

# Assignment 2: South African Media Agency Twitter: Sentiment & Topic Modeling

## Background

South Africa has seen an increase in COVID-19 recently and that has been labelled the third wave. The statistic of a third wave has moved the country into another level 4 lockdown. The news on statistics and general COVID-19 related happenings in South Africa are usually reported by their media agencies. The media agencies use many platforms online to repost their articles such as websites and mobile apps. Twitter is a platform where they can post their headline with a link to the article. Using sentiment analysis and topic modelling, we will compare how sentiment and topics have changed over time and how they compare to other media agencies.

## Analysis Process

Twitter posts will be extracted using the “rtweet” package for the programming language “R”. By using the `get_timeline` method in the package we can extract the latest 3200 Tweets from a specific user without premium. In this case, the users will be a selection of top South African media agencies. 3200 Tweets will give us 2 months’ worth of data per media agency. Relevant COVID-19 Tweets will be extracted from that data. We use VADER to conduct sentiment analysis on the Tweets extracted. We choose VADER over sentimentR, as VADER has been academically proven to provide a more accurate sentiment on Tweets. VADER will give us a positive, negative, neutral, and compound metric on the Tweet. Compound is the Tweets overall sentiment. We then conducted topic modeling using LDA. Most of our process comes from working through Text Mining with R

News24: Recognized by APP Annie (App Annie is the standard in app analytics and app market data) as the most known South African internet media source. Times Live: Claim to be South Africa’s second-biggest news website, published by Arena Holdings (Times Live website). No evidence found to disprove this claim. In top 10 of most visited publication websites for South Africa. Daily Maverick: Boasts free, fair, and fearless reporting. eNCA: In top 10 of most visited publication websites for South Africa. SABC News: National news company with government ties. Reaches a wide variety of viewers in different languages. The company is both state owned and a public broadcaster company.

## Comparing Tweets from South African Media Agencies.

We first clean the original Tweets to remove unique News based language. Media agencies often lead their Tweet about an article with the category it belongs to, eg. OPINION, BUSINESS, WATCH.

Some tweets fetched date further back. The 3200 tweet pull per user causes this. It tells us that agencies like News24 and SABC News Tweet more daily than Daily Maverick.



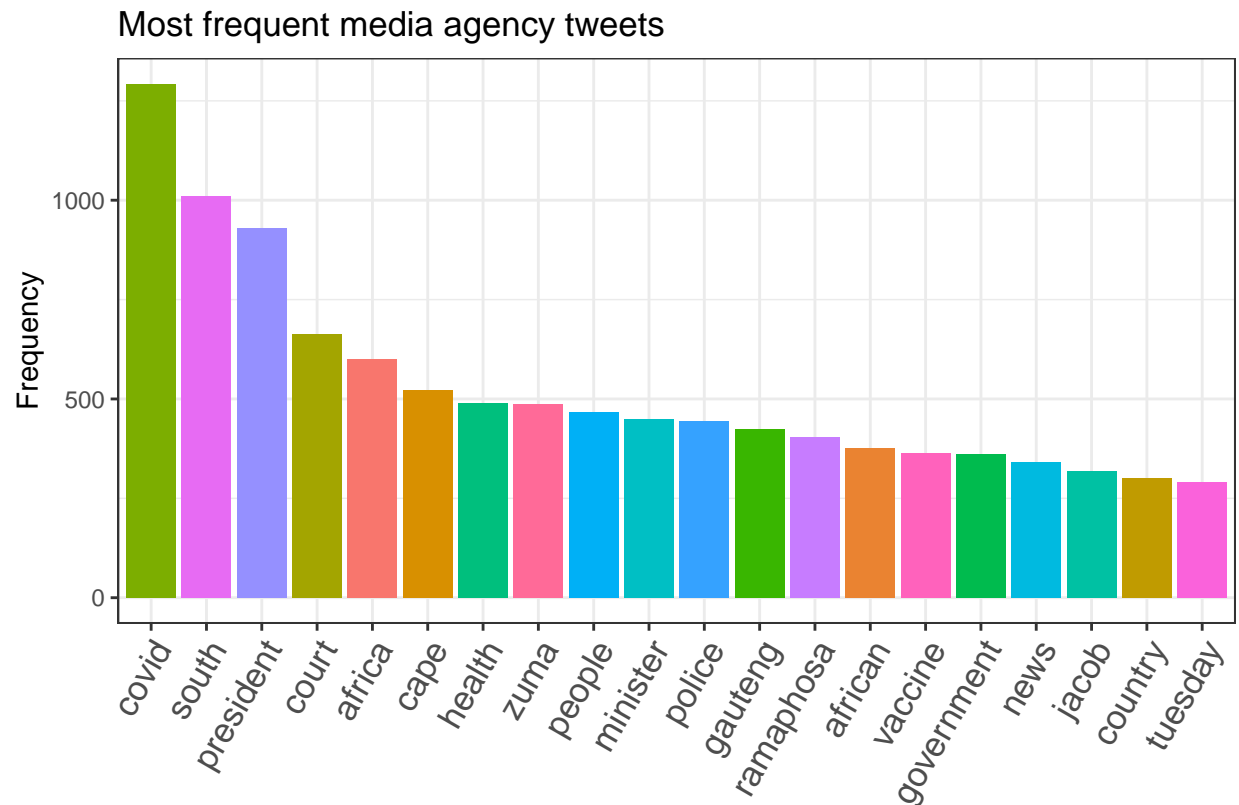
By modeling bigrams and trigrams for our dataset we get a better understanding of what topic is being discussed with each word. Trigrams were modeled but were not necessary as bigrams provided enough information. We can then also see which sentiments are incorrectly labeled. “not good” gives better context of a negative sentiment, rather than it being incorrectly identified as positive good.

We give more weight to words that appear more often with the incorrect sentiment. The graph below shows that ‘no good’ or ‘not impressed’ have the highest weight of being mis-labeled as positive, and vice-versa for

negative words like guilty. We remove these words to increase the accuracy of our sentiment analysis. We can now tidy our dataset based on tidyverse's stopwords collection, and our own negation word collection.

We tokenize the Tweets and remove stop words in tidytext, our own stopwords dictionary, and negation word dictionary. We also use the "twitter" token to handle any left over @'s and URLs.

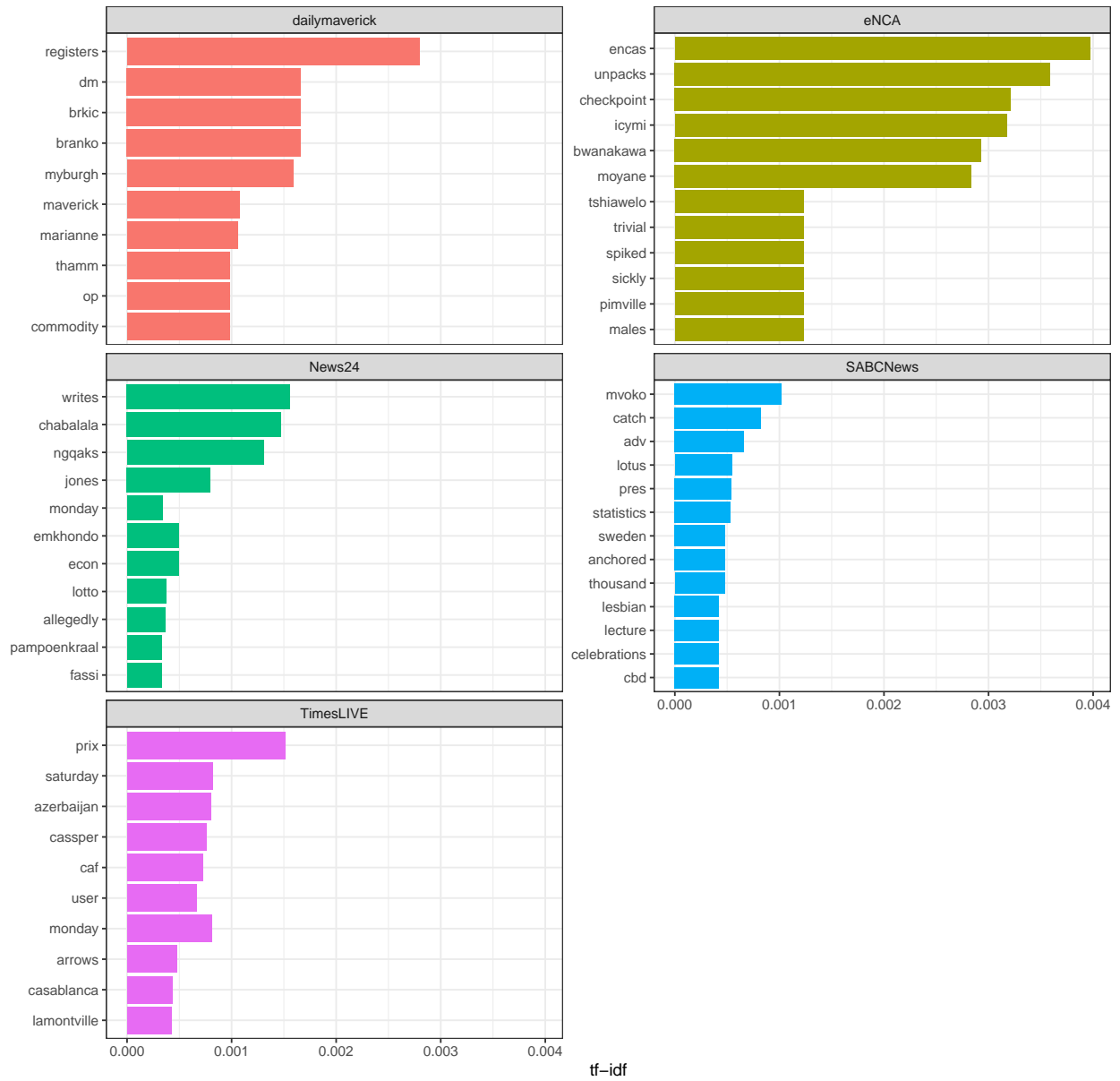
From our tidied Tweet dataset, we look for the top words that appear. This will give us a good idea of what topics are being discussed the most. We find that COVID-19 has been the main topic of discussion. President appears second as President Ramaphosa of South Africa usually addresses the nation regarding COVID-19 information. Additionally, Zuma also appears as he is mentioned as "former president Zuma" in most articles. Zuma appears more as his recent court avoidance and sentencing is being Tweeted. General words surrounding the COVID-19 topic as it is still the main pressure on the country, especially involving Gauteng's rise in infections.



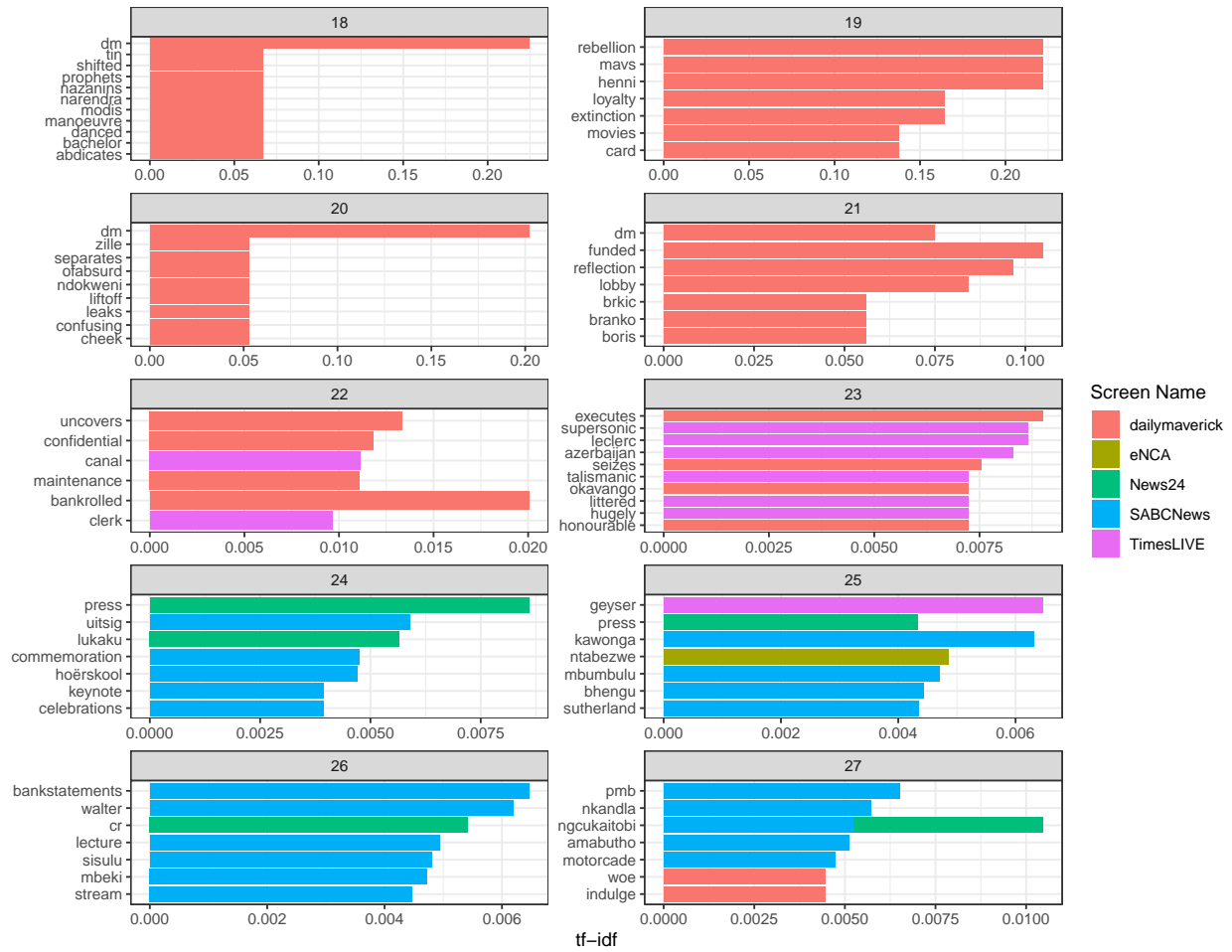
A tf-idf is then modelled to determine which words are the most important per media agency. We also model the word importance by week and determine which media agency has the most unique topics of the week. Daily Maverick is dominating the first four weeks as they are the only user with Tweets from that time.

```
## Selecting by tf_idf
```

Highest tf-idf from each Media Agency

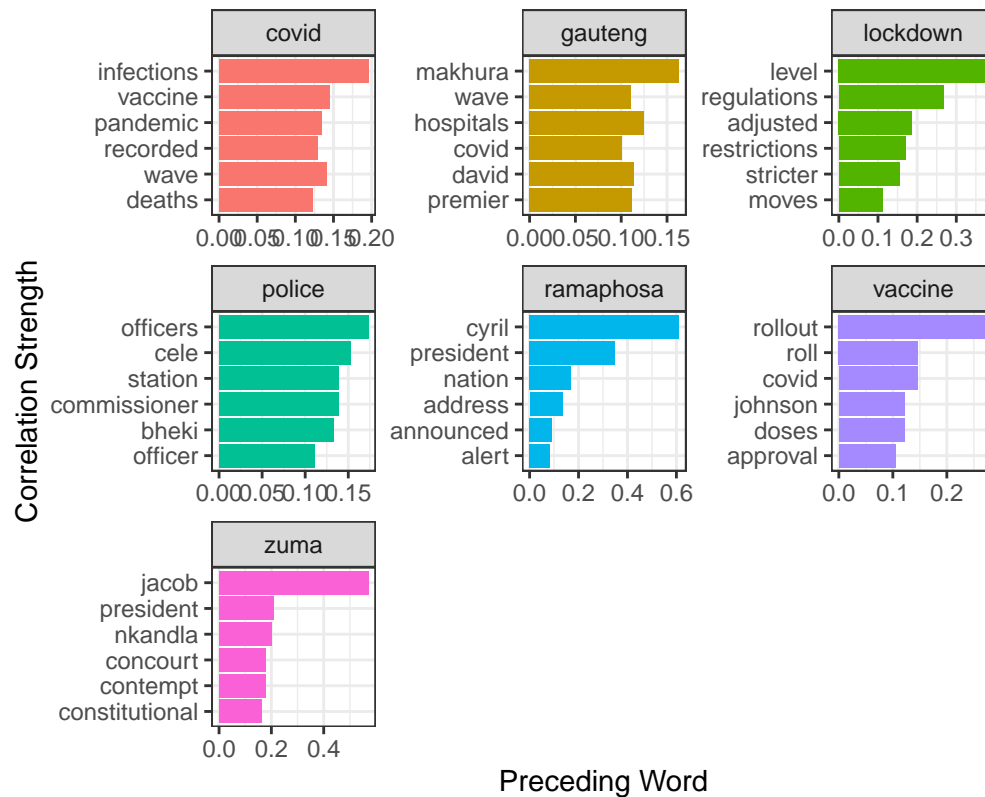


Highest tf-idf by Media Agency in Each Week



The graph below shows which words are most likely to co-occur. We use this to understand the context of words in our topic modeling. The words shown are popular words in our dataset.

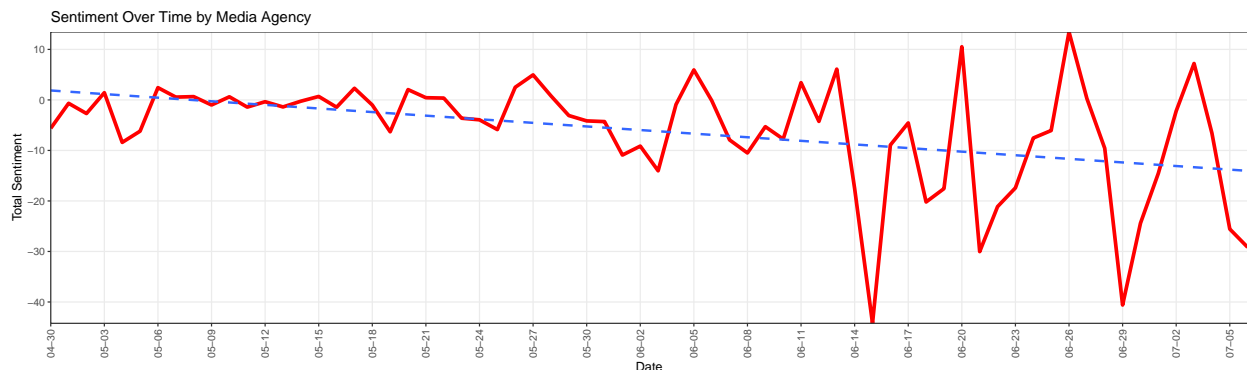
## Words that Precede Popular Terms



## Sentiment Analysis

### Sentiment over time

The general sentiment over time is mostly negative. News articles use negative headlines to get a faster reaction from people when skimming through news. Positive News usually involve sport headlines.



### Most Negative Tweet

An illegal gold miner who was severely injured in a clash in which four other illegal miners were killed has been charged for their murders, Mpumalanga police said on Thursday.

## Most Positive Tweet

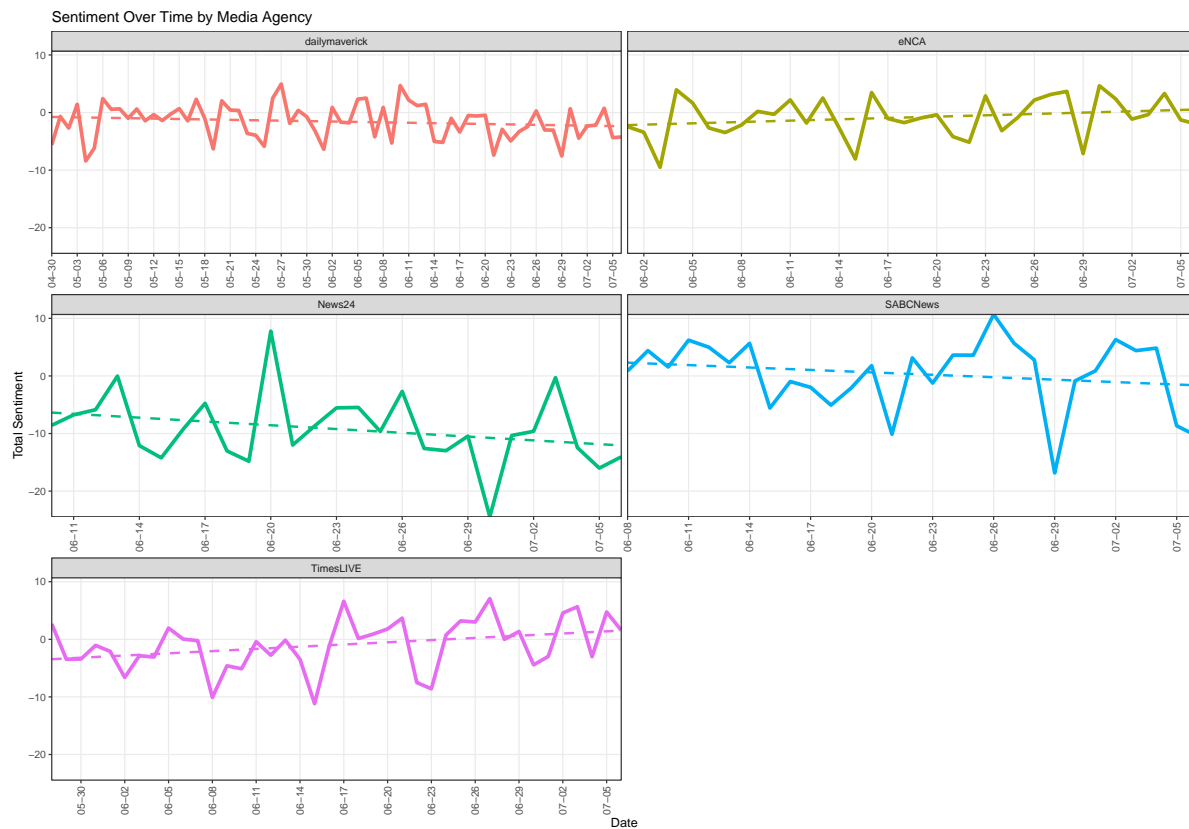
Daily Maverick; Food for Mzansi get the nod at the Global Media Awards: @foodformzansi gets 3rd place in Ad Campaigns; honourable mention for Best Use of Audio @dailymaverick gets honourable mentions for Reader Engagement; Best Use of Print.

## Sentiment Over Time per Agency

Daily Maverick, although decreasing, has the straightest regression line. It also has the least outlying total sentiment. We could conclude that this agency is the least bias to emotion. News24 has the most positive and positive daily news.

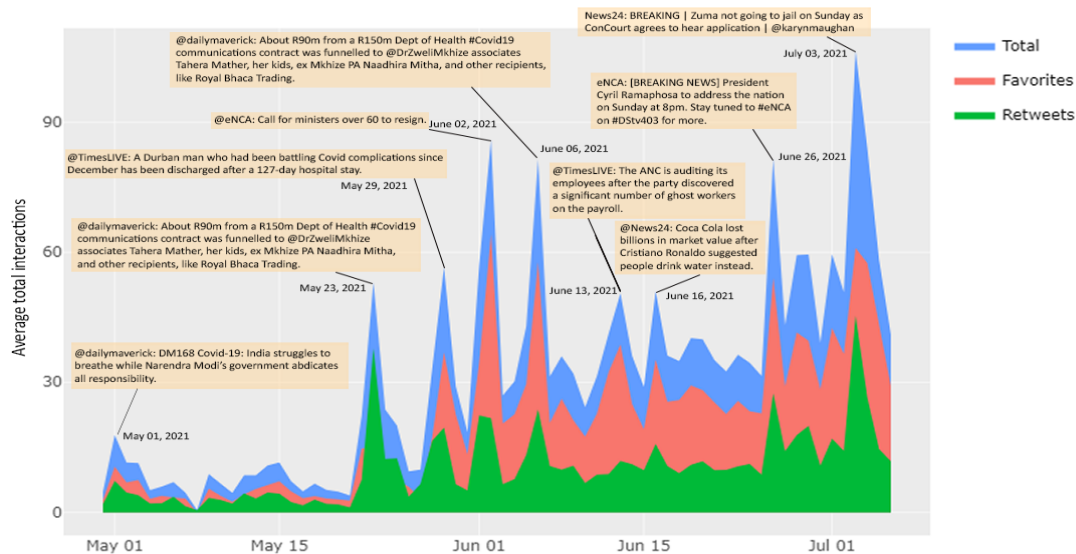
```
## `summarise()` has grouped output by 'created_at'. You can override using the `.groups` argument.
```

```
## `geom_smooth()` using formula 'y ~ x'
```



## Interactions

The plot below maps the average total interactions by day. From the relevant peaks, we extract the top tweet in that day.



### Peak Tweets by User

*@eNCA*: Call for ministers over 60 to resign.

*@dailymaverick*: SCORPIO Floyd Shivambu's brother quietly pays back R4.55m, admits he received the VBS money gratuitously.

*@TimesLIVE*: Do you approve of Duduzane running for president?

*@News24*: Coca-Cola lost \$4 billion in market value after Cristiano Ronaldo suggested people drink water instead.

*@SABCNews*: BREAKING NEWS: King of Eswatini has fled amid public violence in the country.



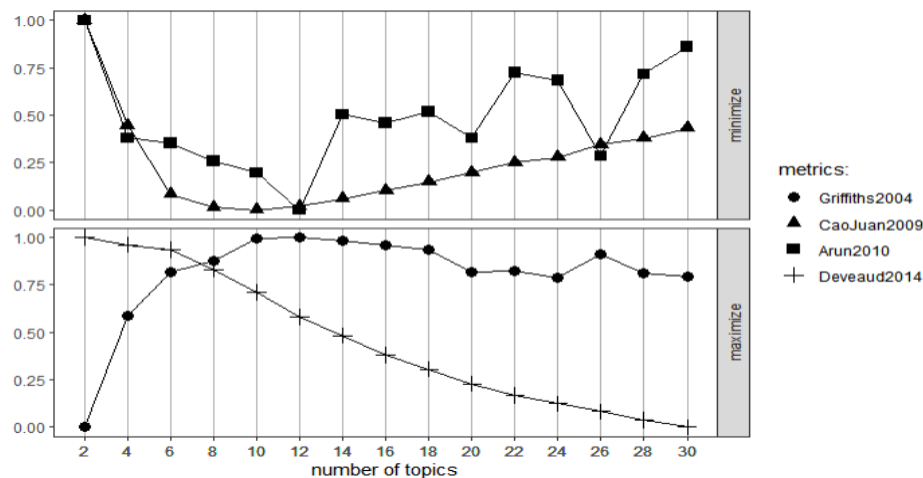
# Topic Modelling

A topic model is a type of statistic model for discovering the abstract “topics” that occur in a collection of documents. We determine the best range k-value for LDA (Latent Dirichlet Allocation). The importance of the value of ‘k’ is to ensure you do not over estimate or underestimate the data. If you over estimate it, you will be left with topics that carry very little meaning and if you under estimate the data, you will lose out on topics that could have been useful to your research.

By looking at the lowest minimum and the highest maximum, we can determine the ‘k’. This is how we have interpreted the graphs produced. Griffiths2004 is not informative in this situation and is therefore ignored.

This method used has been proved to produce the best results of LDA without subjectively tuning the ‘k’ value. Our result is 12 topics.

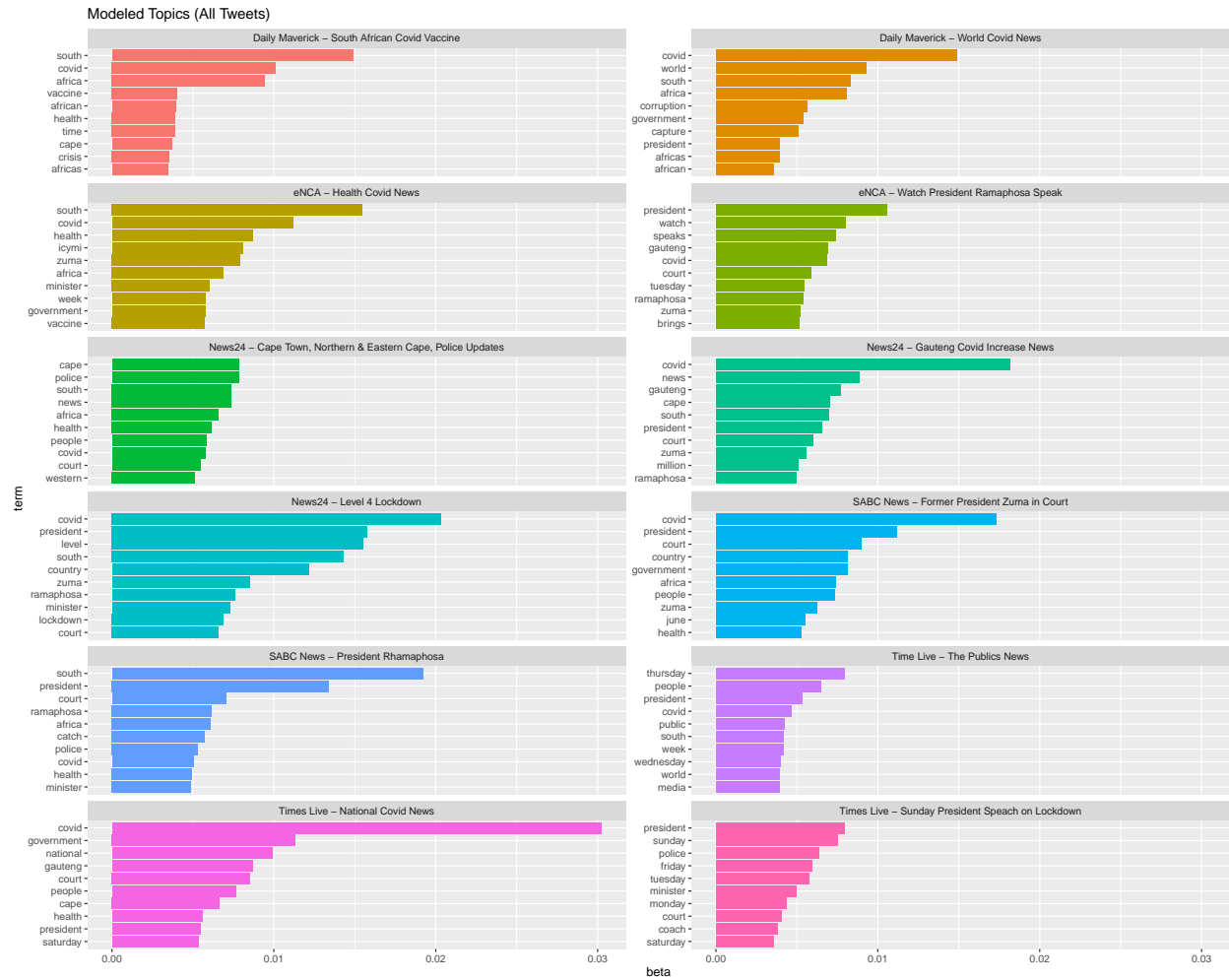
## Gap k justification



## Topics found

### Beta

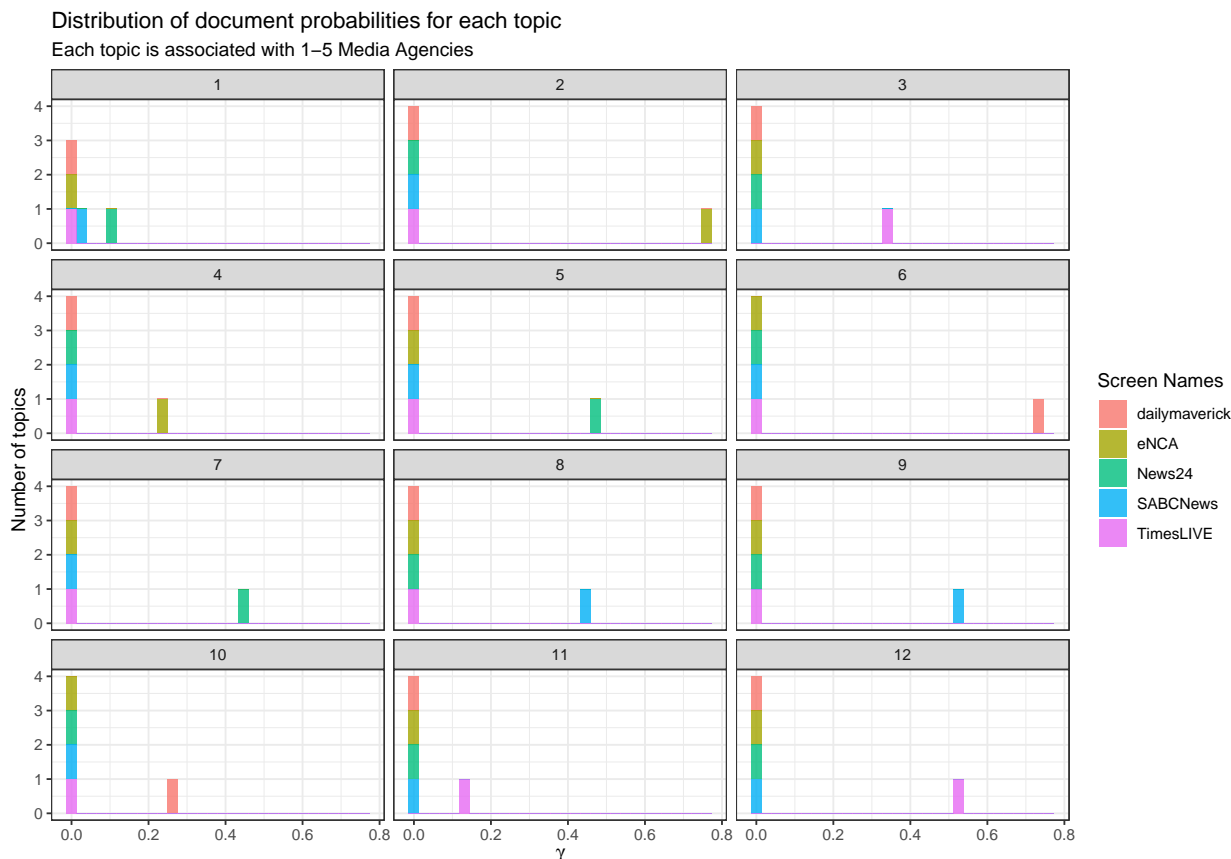
Our main topic influence is COVID-19, as this is what currently affects the country the most. Our words are mapped to a beta which shows the amount the word appears per topic.



## Gamma

The gamma is added to the topics modeled. We can now see which agencies are strongly associated with each topic. The higher the gamma, the more strongly the specific agency associates with the topic.

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



## Additional Requirements

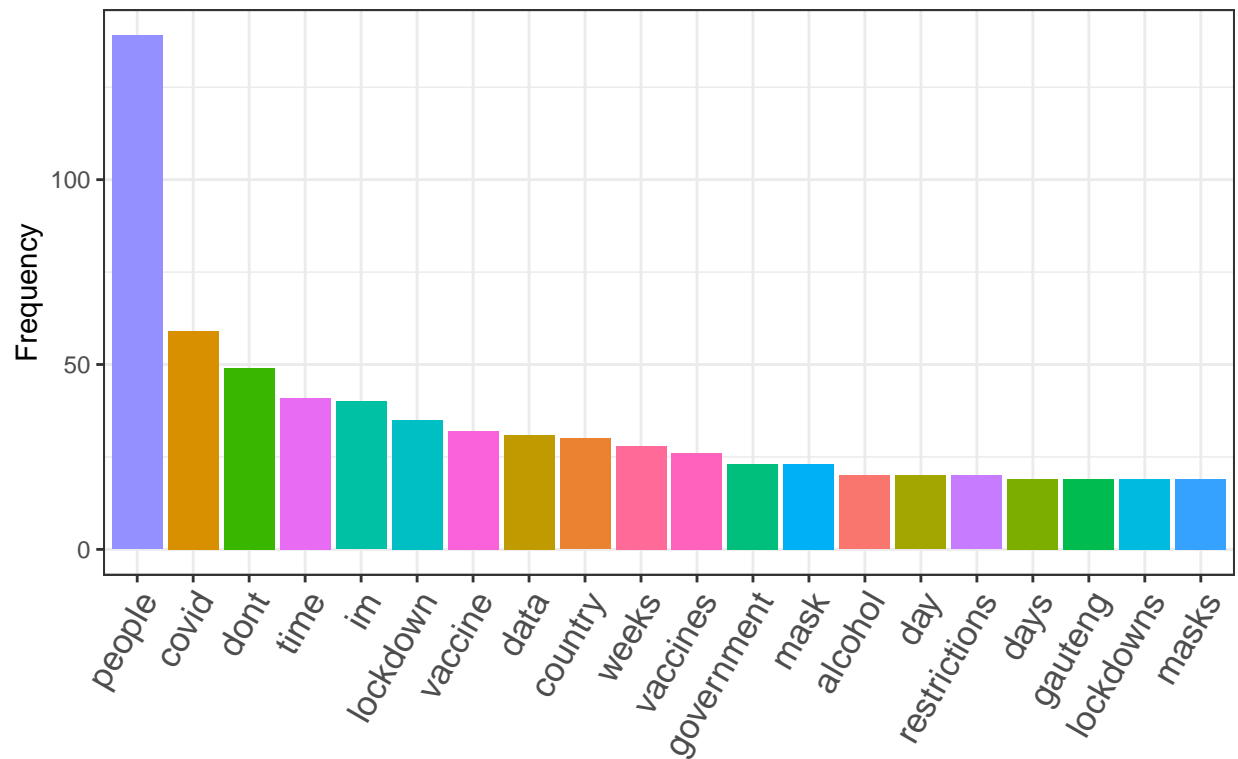
We choose Reddit as our other data source. Facebook was considered but API needing proof of identity with an ID document seemed excessive. The ‘Reddcommentractor’ package is used to extract comment and post data. Search term ‘Covid-19’ is used. Other terms were not used as their post dates went further than 6 months.

## Reddit Comparing Comments From r/southafrica Covid-19 Posts.

We clean the data as we did before. Controversial and foul language is left in to not affect sentiment. The worst language is usually moderated within the Reddit communities before it is seen by the public.

From our tidied Reddit dataset, we look for the top words that appear. This will give us a good idea of what topics are being discussed the most. We find that with COVID-19 comments being pulled, the comments discuss people’s general interaction with the virus. The comments come from regular people and this shows what topics are discussed among people.

Most Frequent Reddit Comment Words

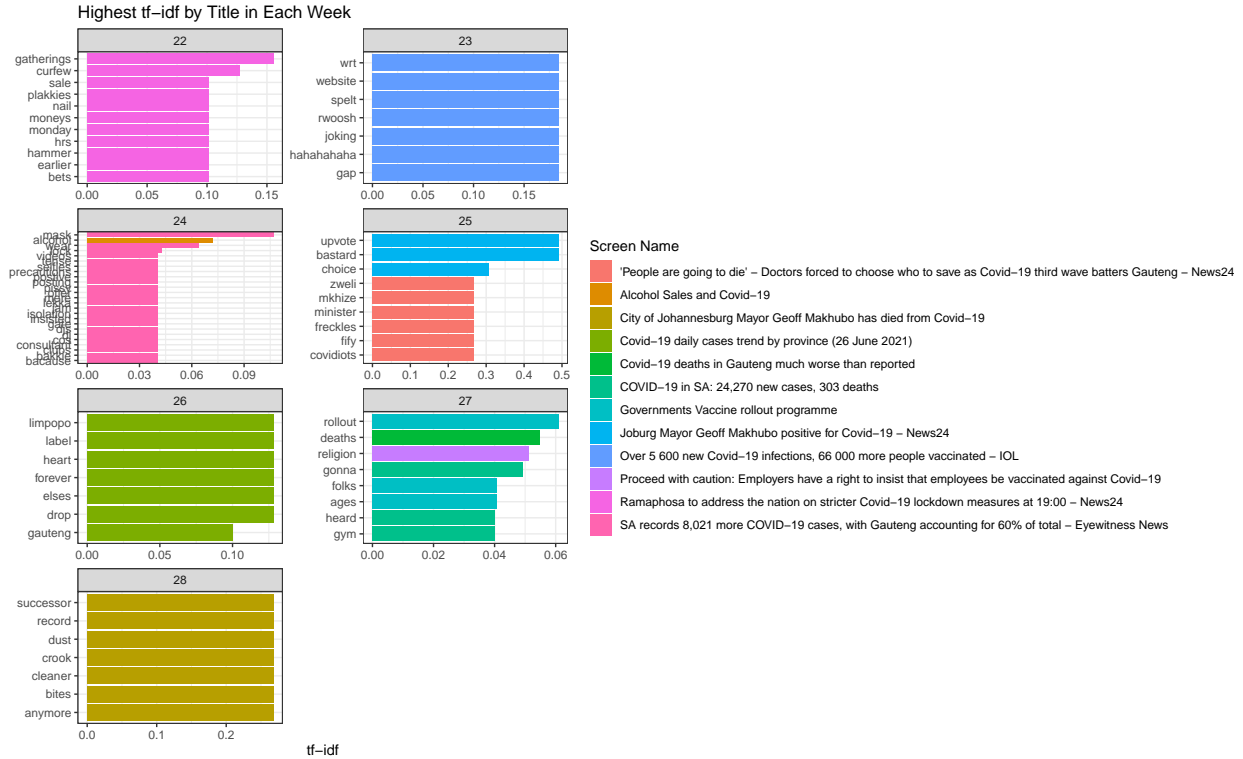


A tf-idf is then modelled to determine which words are the most important per media agency. We also model the word importance by week and determine which media agency has the most unique topics of the week. Daily Maverick is dominating the first four weeks as they are the only user with Tweets from that time.

```
## Selecting by tf_idf
```

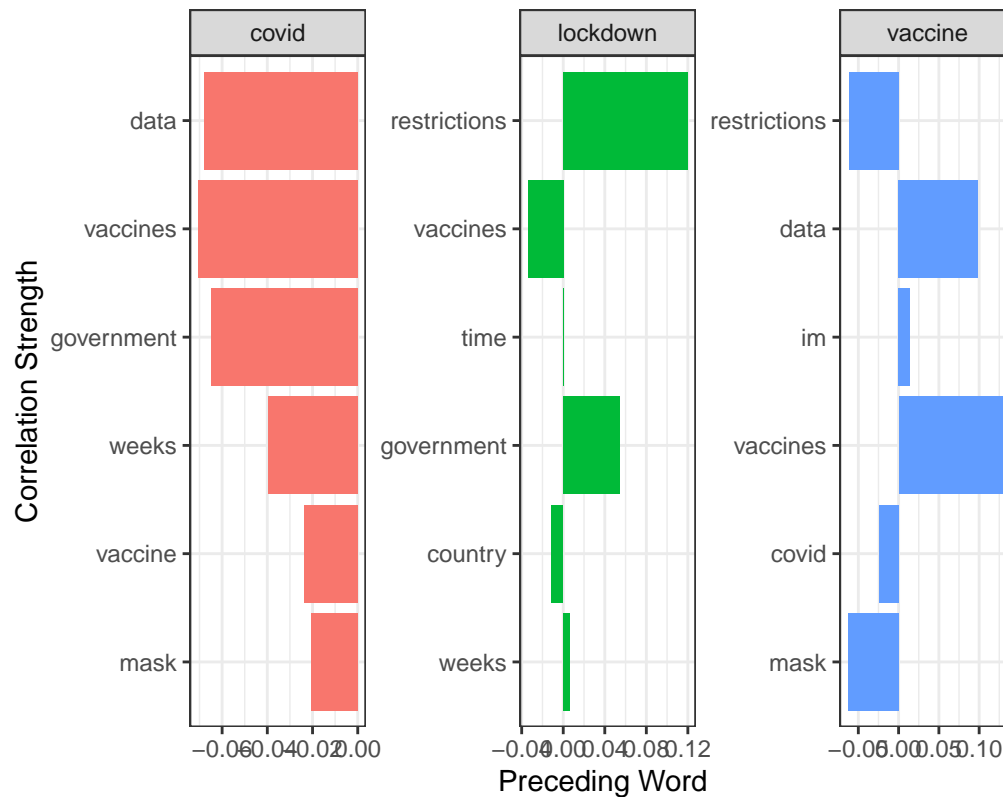
# Highest tf-idf from Title





The graph below shows which words are most likely to co-occur. We use this to understand the concomitant of words in our topic modeling. The words shown are popular words in our dataset.

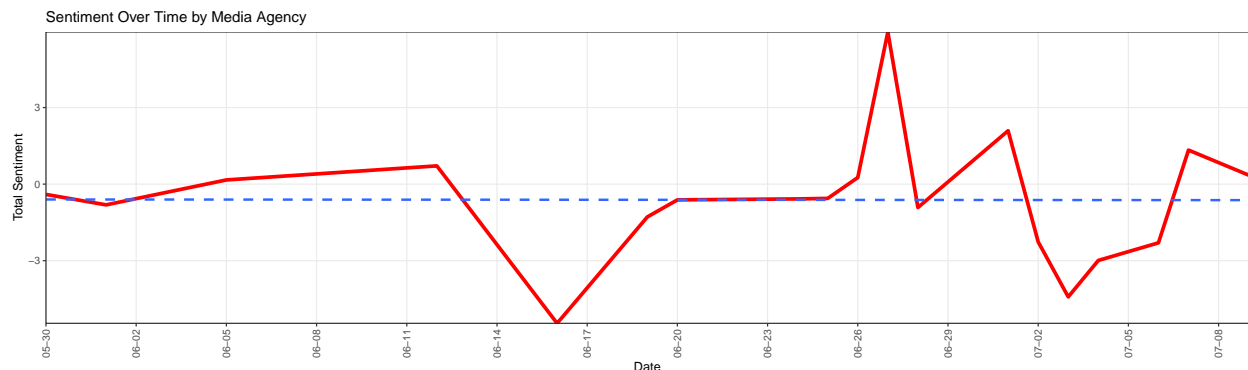
## Words that Precede Popular Terms



## Reddit Sentiment Analysis

### Sentiment over time

Reddit sentiment is sporadic. Everyone has their own opinion on a post title whether it is a positive or negative title.



### Most Negative Comment

Lambpanties: it does but sheesh the poor people my dad rents property to a restuarant owner and the poor guy hasnt been able to pay his rent about or different months now one month my parents even pitched in

to pay his staffs wages there is no way the poor guy is not going to go under from this cherry from hell on top he has covid right now to boot

### **Most Positive Comment**

babufrikhasaposse: but arts a strong driver of an improved society you dont want to live in a society without arts and demanding other people meet a standard you set while pretending they dont contribute positively to society is a bit absurd not everyone is interested in science and the aim of education isnt economic value exclusively even if everything you said is true that doesnt make the comment i replied to mot just an asshole thing to say



## Reddit Interations

Highest upvoted comment from each post (Upvotes > 10 to remove noise)

```
## # A tibble: 13 x 4
## # Groups:   title [12]
##   title                user      comment                comment_score
##   <chr>                <chr>    <chr>                <dbl>
## 1 "Alcohol Sales and Covid~ brightli~ "The primary aim of restr~          13
## 2 "Covid-19 deaths in Gaute~ glynnhays ~ "\nAnd there are still pe~          19
## 3 "Covid-19 deaths in Gaute~ UpSideSu~ "They are fucking morons.~          19
## 4 "EFF take to the streets ~ IlikeGee~ "jislaaik, the eff can ta~          15
## 5 "Governments Vaccine roll~ felixlae~ "I don't think the issue ~          11
## 6 "Lockdown Level 4 Megathr~ snail-ti~ "I love how he targeted w~          53
## 7 "Police and soldiers to a~ AnomalyN~ ">arrest\n\nAnd then w~          27
## 8 "Proceed with caution: Em~ glynnhays ~ "Good article. This one i~          11
## 9 "SA records 383 more COVI~ trashcan~ "It's business as usual. ~          11
## 10 "SA records more than 10,~ Anton_Pa~ "This wave is much worse ~          14
## 11 "WATCH | We won't comply ~ Harrrrum~ "What...is the logic here~          15
## 12 "Zuma appeals against his~ cybercup~ "Just take a shower you f~          13
## 13 "Zuma tells ConCourt jail~ SnooDraw~ "Then he should have crea~          48
```

## Controversial Comments

```
## # A tibble: 25 x 5
## # Groups:   title [9]
##   title                user      text                comment_score controversy
##   <chr>                <chr>    <chr>                <dbl>          <dbl>
## 1 Ramaphosa to addre~ Pretty~ "i bet they ban b~           3           1
## 2 Over 5 600 new Cov~ ReganE~ "you spelt lol wr~           2           1
## 3 Alcohol Sales and ~ charla~ "you see unfortun~          -1           1
## 4 EFF take to the st~ Tokolo~ "sputnik is appar~           0           1
## 5 Lockdown Level 4 M~ teonic~ "schools should s~           2           1
## 6 Lockdown Level 4 M~ Not-th~ "you goto underst~          -3           1
## 7 Lockdown Level 4 M~ Roasty~ "tables can be so~          -1           1
## 8 Lockdown Level 4 M~ simm711 "the problem is n~           0           1
## 9 Lockdown Level 4 M~ cyberc~ "is this honestly~           3           1
## 10 Lockdown Level 4 M~ cyberc~ "im sorry for you~           4           1
## # ... with 15 more rows
```

# Reddit Topic Modelling

## Gap k justification

Our result is 9-14 topics. From this we found 12 topics to be accurate.

## Topics found

### Beta

Our main topic influence is COVID-19, as this is what currently affects the country the most. Our words are mapped to a beta which shows the amount the word appears per topic.

