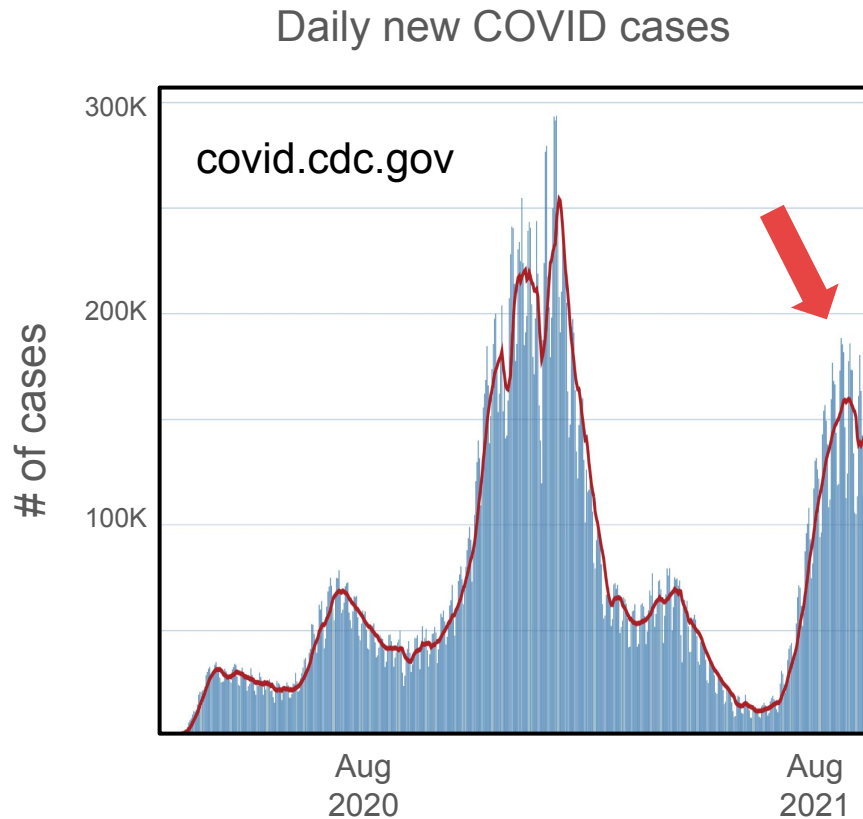# The Many Strains of Anti-vax:

## A study of COVID-19 anti-vaccination Tweets

Maya Remington
September 17th, 2021
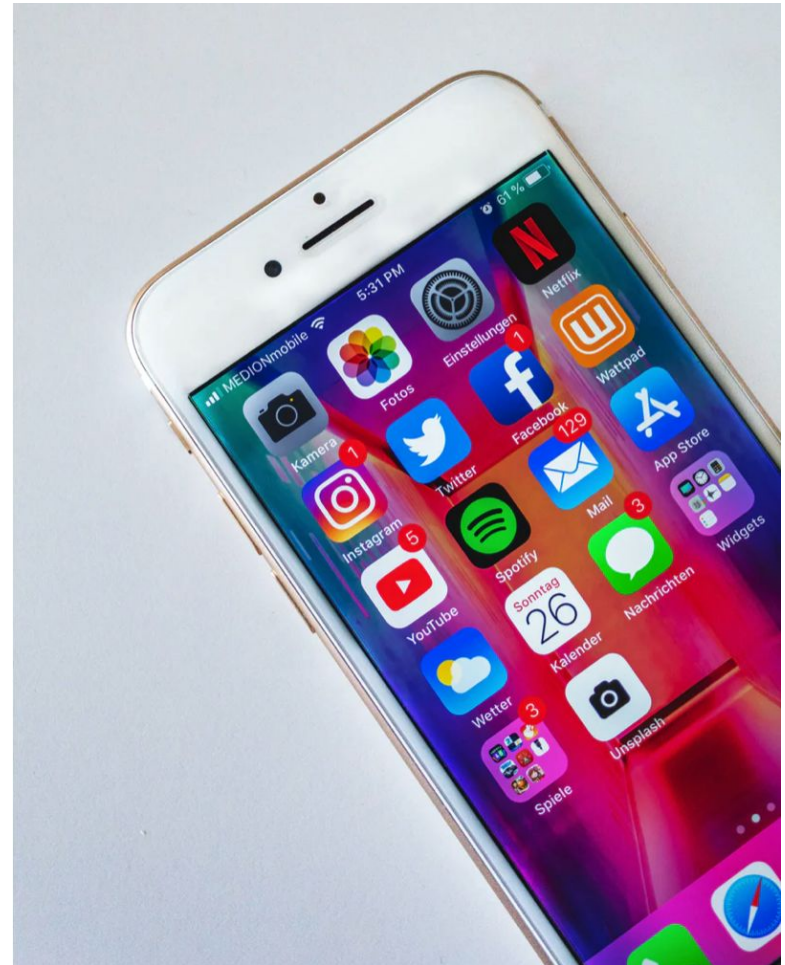
# The Problem

- COVID-19 delta variant continues to surge in the US
- Primarily affecting the unvaccinated
  - Approx 25% of adults

### Daily new COVID cases

covid.cdc.gov
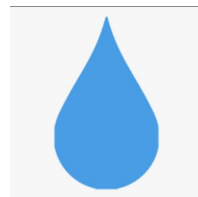
# of cases

300K

200K

100K

Aug
2020

Aug
2021

# The Problem

- Social media platforms are known spreaders of anti-vaccine misinformation
  - Can fuel vaccine hesitancy
- Project aims:

  1) Identify topics within COVID-19 anti-vaccine movements

  2) Learn how topic popularity has changed over time

# Data & Methods

1.8 million TweetIDs
- Original Tweets collected in real time by study authors*
- Authors queried Twitter with 59 anti-vaccine keywords
  - Ex: "vaccineskill"
- Nov 2020 - Apr 2021

Hydrator App

1.1 million Tweets
- Lost 700K Tweets (likely deleted by Twitter)

Removing duplicates

367 K unique Tweets

*Muric G, Wu Y, Ferrara E. COVID-19 Vaccine Hesitancy on Social Media: Building a Public Twitter Dataset of Anti-vaccine Content, Vaccine Misinformation and Conspiracies, arXiv:2105.05134 [cs.SI] 2021
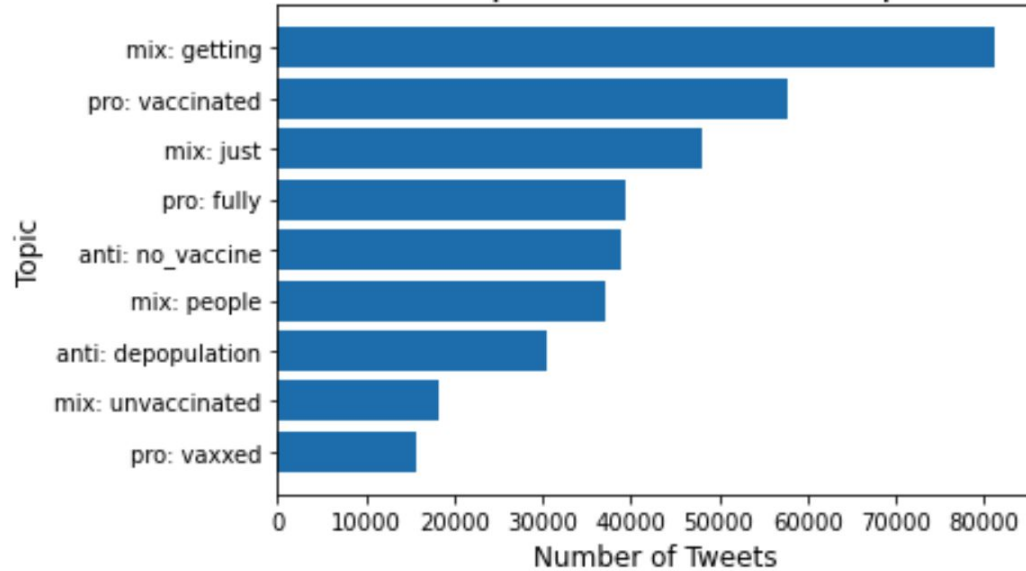
# Text pre-processing & modeling

**Preprocessing** - primarily with sklearn and regex

- Removed elements that would add little meaning (i.e. links and @mentions)
- Hashtags might add meaning → so kept hashtag text, but removed the '#'

**Topic modeling**

- Technique: Non-Negative Matrix Factorization (NMF)
- Optimal number of topics: 9

NMF topic model with 9 topics

9 topics

3 broader categories (based on my review of the top words):

- anti-vaccine

- pro-vaccine

- mix of both

- Although data collection was designed to catch anti-vax, some pro or neutral tweets made it through!

# Two overtly anti-vaccine topics
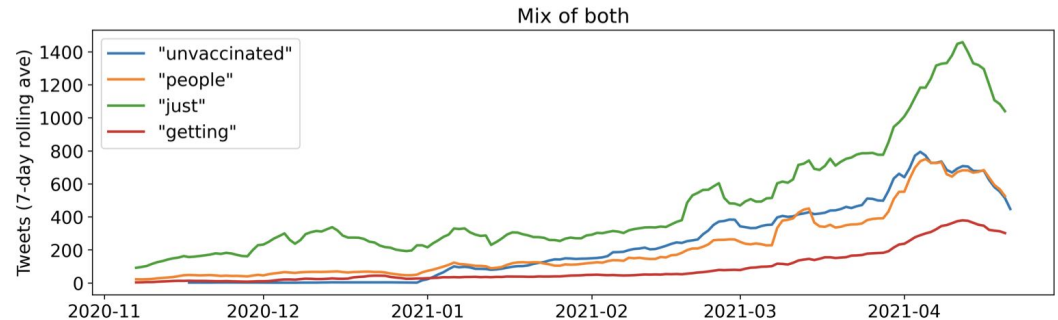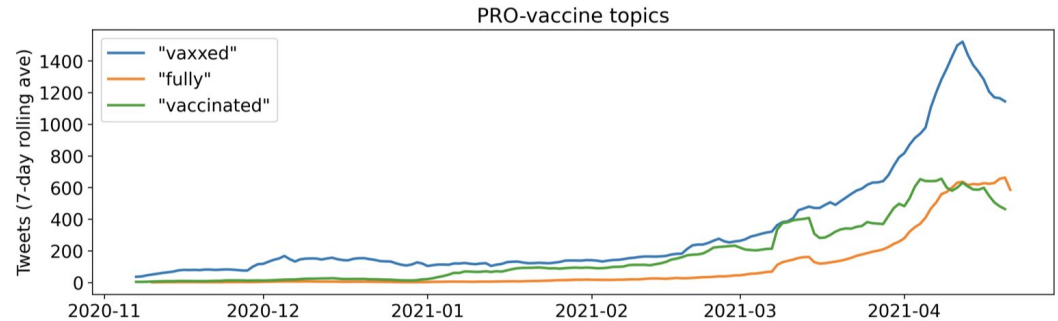
Depopulation/Bill Gates world agenda:
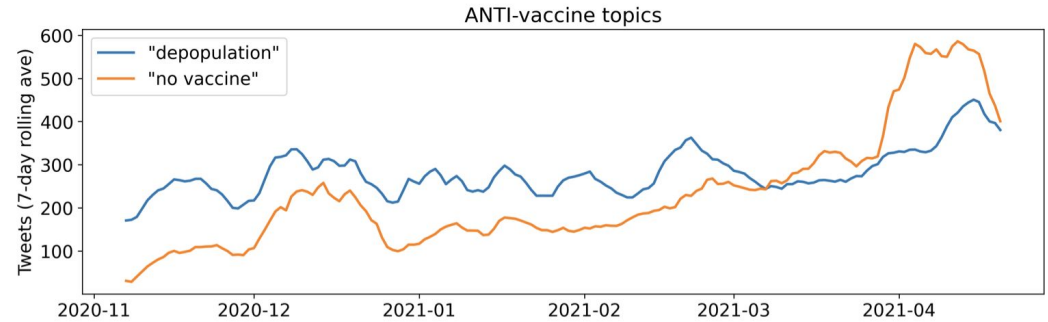
- Bill Gates is one of the biggest proponents of mass depopulation.
- It's not about healing it's about depopulation. 🤡💉
- @melindagates @BillGates After creating a virus, its easy with depopulation.

Misc 'no vaccine':

- What is in this vaccine 😱
- @OANN Every Vaccine Causes Harm\n#LearnTheRisk
- WOW, HEP B Vaccine link to MS
- That's what you'd find on my "vaccine card". #IWillNotComply

# Tweets per Topic
# (7 day rolling average)

- Many topics spiked in April 2021, but originated months earlier
  - Including the two overtly ANTI-vaccine topics

- Lesson: anti-vaccine messaging started MONTHS before most people were eligible for a vaccine

## ANTI-vaccine topics

Legend: "depopulation", "no vaccine"

Y-axis: Tweets (7-day rolling ave)

## PRO-vaccine topics

Legend: "vaxxed", "fully", "vaccinated"

Y-axis: Tweets (7-day rolling ave)

## Mix of both

Legend: "unvaccinated", "people", "just", "getting"

Y-axis: Tweets (7-day rolling ave)

# Conclusion

1) Identified topics within COVID-19 anti-vaccine movements

2) Learned that anti-vax messaging started early

When the NEXT pandemic hits, it may be wise to address vaccine messaging EARLIER!

# Thank you!