

The background is a stylized illustration with a teal and red color palette. It features a large smartphone in the center displaying the words 'SOCIAL MEDIA' and 'FAKE NEWS'. A person is shown interacting with the phone. Surrounding the phone are various icons: a Wi-Fi symbol, a speech bubble with text, a magnifying glass, a sad face with 'x's for eyes, and a person holding a phone. The overall theme is digital communication and misinformation.


EXAMINING MISINFORMATION SPREAD OF SCIENTIFIC EVIDENCE

on Hydroxychloroquine Twitter Discourse using Machine Learning
and “Echo” Scores


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BACKGROUND

- July 27th, 2020, U.S. President Trump retweeted a video falsely claiming that using hydroxychloroquine was a cure for COVID-19 despite well documented concerns about hydroxychloroquine's safety.
- Trump's retweet is related to the broader COVID-19 infodemic which involves deliberate attempts to disseminate wrong information to undermine public health response.
- The dissemination of misinformation is exacerbated with messages from scientific authorities or studies that undermine or directly contradict official scientific findings.

Donald J. Trump  54K Tweets Following

Donald J. Trump Retweeted

 **Biobiobio** @biobiobiobior · Jul 25

REMINDER - July 25, 2020: 62 studies confirm the effectiveness of hydroxychloroquine. Deafening silence of the Mainstream Medias, unacceptable mediatic lockdown. [#Hydroxychloroquine](#) [#Hydroxychloroquineworks](#) [#Trump](#) [#coronavirus](#) [#COVID19](#) [#FauciTheFraud](#)

PrEP	PEP	Early	Late
100%	100%	100%	61%

65 HCQ COVID-19 studies (39 peer reviewed)

PrEP, PEP, and early treatment studies show high effectiveness, while late treatment shows mixed results.

COVID-19 Treatment Analysis
COVID-19 Treatment - Analysis of 65 global studies showing high effectiveness for early treatment
c19study.com

882 5.7K 10.6K

METHODS

- Tweets were collected from the Twitter API using “hydroxychloroquine” and “chloroquine” as keywords from July 27th-31st, 2020.
- In order to analyze the large volume of tweets, we used an unsupervised machine learning approach called the biterm topic model (BTM) which categorizes tweets into highly correlated topic clusters based on textual similarity.
- Top 10 most retweeted tweets were extracted from each topic cluster and manually coded to identify misinformation themes, which included: ***Medical Endorsements, Supportive Scientific Evidence, Opposing Scientific Evidence***
- Echo scores were measured for each topic by taking the number of total tweets and dividing by the number of unique tweets. High echo scores indicate higher number of replicated tweets with identical text.

Echo Score = Total Tweets / Unique Tweets

RESULTS

OF 532,199 USERS:

88.3% are engaged in topics with positive sentiment towards hydroxychloroquine compared to only **5.5%** that expressed negative sentiment.

OF THE 2,289,441 TOTAL TWEETS:

18.04% were within topics featuring a medical endorsement for hydroxychloroquine

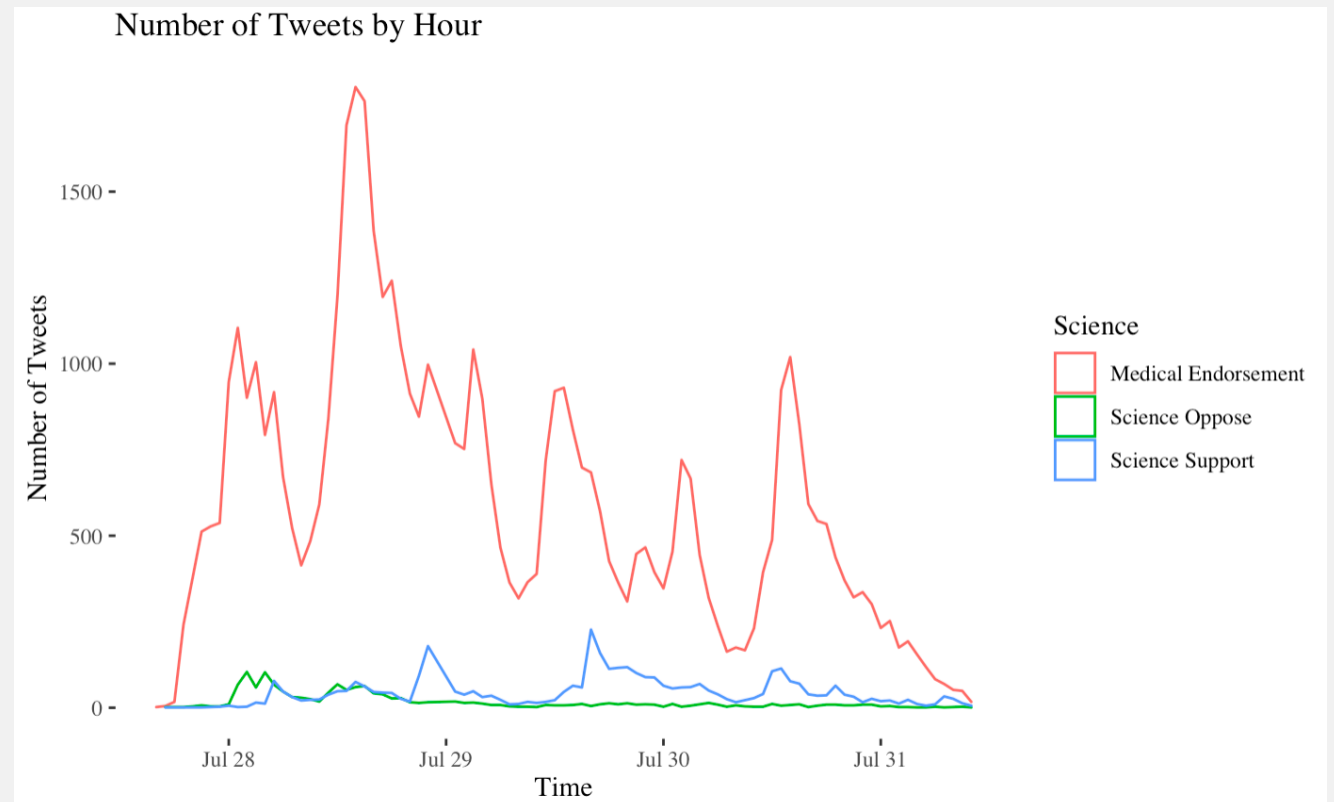
1.34% featured scientific evidence supporting hydroxychloroquine usage.

.51% Less than 1 percent featured opposing scientific evidence

TIMELINE & ECHO SCORES

- Topics that were high in medical endorsements and supportive scientific evidence also had higher echo scores of retweets, indicating higher levels of retweets without additional commentary (i.e. message was unaltered) compared to the topic featuring opposing scientific evidence
- While both medical endorsement and scientific support topics experience multiple peaks in tweet numbers throughout the duration of the discourse, the scientific opposition topic only has two smaller peaks early in the conversation and then tapers off

Topic	Tweets	% Total Tweets	Sentiment	Echo
<i>Med Endorse</i>	413072	18.04%	0.88	17.394
<i>Sci Support</i>	30759	1.34%	0.84	9.59
<i>Sci Oppose</i>	11601	0.51%	-0.89	5.13



CONCLUSION

The majority of the hydroxychloroquine twitter discourse revolves around topics that express positive sentiment towards its usage, and misinformation such as medical endorsements and supportive scientific evidence are prevalent themes.

Topics with high levels of hydroxychloroquine support also have higher echo scores, indicating that misinformation from original tweets is transmitted unaltered across the communication network.

These results demonstrate the need for higher online engagement from public health officials in disseminating accurate and up-to-date scientific evidence that is messaged consistently (i.e., high echo score) across health-related online discourse to combat against the spread of misinformation.