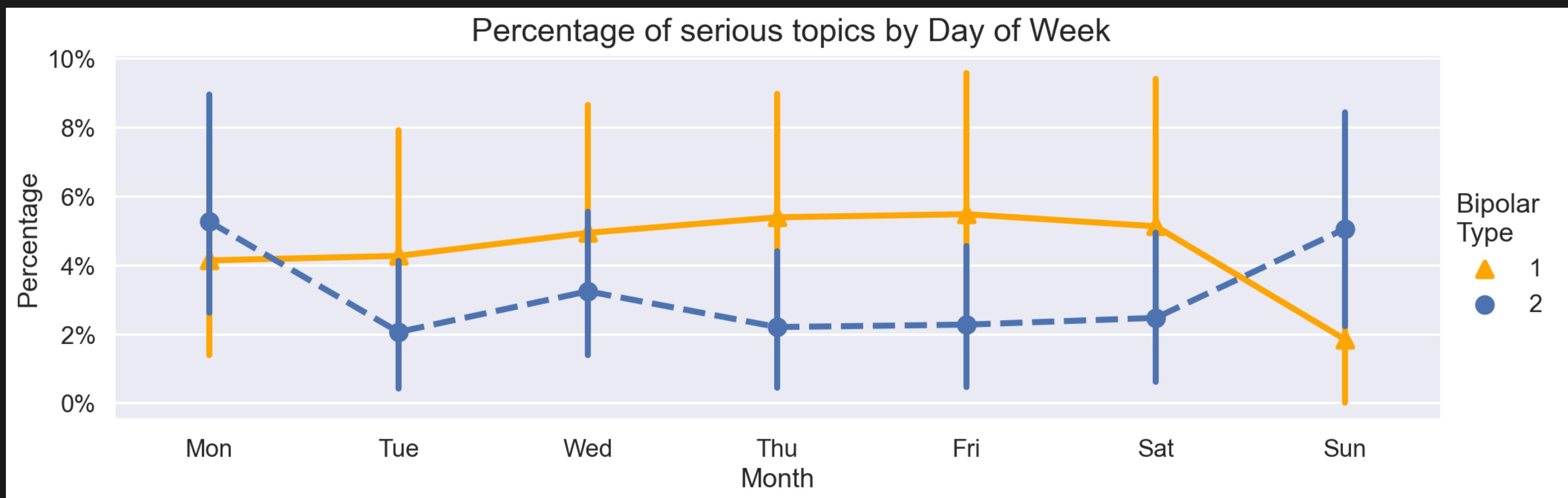
Sentiment Analysis by Day of Week



Defining Serious Topics

None	Drug Use
Med Question	Caution - Manic Trigger
99 Problems/Rant/Story	Art
General	Misleading Title
General Question	Interesting Link
Advice	Caution - Self Harm
Discussion Starter	Amazeballs
Good News	Self-Harm Trigger
Suicidal Thoughts Trigger	General Question/Advice
Caution - Suicidal Thoughts	STAR WARS SPOILER
Caution - Depression Trigger	Sexual Abuse Trigger Warning
Dangerous Behavior Warning	Domestic Abuse Trigger Warning
Meme	

Serious Topics by Day of Week



Which Season has the highest suicide rate?



Spring

Summer

Autumn

Winter

Why Do Mania and Suicide Occur Most Often in the Spring?

[Chul-Hyun Cho](#) and [Heon-Jeong Lee](#)

► Author information ► Article notes ► Copyright and License information [Disclaimer](#)

This article has been [cited by](#) other articles in PMC.

Symptoms of mental illness often become worse during the spring season. In disorders, the phrase “spring fever” has a different meaning. Previous studies have shown that the incidence of mania peaks during the spring in both the Northern and Southern Hemispheres. Previous studies have indicated that suicide rates also peak during the spring season in the Northern Hemisphere. One possible cause may be the sudden increase in the duration and amount of sunlight is a possible cause.

[Int J Environ Res Public Health.](#) 2012 Feb; 9(2): 531–547.

Published online 2012 Feb 14. doi: [10.3390/ijerph9020531](https://doi.org/10.3390/ijerph9020531)

Seasonality of Suicidal Behavior

[Jong-Min Woo](#),^{1,2} [Olaoluwa Okusaga](#),^{3,4} and [Teodor T. Postolache](#)^{3,4,*}

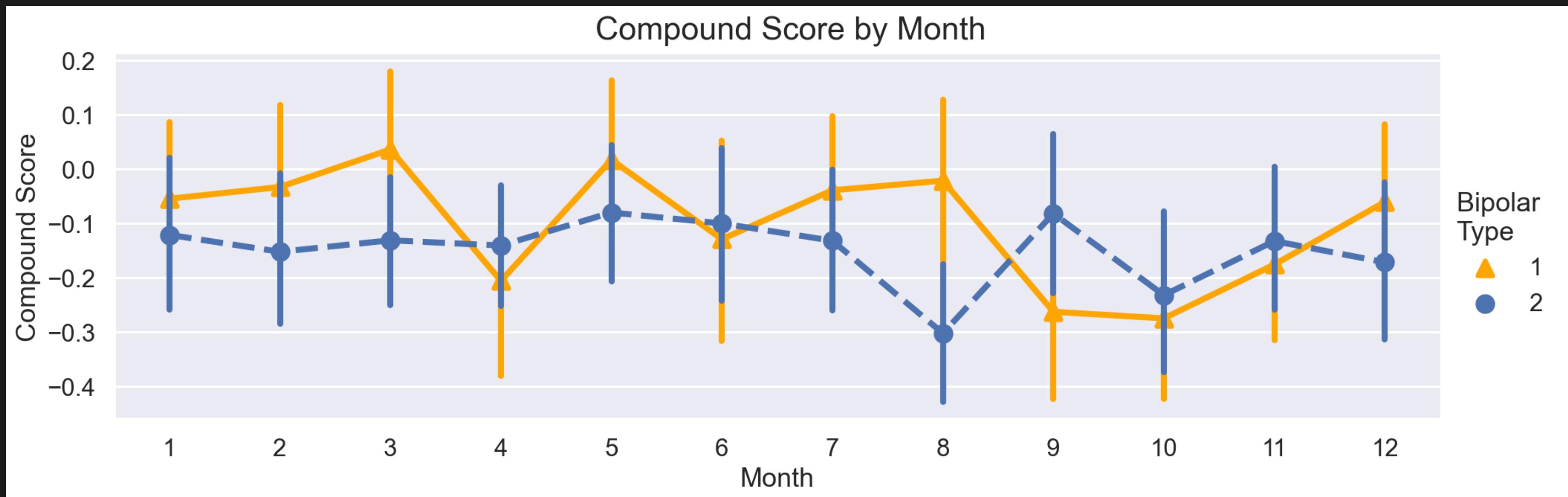
► Author information ► Article notes ► Copyright and License information [Disclaimer](#)

This article has been [cited by](#) other articles in PMC.

Abstract

A seasonal suicide peak in spring is highly replicated, but its specific cause is unknown. This study aims to review the literature on suicide risk factors which can be associated with seasonal variation of suicides. We performed a systematic review of published articles from 1979 to 2011. Such risk factors include environmental determinants such as temperature, humidity, and sunlight, as well as physical, chemical, and biological factors. We also summarized the influence of potential risk factors on seasonal variation of suicides. Seasonal variation of suicides is influenced by various clinical characteristics such as age, gender, month of birth, socioeconomic status, methamphetamine use, and so on.

Sentiment Analysis by Month



Epub 2007 Jan 3.

Autumn peak in shooting suicides of children and adolescents from northern Finland

Anniina Lahti ¹, Pirkko Räsänen, Kaisa Karvonen, Terttu Särkioj

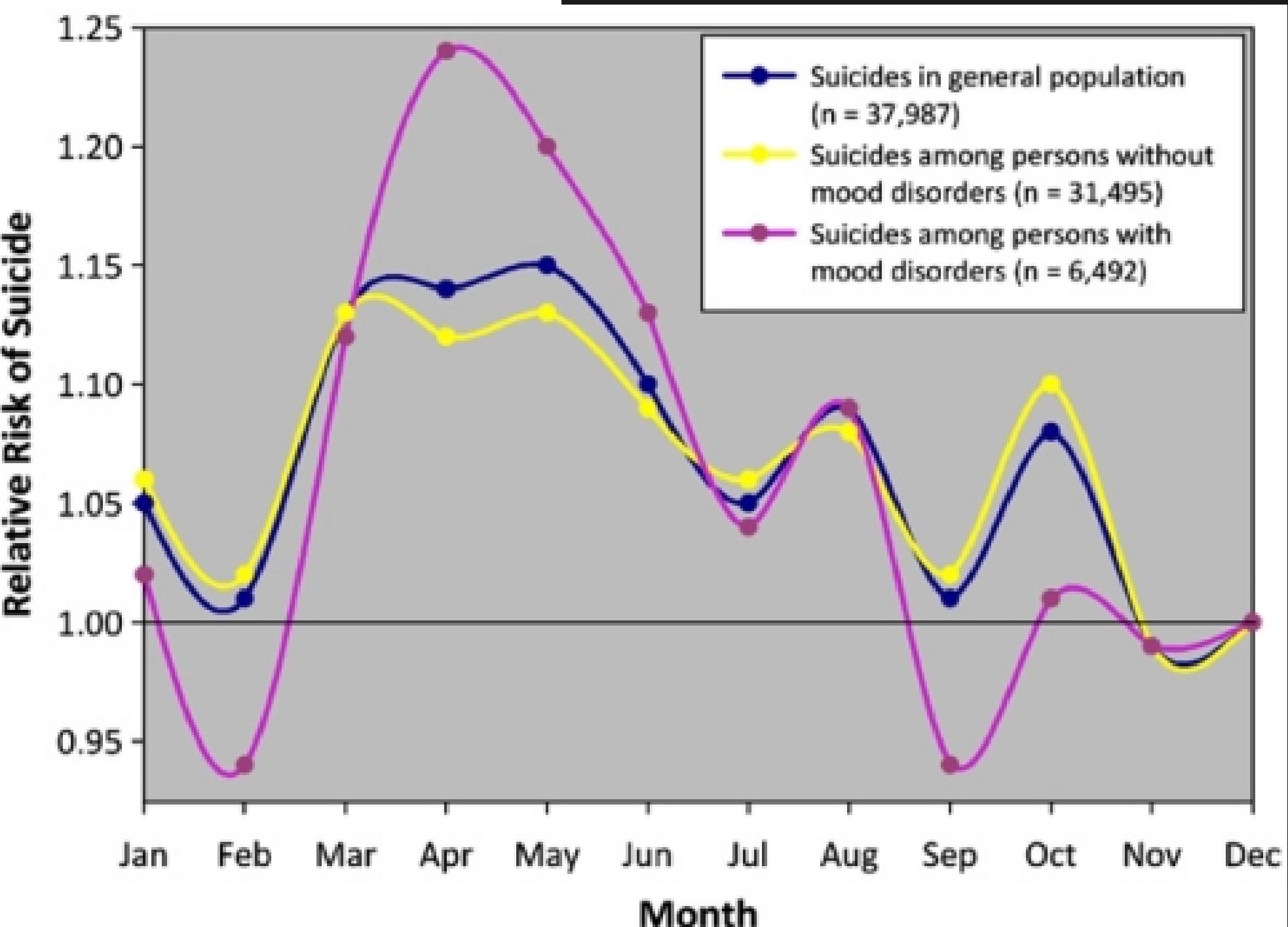
Helinä Hakko

Affiliations + expand

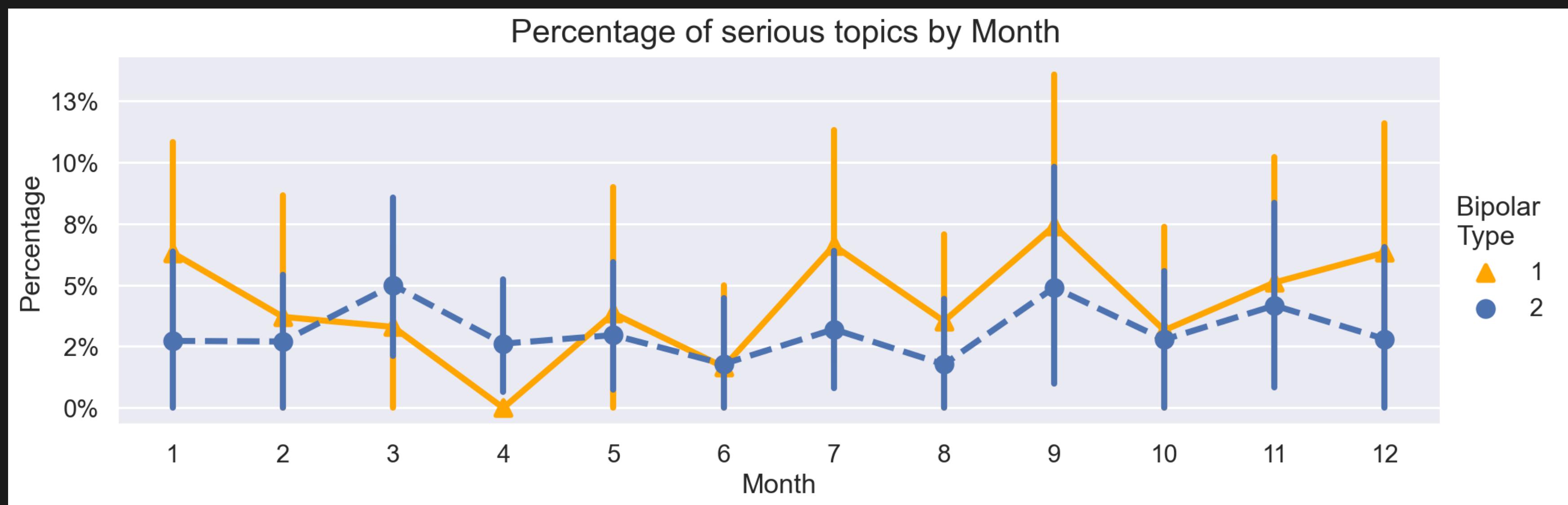
PMID: 17199100 DOI: 10.1159/000098265

Seasonality of Suicidal Behavior

Jong-Min Woo,^{1,2} Olaoluwa Okusaga,^{3,4} and Teodor T. Postolache^{3,4,*}



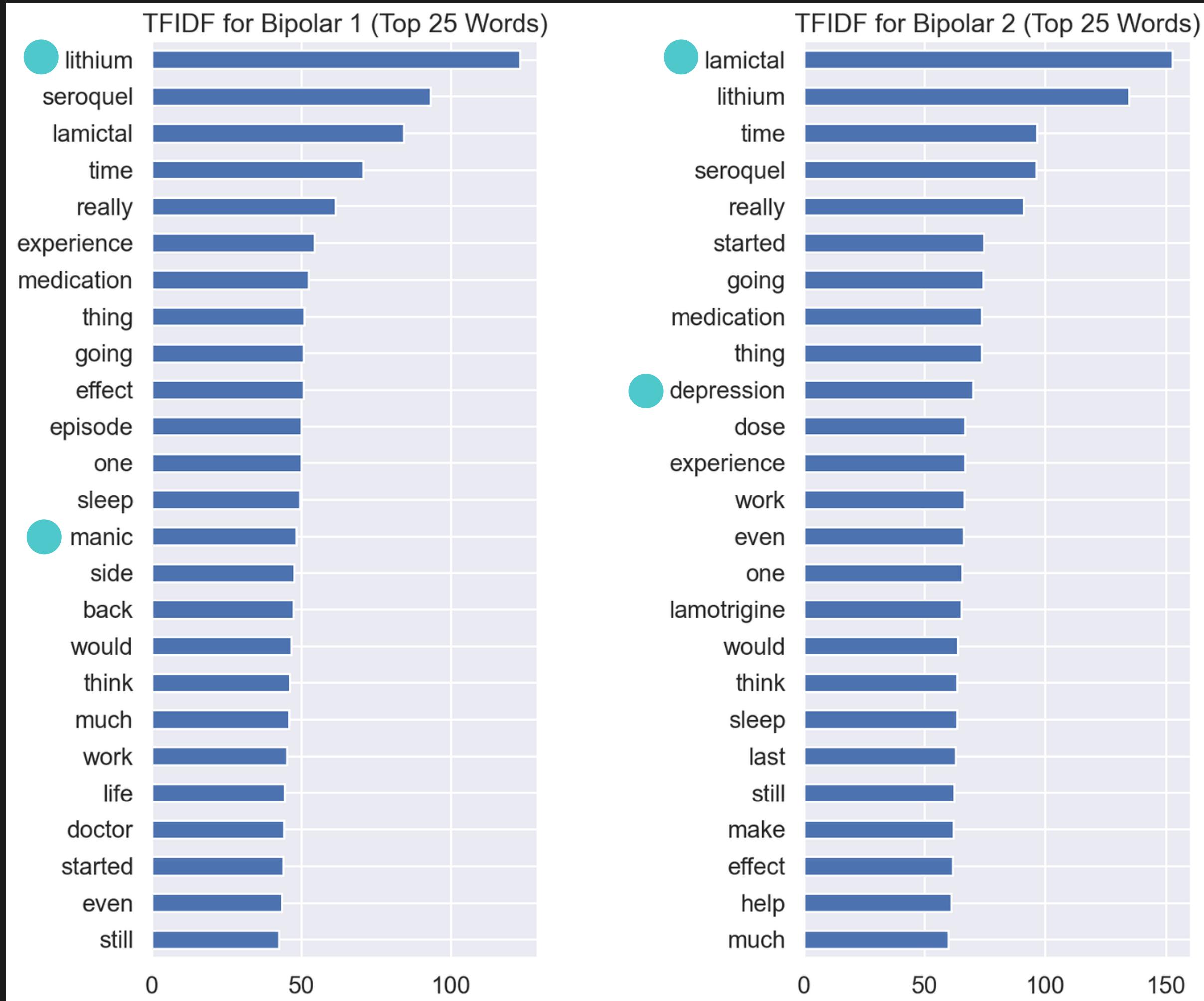
Serious Topics by Month



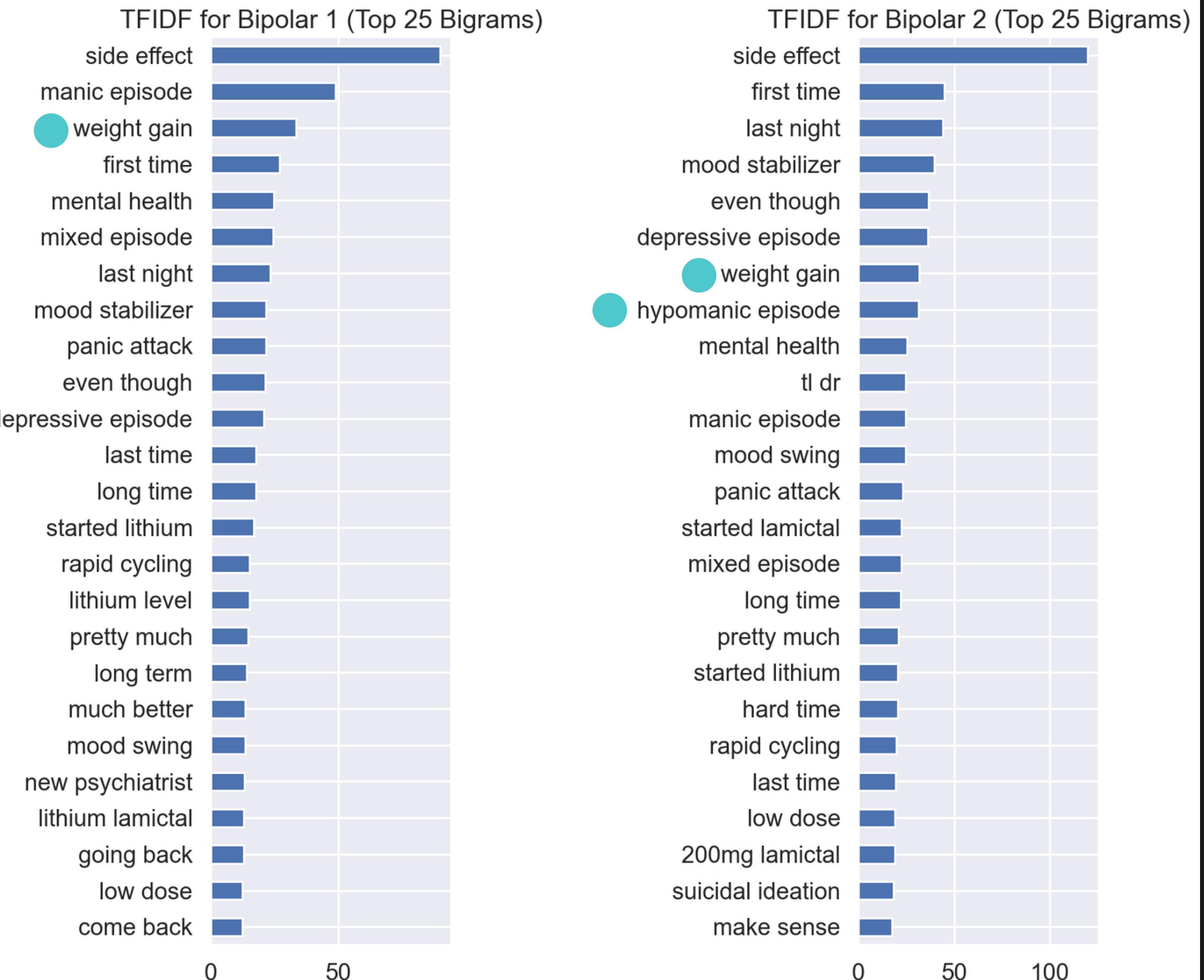
Word Counts

Stopwords filtered

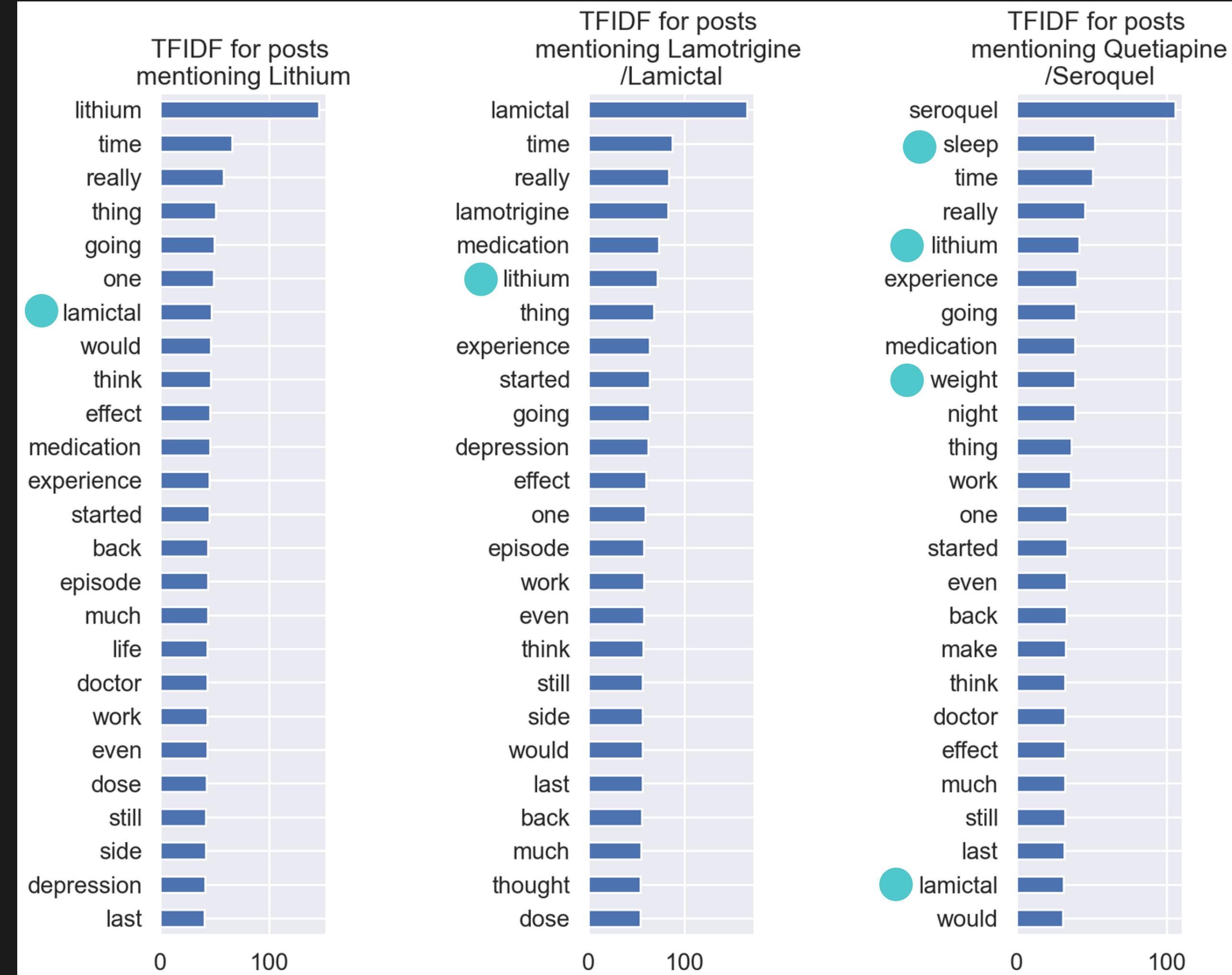
'feel', 'feeling', 'like', 'take',
 'taking', 'go', 'get', 'got',
 'bipolar', 'day', 'days', 'month',
 'months', 'year', 'years', 'week',
 'weeks', 'ago', 'med', 'meds',
 'know', 'anyone', 'want', 'else',
 'also', 'since'



Bigrams



Mood Stabilisers



" Does Seroquel make it hard to wake up? I've been extremely late for work three times since starting Seroquel. I've never had problems being late before and I'm not typically a heavy sleeper.

But lately, I could sleep through a tornado."

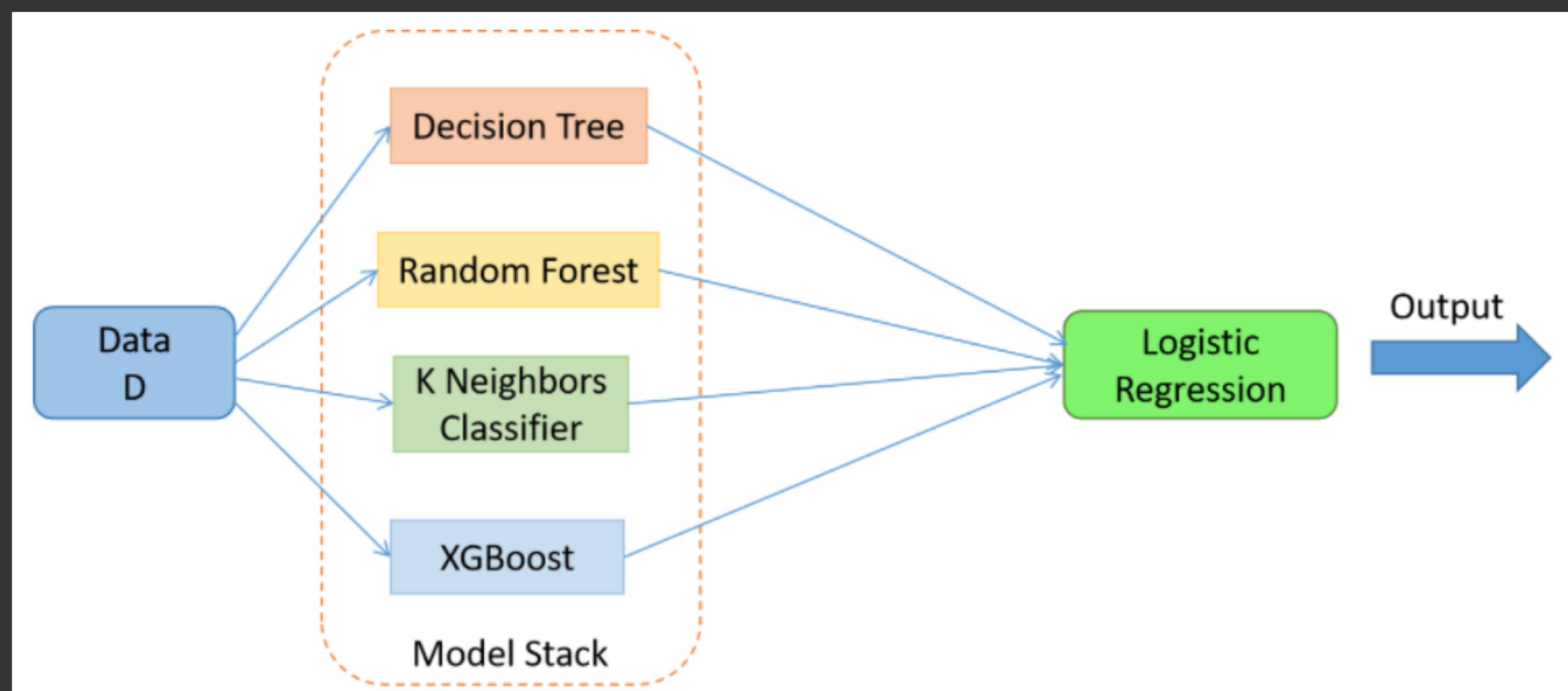
" Is it possible to gain weight from Seroquel only a week after it's being increased? I gained 6 pounds in one week. I don't understand because I feel like I am eating the exact same. Also, I am actually excessing more. The only thing that is different is that my Seroquel increased by 150mg. So now I'm taking 200mg. Please give advice, I really want to be proactive in making sure I don't gain weight. I will stop the medication if this side effect happens..."

Modelling

Engineered features did not improve the model, so only text was used

Text was vectorised using either Count or TFIDF Vectorisation

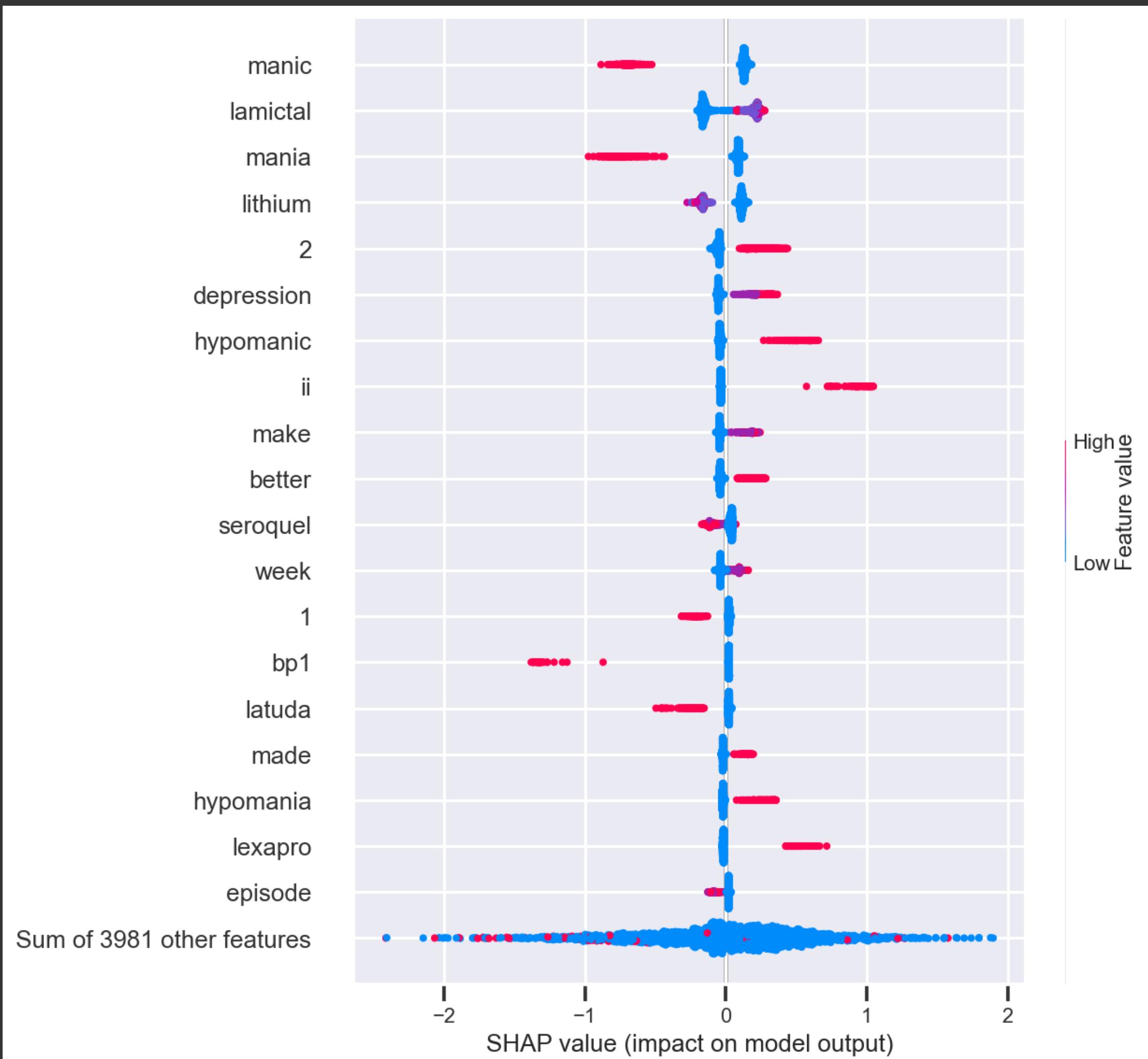
Tried stacking models



Classifier Results

Model	Vectorization	Test Accuracy	Cross-Val Training Accuracy (5-fold)	Training Accuracy	F1 Score (Bipolar 1)	F1 Score (Bipolar 2)	ROC AUC
CatBoost Classifier	Count	0.72	0.69	0.89	0.61	0.78	0.78
Random Forest	Count	0.65	0.65	1.00	0.44	0.75	0.71
CatBoost + XGBoost + LGBM Classifiers	TFIDF	0.71	0.67	0.68	0.59	0.78	0.68
LogisticRegression + KNeighborsClassifier + DecisionTreeClassifier + SVC + MultinomialNB	TFIDF	0.69	0.65	0.99	0.03	0.73	0.71

Feature Importances



Key Takeaways

Bipolar Type 1

- Monitor during April (as well as Sept-Oct)
- Effect of seasons
- Manic or mixed instability

Bipolar Type 2

- Monitor during Aug and Oct
- Monitor on weekends
- Depression

Both

- Weight gain is a concern
- Side effects are a general concern
- People want to compare or find out others' experiences

Future Directions

- 01 **Different scope**
We are only scratching the surface
- 02 **Psychoeducation**
Q&A verified by medical professionals
- 03 **Data Labelling**
90% of posts on the subreddit are not labelled with author subtype

Concluding Words

Thank
You

None	1631
Med Question	303
99 Problems/Rant/Story	124
General	123
General Question	88
Advice	55
Discussion Starter	34
Good News	22
Suicidal Thoughts Trigger	21
Caution - Suicidal Thoughts	17
Caution - Depression Trigger	15
Dangerous Behavior Warning	14
Meme	11
Drug Use	10
Caution - Manic Trigger	9
Art	6
Misleading Title	4
Interesting Link	2
Caution - Self Harm	2
Amazeballs	2
Self-Harm Trigger	2
General Question/Advice	2
STAR WARS SPOILER	1
Sexual Abuse Trigger Warning	1
Domestic Abuse Trigger Warning	1

Defining Serious Topics

```
# List of flairs for serious topics
serious_flairs = ['Suicidal Thoughts Trigger',
                   'Caution - Suicidal Thoughts',
                   'Caution - Depression Trigger',
                   'Dangerous Behavior Warning',
                   'Drug Use',
                   'Caution - Manic Trigger',
                   'Caution - Self Harm',
                   'Self-Harm Trigger',
                   'Sexual Abuse Trigger Warning',
                   'Domestic Abuse Trigger Warning']
```

0	2408
1	92

Confusion Matrix

