This report is an effort to summarize social media conversations around COVID-19 issues in Pennsylvania, focusing on vaccination. It contains an analysis of the general topics about the current pandemic, such as COVID-19 regulations, mandates, masks, pro- and anti-vaccination campaigns, as well as other topics related to COVID-19 misinformation, disinformation, conspiracy theories, and vaccine hesitancy messages.

The material contained in this report is a summary of social media content and does not represent a judgment or characterization of any individual.
High Level View May 20 – May 26, 2021

<table>
<thead>
<tr>
<th>Narrative</th>
<th>Total PA</th>
<th>Philadelphia</th>
<th>Pittsburgh</th>
<th>Erie</th>
<th>Allentown/Bethlehem</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversation Tweets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>79,169</td>
<td>42,981</td>
<td>18,088</td>
<td>629</td>
<td>1,001</td>
<td>1,001</td>
</tr>
<tr>
<td>Vaccine</td>
<td>79,169</td>
<td>42,981</td>
<td>18,088</td>
<td>629</td>
<td>1,001</td>
<td>1,001</td>
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<tr>
<td>Vaccine Passports</td>
<td>1,121</td>
<td>503</td>
<td>327</td>
<td>9</td>
<td>1</td>
<td>267</td>
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<tr>
<td>Boosters</td>
<td>50</td>
<td>21</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>13</td>
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<tr>
<td>Misinfo: Microchips</td>
<td>80</td>
<td>43</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Misinfo: Magnets</td>
<td>63</td>
<td>28</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>7</td>
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<tr>
<td>Misinfo: Shedding</td>
<td>32</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>11</td>
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<tr>
<td>&quot;Experimental&quot;</td>
<td>439</td>
<td>157</td>
<td>159</td>
<td>7</td>
<td>2</td>
<td>114</td>
</tr>
<tr>
<td>Children</td>
<td>966</td>
<td>488</td>
<td>269</td>
<td>12</td>
<td>1</td>
<td>184</td>
</tr>
<tr>
<td>Myocarditis</td>
<td>126</td>
<td>54</td>
<td>21</td>
<td>0</td>
<td>0</td>
<td>51</td>
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<tr>
<td>Masks</td>
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<td>1128</td>
<td>377</td>
<td>14</td>
<td>1</td>
<td>406</td>
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<tr>
<td>Infertility</td>
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<td>12</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Mandates</td>
<td>293</td>
<td>158</td>
<td>53</td>
<td>1</td>
<td>0</td>
<td>72</td>
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<tr>
<td>Ingredients</td>
<td>23</td>
<td>16</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>&quot;ExposeFacebook&quot;</td>
<td>918</td>
<td>356</td>
<td>392</td>
<td>12</td>
<td>1</td>
<td>146</td>
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</tbody>
</table>

- Previously found narratives with 10 or less tweets not shown (e.g. MarkoftheBeast, fake vaccine cards)
- New discussions: magnets, myocarditis, ExposeFacebook
- “Shedding” discussion dropped from higher level the week before

Vaccine Narrative Descriptions (Newer)

- Magnets: Related to the microchip conspiracy stories, both pushing of misinformation and sharing scorn for it
- Myocarditis: Related to discussion of vaccines and children, both discussion of news and pushing of anti-vax narratives
- Mandates: Mixed discussions on vaccine mandates for schools and in other areas
- Ingredients: non-microchip related discussion and misinformation about vaccine ingredients
- ExposeFacebook: discussion of a potentially dubious report about Facebook censoring anti-vax narratives on its platform, connecting Big Tech worries and vaccine worries. Mix of questioning and misinformation discussion.
Ongoing work

- Separating out more clearly the pro-misinformation and anti-misinformation discussions and which narratives occur together in time
- Looking more closely at proponents of misinformation that are targeting officials/health agencies – we have a list and are currently conducting a network analysis

Background
Process Description

- To get a broad sense of the Twitter conversation about vaccines and vaccine misinformation we have collected tweets based on a combination of keyword-based and location-based methods.

- Locations are assigned to tweets based on a mix of the following: Twitter's own location-based search operations, Twitter's annotations, and our own machine-learning based tool.

- We are focused on the 5 following locations:
  - 4 larger city areas: Philadelphia, Pittsburgh, Allentown/Bethlehem, Erie
  - 1 area comprised of as much of the rest of PA as is possible (rural areas plus other smaller urban areas) – this is not currently shown in these slides

Types of Discussions

- It is helpful to be aware that Twitter conversations around vaccines and vaccine misinformation may contain a variety of types of discussions:
  - Pro-vaccine news and information
  - Honest questions/concerns about vaccines
  - Informative responses to questions
  - Misinformation and disinformation about vaccines
  - Informative responses to misinformation/fact-checking
  - Pro-vaccine satire/sarcasm/personal attacks against proponents of anti-vaccine views
  - Anti-vaccine satire/sarcasm/personal attacks against proponents of pro-vaccine views/government and medical professionals
Vaccine Narrative Descriptions (Older)

- Overall Vaccine Conversation: tweets that mention any of a set of vaccine keywords
  - Vaccine Passports: mix of discussions mentioning vaccine passports
    - Misinfo: “Mark of the Beast” – religiously-tinged conspiracy theory that vaccines and vaccine passports represent the mark of the Devil from an interpretation of Christian end times scripture
    - Mixed: Non-Religious Government control narratives – mix of questioning and outright conspiracy
    - Fake vaccine cards – discussions of creating fake IDs (both pro and anti-making the IDs)
- Vaccine Ingredients
  - Misinfo: Luciferase - religious-tinged conspiracy that the compound is of the Devil (Luciferase is a real compound related to bioluminescence), mix of misinformation and those scorning the misinformation
  - Misinfo: Microchips – conspiracy theory that microchips for population control are in the vaccines, Twitter conversation is mix of sharing conspiracy and sharing scorn for it
- Vaccine Side effects
  - Mixed: Menstrual ghost effects/shedding – questioning and/or passing of misinformation about vaccine’s ability to “hop” from person to person affecting menstrual patterns
  - Mixed: Herpes – questioning and/or passing of misinformation that vaccines cause herpes
  - Misinfo: Celebrity deaths – discussions blaming the death of DMX and Prince Phillip on them getting COVID vaccines

Vaccine Narrative Descriptions (older cont.)

- Need for vaccine
  - Misinfo: “if you have already had the disease” then you don’t need the vaccine – mix of questioning and misinformation

- Vaccine administration
  - Not FDA approved – discussion/misinformation about emergency use authorization
  - Boosters – news and discussion of whether boosters are just a cash grab

- Johnson and Johnson fallout – discussions of the pause in use of J&J vaccine in US, mix of questioning, news discussion, and misinformation related to vaccine safety/confounding all three vaccines in the US
Vaccine Narrative Descriptions (older cont.)

- Experimental: mix of discussions, mostly misinformation or correcting misinformation that COVID vaccines are entirely experimental

- Children: mix of discussions about announcement to allow use of more vaccines for teenagers, mix of news, pro-content, anti-content, and misinformation

- Masks: mix of discussions about vaccines and masks

- Infertility: mix of questioning and sharing idea that the vaccines cause infertility

For More Information

- Dr. Kathleen M. Carley - kathleen.carley@cs.cmu.edu
  - http://www.casos.cs.cmu.edu/bios/carley/carley.html
- IDeaS website - https://www.cmu.edu/ideas-social-cybersecurity/
- CASOS website – http://www.casos.cs.cmu.edu/