Using A.I. for the Public Good

Joe Smyser, PhD MSPH

October, 2019
Who we are

The Public Good Projects (PGP) is a public health nonprofit that specializes in using the tools and techniques of communication for large-scale public health programs.

PGP routinely creates disease surveillance systems and bots using AI. These systems often power behavior change campaigns.

Projects include:
- Sugar-sweetened beverages
- Tobacco products (including e-cigs)
- Mental health
- Low birth weight
- Opioids
- Alcohol
- School wellness
- Social isolation
- Vaccines
- Reproductive health
Current Work in NJ

Tobacco Control

SSB’s
Current Work in NJ

**Tobacco Control**

**SSB’s**

- **Fruit drink mixes**
  - 7.9% decrease in Passaic County,
    - 4.3% decrease in NJ.

- **Sodas / soft drinks**
  - 7.6% decrease in Passaic County,
    - 1.7% decrease in NJ.

- **Sports drinks**
  - 7.1% decrease in Passaic County,
    - 6.2% decrease in NJ.
PGP collects and analyzes all publicly available media data in the U.S. for several priority health topics.

Media data include television, radio, print, online video, websites, and public social media.
Methodology: Data Queries

Methodology: Results
PROJECT VCTR

Vaccine Communication Tracking & Response
<table>
<thead>
<tr>
<th>Keyword Query</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standalone Words</strong></td>
</tr>
<tr>
<td>anti-flu vaccine</td>
</tr>
<tr>
<td>antivax</td>
</tr>
<tr>
<td>flu shot</td>
</tr>
<tr>
<td><strong>Co-Occurring</strong></td>
</tr>
<tr>
<td>varicella</td>
</tr>
<tr>
<td>measles</td>
</tr>
<tr>
<td>mumps</td>
</tr>
<tr>
<td>rubella</td>
</tr>
<tr>
<td>polio</td>
</tr>
<tr>
<td>measles</td>
</tr>
<tr>
<td>chickenpox</td>
</tr>
<tr>
<td>mumps</td>
</tr>
<tr>
<td>flu</td>
</tr>
<tr>
<td>measles</td>
</tr>
<tr>
<td>varicella</td>
</tr>
<tr>
<td>measles</td>
</tr>
<tr>
<td>mumps</td>
</tr>
<tr>
<td>rubella</td>
</tr>
<tr>
<td>polio</td>
</tr>
<tr>
<td>measeless</td>
</tr>
<tr>
<td>chickenpox</td>
</tr>
<tr>
<td>chickenpox</td>
</tr>
<tr>
<td>mumps</td>
</tr>
<tr>
<td>flu</td>
</tr>
<tr>
<td>measles</td>
</tr>
<tr>
<td>varicella</td>
</tr>
<tr>
<td>measeless</td>
</tr>
<tr>
<td>chickenpox</td>
</tr>
</tbody>
</table>
Research Questions

How do personal variables like religious and political beliefs correlate with vaccination content?
How does employment status and occupation correlate with vaccination content (ie, nurses, doctors, lawmakers, etc)?
How are automated accounts (bots) amplifying messages related to vaccination?
  What are the types of messages they promote?
  Which resonate most with individuals?
  What is the path of misinformation from human to bot, and bot to human?
What types of pro-vaccination mentions are:
  Most positively received, and by whom?
  Most negatively received/attacked, and by whom?
What types of pro-vaccination messaging would resonate most with different groups of individuals?

Questions for users

1. What would you want answered with these data?
2. What research questions would you add or examine?
3. What are common problems that you wish you had answers to?
4. How can these insights be actionable for individuals working on vaccination at various levels?
Preliminary Results

Initial national-level analysis suggests that the public frames vaccinations in several distinct ways. These themes can fluctuate day by day, and by geography (city by city, state by state). The top themes that appear to be surfacing are:

- Advocacy: Pro-vaccination
- Advocacy: Anti-vaccination
- The government’s role in vaccination (often related to election campaign platforms)
- Research & clinical trials
- Vaccinations & school environment (often framed around “back to school” vaccination requirements)
- Policy & regulations
- Pharmaceutical industry
- Religion and religious freedom
- Family
- Conversation directed toward notable public health agencies (CDC, FDA)
Geographic Analysis

New York State

Next Steps:
Look at themes at different geographic levels.
At-Risk Groups

Religious conservatives

Debra Chavez
@DebraCh44905146

#Vaccines are a scam by #BigPharma. Why aren't vaccines in the Bible if they're so important? #antivax #proudChristian

1:49 AM · Jul 27, 2019 · Twitter for Android

Homeopathic believers (often politically liberal)

New Direction
@newdirectiondoc

Avoid the flu this season! Homeopathic Flu shots are a natural alternative to the flu vaccine. Call to schedule an appointment to get yours today! 321-972-2940

#supplementsunday #chinesemedicine #acupuncture #newdirectionnaturalmedicine

Political conservatives

Mark Boecher
@markboecher

There ARE two genders. Vaccinate your kids. Trump is your president, guns aren’t going anywhere. Getting offended is a new trend (unfortunately). Hillary is a loser. Respect is a two way street. You can be racist no matter what color you are, and being a racist is not cool.

Political liberals

Lauren Ashcraft for NY-12
@VoteLauren

White supremacy is terrorism.
No human is illegal.
Black lives matter.
Capitalism is socialism for the huge corporations only.
If it’s not your uterus, it’s not your choice.
Vaccines help protect those around you and do NOT CAUSE AUTISM.

Next Steps: Correlate affiliations with vaccination volume and themes. Begin to create counter messaging strategy for groups.
Automated Accounts (Bots)

- Software gives a score of 1 (Human) to 100 (Bot) to each Twitter user in the database.
  - The score is based on the frequency/timing of posts, number of posts, number of followers, engagement with other accounts, as well as machine learning technologies.
- PGP’s analysis allows for a comparison of conversations that originate from confirmed humans, suspected bots, and confirmed bots.
- Comparisons can be made across all data collected, to examine the volume and scope, different themes, as well as the flow of conversation between bots and humans.

<table>
<thead>
<tr>
<th>Total Mentions</th>
<th>Total Mentions</th>
<th>Total Mentions</th>
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</thead>
<tbody>
<tr>
<td><img src="image" alt="Table" /></td>
<td>104,351</td>
<td>960,171</td>
</tr>
<tr>
<td><img src="image" alt="Confirmed Humans" /></td>
<td><img src="image" alt="Suspected Bots" /></td>
<td><img src="image" alt="Confirmed Bots" /></td>
</tr>
</tbody>
</table>

Amount and flow of conversation from humans, suspected bots, and confirmed bots.
Antis-Vaccination Bot Networks

- Bots can function in conjunction with one another through networks.
- This graphic shows a representation of anti-vaccination networks that are driven by bots.
  - Certain bots have large human followings (@Hammer_Time)
  - Lines connecting circles show the ways that accounts are connected to bots.

**Next Steps:** Examine what types of content bots are most frequently promoting, major themes in their conversation, and strategies for counter messaging.
Total Mentions by Issue

Top Issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>All</th>
<th>Positive</th>
<th>Negative</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criminal Justice</td>
<td>120,524</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharma</td>
<td>119,916</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy</td>
<td>102,575</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Family</td>
<td>72,745</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctors</td>
<td>70,090</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>53,826</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic Pain</td>
<td>26,017</td>
<td></td>
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</tr>
</tbody>
</table>
NEWSROOM SHOWING 25 OF 31797 STORIES

Opioids, Issues (All): Pharma Date Range: 09/16/2019 (EDT)

RT @beneltham: Purdue Pharma files for bankruptcy with a partial deal aimed at resolving thousands of state, local lawsu... More
  @drtroyw63 - 17 days ago

RT @CNN: Purdue Pharma, the maker of the painkiller OxyContin, said it has filed for bankruptcy as part of a plan to set... More
  @andrewmyers310 - 17 days ago

RT @AmyMcGrathKY: As Purdue Pharma files for bankruptcy, we must hold the company—and the Sackler family that owns it—ac... More
  @womingestrogen - 17 days ago

Purdue Files for Bankruptcy

Purdue Files for Bankruptcy Purdue Pharma, the drugmaker under fire for triggering an opioid crisis in the US, has file... More
  @chemanager-online.com/ - 17 days ago

RT @AmyMcGrathKY: As Purdue Pharma files for bankruptcy, we must hold the company—and the Sackler family that owns it—ac... More
  @paxnstrum - 17 days ago

RT @QasimiRashid: The Sackler family made over $4B off the opioid crisis & transferred billions to offshore accounts t... More
  @takistewart - 17 days ago

OxyContin Maker #PurduePharma Files For Bankruptcy Major lawsuit alleges Purdue fueled US opioid crisis https://t.co/eVR... More
  @mIw975 - 17 days ago
Hey girl! I'm Layla. Consider me your new best friend with all the deets about those uncomfortable topics like birth control, sex, and STDs. You know, the stuff you're not exactly running home to talk to mom about. Ask me anything you want and I promise, it stays between me and you. Have any questions for me? I'm listening!
Hey girl! I’m Layla. Consider me your new best friend with all the deets about those uncomfortable topics like birth control, sex, and STDs. You know, the stuff you’re not exactly running home to talk to mom about. Ask me anything you want and I promise, it stays between me and you. Have any questions for me? I’m listening!

<table>
<thead>
<tr>
<th></th>
<th>July</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Sessions</td>
<td>546</td>
<td>642 (+18%)</td>
</tr>
<tr>
<td># Messages Sent by Users</td>
<td>206</td>
<td>284 (+38%)</td>
</tr>
<tr>
<td>Messages per session</td>
<td>3.00</td>
<td>3.12 (+4%)</td>
</tr>
<tr>
<td>Time per session</td>
<td>15.9</td>
<td>16.97 (+6%)</td>
</tr>
</tbody>
</table>
YOU ARE 100% THAT QUEEN.

@peptik

LAYLA LINK IN BIO TO CHAT WITH LAYLA LINK IN BIO TO CHAT WITH LAYLA
Let your strength shine. 🌟 #blackgirlmagic #girlsarestrong