



# COVID VACCINE HESITANCY

## SCIENCE OR HYSTERIA?

Project: MIS-284N Analytics for Unstructured Data

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# INTRODUCTION

**~95% reduction in mortality and severity of covid cases was observed post vaccination with no reported side-effects**

## How some of the Covid-19 vaccines compare

Company	Type	Doses	How effective*	Storage	Cost per dose
 Oxford Uni- AstraZeneca	Viral vector (genetically modified virus)	x2 	62-90%	Regular fridge temperature	£3 (\$4)
 Moderna	RNA (part of virus genetic code)	x2 	95%	-20C up to 6 months	£25 (\$33)
 Pfizer- BioNTech	RNA	x2 	95%	-70C	£15 (\$20)
 Gamaleya (Sputnik V)	Viral vector	x2 	92%	Regular fridge temperature (in dry form)	£7.50 (\$10)

\*preliminary phase three results, not yet peer-reviewed

Source: Respective companies, WHO

BBC

- Vaccines prevalent in the US (Pfizer & Moderna) - 95%+ efficacy
- Protection against fatalities from variants in the majority of cases
- Reduction in economic losses by enabling quicker reopening of economies
- Boost the economy by saving \$10 of healthcare costs for every \$1 invested in early-care vaccine programs

# INTRODUCTION

Even after targeted government initiatives, more than 40% of the Americans are unvaccinated, which might be due to strong apprehensions regarding the vaccine

## Govt Incentives

~63%

Americans (12+) have been vaccinated once

~53%

Eligible Americans have been fully vaccinated

~98%

COVID Deaths in the US were from the unvaccinated cohort

~57%

Unvaccinated adults consider Covid-19 claims exaggerated



## Problem Statement:

We plan to understand the common perceptions of individuals around COVID-19 vaccination, the key attributes associated with it and any underlying reasons for vaccine hesitancy.



# METHODOLOGY

8 topics were identified and the associated sentiment & lift values were analyzed



## WEB-SCRAPING

- Scraped tweets using Tweepy including the terms “covid” or “vaccine”
- Post extraction, used Selenium to scrape replies to these tweets
- Request Library to extract URL from the shortened version



## PRE-PROCESSING

- Removed additional stop words like “RT” , “AMP” and other Twitter lingo
- Lemmatized available tweets to simplify word universe
- Removed hashtags, retweets and mentions
- Added keywords from extracted URLs



## SENTIMENT ANALYSIS

- Found sentiments of tweets using Vader
- Word frequency analysis for +ve and -ve sentiment tweet clusters
- Positive Words: Effective, Vaccine, Health
- Negative Words: Covid, Death, Mandates



## TOPIC MODELLING & LIFT ANALYSIS

- Applied Bag of words & TF-IDF
- Performed LDA to find topics; tuned alpha and eta values to modify the prior Dirichlet distribution
- Found 8 insightful topics; lift analysis and sentiment analysis
- Computed conditional lift to understand reasons for cluster
- Extracted most mentioned accounts for each topic to understand reasons for polarity

## RESULTS & INSIGHTS

## Frequent words associated with sentiments provided insights into commonly discussed topics

## Positive



## Negative



# RESULTS & INSIGHTS

## CLUSTER1: #VaccinesWork

Getting vaccinated will reduce the spread and deaths from COVID-19		Hospitals are filling up, deaths have risen in Florida		COVID causes more serious illness and more deaths than flu		Getting vaccinated will reduce the spread and deaths from COVID-19	
get, vaccine	3.5	Florida, death	4.3	flu, illness	4.0	use, vaccine	2.9
people, vaccine	3.2	cases, death	5.2	flu, covid	3.7	approve, vaccine	1.8
vaccine, death	0.4	Florida, hospital	8.2	flu, death	4.1	effective, vaccine	3.4
get, vaccine   death	0.5	Florida   death, up	2.7	flu, death   less	2.5	booster, vaccine   effective	2.1

# RESULTS & INSIGHTS

## CLUSTER2: #ForcedInjections

Natural immunity works better than vaccines	Vaccine mandates are unconstitutional and anti freedom	Distrust towards government officials is high	Political divide is inhibiting vaccinations
immunity, natural9.1	mandate, school6.2	Fauci, misinform3.3	Biden, death3.4
natural, good2.9	mandate, worker3.9	America, virus2.5	Trump, death0.5
immunity, vaccine0.9	mandate, vaccine7.7	virus, made4.6	Biden, America1.7
natural, immunity   good2.4	school, mandate   issue2.4	virus, made   America1.3	death, America   Biden2.1



# RECOMMENDATIONS & NEXT STEPS

There exists a bias in commonly viewed sources of information, making a neutral source of information the need of the hour

## Polarity



There is a visible polarity in public opinion, looking at the most frequent mentions:

### #VaccinesWork



CNN  
@CNN



World Health Organization (WHO)  
@WHO



ABC  
@ABCNetwork



CDC  
@CDCgov

### #ForcedInjections



Fox News  
@FoxNews



Ben Shapiro  
@benshapiro



Newsmax  
@newsmax



Tucker Carlson  
@TuckerCarlson

## Bias



Due to the polarity, the information obtained is biased w.r.t. news sources followed by the individuals

## Propoganda



The absence of a trustworthy, fair source of information is further propagating polarizing information:

- Promoting anti-vax behaviors
- Spreading falsehood
- Causing unnecessary mass hysteria

**THANK YOU!**



# APPENDIX

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# DATA SOURCES

S.No.	Data Sources
1	<a href="https://usafacts.org/visualizations/covid-vaccine-tracker-states/">https://usafacts.org/visualizations/covid-vaccine-tracker-states/</a>
2	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2647387/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2647387/</a>
3	<a href="https://www.nationalgeographic.com/science/article/vaccines-are-highly-unlikely-to-cause-side-effects-long-after-getting-the-shot-">https://www.nationalgeographic.com/science/article/vaccines-are-highly-unlikely-to-cause-side-effects-long-after-getting-the-shot-</a>
4	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4802703/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4802703/</a>
5	<a href="https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-profile-of-the-unvaccinated/">https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-profile-of-the-unvaccinated/</a>
6	<a href="https://apnews.com/article/coronavirus-pandemic-health-941fcf43d9731c76c16e7354f5d5e187">https://apnews.com/article/coronavirus-pandemic-health-941fcf43d9731c76c16e7354f5d5e187</a>
7	<a href="https://www.mayoclinic.org/coronavirus-covid-19/vaccine-tracker">https://www.mayoclinic.org/coronavirus-covid-19/vaccine-tracker</a>
8	<a href="https://twitter.com/?lang=en">https://twitter.com/?lang=en</a>