PA Vaccine Conversations and Misinformation on Twitter

Iuliia Alieva, Dawn Robertson, Dr. Kathleen M. Carley
Vaccine Hesitancy Project Update based on November 5 – November 11, 2021

The CMU centers for:
Informed DEmocracy And Social cyber-security
Computational Analysis of Social and Organizational Systems

PA Vaccine Conversation Project

- This report is an effort to summarize social media conversations around COVID-19 issues in Pennsylvania, with a focus on vaccination. It contains an analysis of the general topics related to COVID-19 vaccination. This includes discussions related to COVID-19 regulations, mandates, masks, pro-and anti-vaccination campaigns, science messages, 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.
This week’s trending stories cover trends similar to the previous week, such as vaccination for children, vaccination mandates, sports figures commenting on vaccines, and others;

On "The Pat McAfee Show," Aaron Rodgers, an unvaccinated NFL player, spread COVID-19 misinformation and was promoting "alternative" treatments, like ivermectin and homeopathic remedies, which are completely ineffective at preventing or treating COVID-19. Trending hashtags related to the topic #patmcafeeshowlive and #aaronrodgerslied

Disinformation story about Pfizer CEO Albert Bourla being arrested by the FBI for fraud

https://www.conservativebeaver.com/2021/11/05/ceo-of-pfizer-arrested-charged-with-fraud-media-blackout/ CEO of Pfizer arrested by the FBI, charged with fraud – media blackout as #PfizerGate trends


Other trending stories: https://cnb.cx/3o98t58 White House tells businesses to proceed with vaccine mandate despite court-ordered pause; https://nilli.cm/ms6iIpeW McConaughey comes out against vaccine mandates for kids; https://wapo.st/3vihyD Big Bird got his Pfizer shot, and conservatives are calling it vaccine ‘propaganda’; https://cnb.cx/3js322z Pfizer CEO says people who spread misinformation on Covid vaccines are ‘criminals’

High Level View by City November 5 – November 11

**Trending conversations:**
- Boosters
- Mandates
- Race

**Dropped “fetal” as it no longer trends**
**Added “employees” in the context of mandates**

### High Level View by City November 5 – November 11

<table>
<thead>
<tr>
<th>Conversation</th>
<th>Total PA Tweets</th>
<th>Philadelphia Tweets</th>
<th>Pittsburgh Tweets</th>
<th>Erie Tweets</th>
<th>Allentown/Bethlehem Tweets</th>
<th>Other Tweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Vaccine</td>
<td>10626</td>
<td>5134</td>
<td>2749</td>
<td>999</td>
<td>16720</td>
<td>4134</td>
</tr>
<tr>
<td>Vaccine Passports</td>
<td>915</td>
<td>453</td>
<td>255</td>
<td>4</td>
<td>180</td>
<td>1</td>
</tr>
<tr>
<td>FDA Approval</td>
<td>241</td>
<td>123</td>
<td>57</td>
<td>4</td>
<td>48</td>
<td>9</td>
</tr>
<tr>
<td>Boosters</td>
<td>2405</td>
<td>1150</td>
<td>618</td>
<td>26</td>
<td>433</td>
<td>178</td>
</tr>
<tr>
<td>Employees</td>
<td>3315</td>
<td>1147</td>
<td>1510</td>
<td>29</td>
<td>516</td>
<td>93</td>
</tr>
<tr>
<td>&quot;Experimental&quot; Children</td>
<td>608</td>
<td>334</td>
<td>136</td>
<td>8</td>
<td>108</td>
<td>22</td>
</tr>
<tr>
<td>Myocarditis</td>
<td>573</td>
<td>241</td>
<td>165</td>
<td>7</td>
<td>146</td>
<td>14</td>
</tr>
<tr>
<td>Heart</td>
<td>971</td>
<td>494</td>
<td>255</td>
<td>11</td>
<td>187</td>
<td>24</td>
</tr>
<tr>
<td>Masks</td>
<td>3431</td>
<td>1720</td>
<td>854</td>
<td>34</td>
<td>533</td>
<td>284</td>
</tr>
<tr>
<td>Thrombosis/VITT</td>
<td>99</td>
<td>50</td>
<td>24</td>
<td>23</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mandates</td>
<td>15423</td>
<td>7652</td>
<td>3192</td>
<td>150</td>
<td>3833</td>
<td>596</td>
</tr>
<tr>
<td>Natural Immunity</td>
<td>1510</td>
<td>1053</td>
<td>249</td>
<td>4</td>
<td>185</td>
<td>19</td>
</tr>
<tr>
<td>Efficacy</td>
<td>346</td>
<td>349</td>
<td>87</td>
<td>3</td>
<td>95</td>
<td>12</td>
</tr>
<tr>
<td>Spike Proteins</td>
<td>81</td>
<td>36</td>
<td>21</td>
<td>2</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Delta Variant</td>
<td>436</td>
<td>229</td>
<td>93</td>
<td>3</td>
<td>69</td>
<td>42</td>
</tr>
<tr>
<td>Race</td>
<td>2258</td>
<td>813</td>
<td>1066</td>
<td>31</td>
<td>293</td>
<td>55</td>
</tr>
<tr>
<td>Ivermectin</td>
<td>750</td>
<td>354</td>
<td>213</td>
<td>9</td>
<td>153</td>
<td>21</td>
</tr>
<tr>
<td>Military</td>
<td>216</td>
<td>84</td>
<td>55</td>
<td>1</td>
<td>68</td>
<td>8</td>
</tr>
<tr>
<td>Breakthrough</td>
<td>316</td>
<td>195</td>
<td>61</td>
<td>2</td>
<td>45</td>
<td>13</td>
</tr>
</tbody>
</table>

### High Level View by County November 5 – November 11

<table>
<thead>
<tr>
<th>County</th>
<th>Allegheny Tweets</th>
<th>Beaver Tweets</th>
<th>Butler Tweets</th>
<th>Cambria Tweets</th>
<th>Fayette Tweets</th>
<th>Indiana Tweets</th>
<th>Somerset Tweets</th>
<th>Westmoreland Tweets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Vaccine</td>
<td>28070</td>
<td>44</td>
<td>119</td>
<td>30</td>
<td>56</td>
<td>26</td>
<td>15</td>
<td>89</td>
</tr>
<tr>
<td>Vaccine Passports</td>
<td>262</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>FDA</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boosters</td>
<td>649</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Employees</td>
<td>1530</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Experimental&quot; Children</td>
<td>140</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocarditis</td>
<td>167</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart</td>
<td>257</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masks</td>
<td>913</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Thrombosis/VITT</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandates</td>
<td>3279</td>
<td>7</td>
<td>10</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Natural Immunity</td>
<td>252</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Efficacy</td>
<td>87</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spike Proteins</td>
<td>21</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delta Variant</td>
<td>96</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>1074</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ivermectin</td>
<td>214</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Military</td>
<td>57</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakthrough</td>
<td>63</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tweets counted here if there is a county location attached**
**Race: pulled by one of the vaccine keywords plus at least one other term in ("Black", "African American", "of color", "Latin", "Hispanic", "brown", "eugenic")**
Top Words Used per Week November 5 – November 11

Word count in COVID-19 related tweets

Top Hashtags by County November 5 – November 11

We’ve checked hashtags in several counties such as Allegheny, Beaver, Butler, Cambria, Fayette, Indiana, Somerset, and West Moreland. After removing hashtags that were part of our search criteria, the top 5 hashtags for each county related to COVID19/vaccines are as follows*: 

<table>
<thead>
<tr>
<th>Allegheny</th>
<th>Beaver + Butler</th>
<th>Cambria</th>
<th>Fayette</th>
<th>West Moreland</th>
</tr>
</thead>
<tbody>
<tr>
<td>covid19 (578)</td>
<td>covid19 (2)</td>
<td>maskup (1)</td>
<td>donotcomply (1)</td>
<td>covidvaccine (4)</td>
</tr>
<tr>
<td>pfzergate (363)</td>
<td>donotcomply (2)</td>
<td>patmcafeeshowlive (1)</td>
<td>freedom (1)</td>
<td>bigpharma (1)</td>
</tr>
<tr>
<td>patmcafeeshowlive (295)</td>
<td>sciencewillwin (2)</td>
<td>vikings (1)</td>
<td>patmcafeeshowlive (1)</td>
<td>booster (1)</td>
</tr>
<tr>
<td>sciencewillwin (282)</td>
<td>bigpharmakills (1)</td>
<td>wearmask (1)</td>
<td>thanlyoubrand (1)</td>
<td>getvaccinated (1)</td>
</tr>
<tr>
<td>vaccine (138)</td>
<td>patmcafeeshowlive (1)</td>
<td>vaccine (1)</td>
<td>notsofreevaccines (1)</td>
<td></td>
</tr>
</tbody>
</table>
Top Hashtags by City November 5 – November 11

- After removing hashtags that were part of our search criteria, the top 5 hashtags for each region related to COVID19/vaccines are as follows:

<table>
<thead>
<tr>
<th>Region</th>
<th>Hashtags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philadelphia</td>
<td>covid19, thankyoubranchdon, sciencewillwin, pfizergate, patmcakehowlivew</td>
</tr>
<tr>
<td>Chester</td>
<td>covid19, thankyoubranchdon, sciencewillwin, pfizergate, patmcakehowlivew</td>
</tr>
<tr>
<td>Norristown</td>
<td>covid19, thankyoubranchdon, sciencewillwin, pfizergate, patmcakehowlivew</td>
</tr>
<tr>
<td>Pittsburgh</td>
<td>covid19, thankyoubranchdon, sciencewillwin, pfizergate, patmcakehowlivew</td>
</tr>
<tr>
<td>Erie</td>
<td>covid19, thankyoubranchdon, sciencewillwin, pfizergate, patmcakehowlivew</td>
</tr>
<tr>
<td>Allentown/Bethlehem</td>
<td>covid19, thankyoubranchdon, sciencewillwin, pfizergate, patmcakehowlivew</td>
</tr>
</tbody>
</table>

Top URLs by County November 5 – November 11

<table>
<thead>
<tr>
<th>Region</th>
<th>URLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allegheny</td>
<td><a href="https://www.alleghenywiscare.org/2021/11/06/schulman-jackson-said-">https://www.alleghenywiscare.org/2021/11/06/schulman-jackson-said-</a></td>
</tr>
<tr>
<td></td>
<td>-southeast-pa-patient-gets-discharged/ at-first-no-hospital-says-</td>
</tr>
<tr>
<td></td>
<td>-pittsburgh-sent-her-patient-to-</td>
</tr>
<tr>
<td></td>
<td>-another-hospital-after-flip-flop/</td>
</tr>
<tr>
<td></td>
<td><a href="https://pittsburghpostzeitung.com/2021/11/06/pittsburgh-patient-">https://pittsburghpostzeitung.com/2021/11/06/pittsburgh-patient-</a></td>
</tr>
<tr>
<td></td>
<td>-gets-discharged-after-first-hospital-</td>
</tr>
<tr>
<td></td>
<td>-says-its-now-schulman-jackson/</td>
</tr>
<tr>
<td></td>
<td><a href="https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-">https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-</a></td>
</tr>
<tr>
<td></td>
<td>-panthers-johnson-tonery-and-</td>
</tr>
<tr>
<td></td>
<td>-coulibaly/ Solid Opening Night For Former Pitt Panthers Johnson,</td>
</tr>
<tr>
<td></td>
<td>Tonery and Coulibaly (2)</td>
</tr>
<tr>
<td>Butler + Beaver</td>
<td><a href="https://pittsburghpostzeitung.com/2021/11/06/pittsburgh-patient-">https://pittsburghpostzeitung.com/2021/11/06/pittsburgh-patient-</a></td>
</tr>
<tr>
<td></td>
<td>-gets-discharged-after-first-hospital-</td>
</tr>
<tr>
<td></td>
<td>-says-its-now-schulman-jackson/</td>
</tr>
<tr>
<td></td>
<td><a href="https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-">https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-</a></td>
</tr>
<tr>
<td></td>
<td>-panthers-johnson-tonery-and-</td>
</tr>
<tr>
<td></td>
<td>-coulibaly/ Solid Opening Night For Former Pitt Panthers Johnson,</td>
</tr>
<tr>
<td></td>
<td>Tonery and Coulibaly (2)</td>
</tr>
<tr>
<td>Cambria</td>
<td><a href="https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-">https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-</a></td>
</tr>
<tr>
<td></td>
<td>-panthers-johnson-tonery-and-</td>
</tr>
<tr>
<td></td>
<td>-coulibaly/ Solid Opening Night For Former Pitt Panthers Johnson,</td>
</tr>
<tr>
<td></td>
<td>Tonery and Coulibaly (2)</td>
</tr>
<tr>
<td>Indiana</td>
<td><a href="https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-">https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-</a></td>
</tr>
<tr>
<td></td>
<td>-panthers-johnson-tonery-and-</td>
</tr>
<tr>
<td></td>
<td>-coulibaly/ Solid Opening Night For Former Pitt Panthers Johnson,</td>
</tr>
<tr>
<td></td>
<td>Tonery and Coulibaly (2)</td>
</tr>
<tr>
<td>Fayette</td>
<td><a href="https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-">https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-</a></td>
</tr>
<tr>
<td></td>
<td>-panthers-johnson-tonery-and-</td>
</tr>
<tr>
<td></td>
<td>-coulibaly/ Solid Opening Night For Former Pitt Panthers Johnson,</td>
</tr>
<tr>
<td></td>
<td>Tonery and Coulibaly (2)</td>
</tr>
<tr>
<td>Westmoreland</td>
<td><a href="https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-">https://twitter.com/muppetwiki/solid-opening-night-for-former-pitt-</a></td>
</tr>
<tr>
<td></td>
<td>-panthers-johnson-tonery-and-</td>
</tr>
<tr>
<td></td>
<td>-coulibaly/ Solid Opening Night For Former Pitt Panthers Johnson,</td>
</tr>
<tr>
<td></td>
<td>Tonery and Coulibaly (2)</td>
</tr>
</tbody>
</table>

1/11/2022
Top URLs by City November 5 – November 11

Philadelphia

Chesnut

Pittsburgh

Erie

Allegheny

Other

Analysis of Tweeters - Super Spreaders

- Super Spreaders are users who generate content that is shared often, and hence spread information effectively.
Analysis of Tweeters - Super Friends

- Super Friends are users that exhibit frequent two-way communication, facilitating large or strong communication networks.

![Graph showing Super Friends](image)

Analysis of Tweeters - Other Influencers

- Other Influencers are users which have an active network presence, by tweeting often or mentioning users often, and operate in central parts of the conversation, such as by using important hashtags, or mentioning important users.

![Graph showing Other Influencers](image)
Accounts Referenced by the Most Tweets

This shows the tweeters that are most often referenced (e.g. mentioned) in PA tweets. Value is the number of tweets that reference the agent.

<table>
<thead>
<tr>
<th>Agent Label</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EricaRHill</td>
<td>2,748</td>
</tr>
<tr>
<td>AaronRodgers12</td>
<td>1,602</td>
</tr>
<tr>
<td>pfizer</td>
<td>1,332</td>
</tr>
<tr>
<td>BigBird</td>
<td>1,022</td>
</tr>
<tr>
<td>PatMcAfeeShow</td>
<td>965</td>
</tr>
<tr>
<td>catturd2</td>
<td>800</td>
</tr>
<tr>
<td>RexChapman</td>
<td>686</td>
</tr>
<tr>
<td>telerdugguz</td>
<td>676</td>
</tr>
<tr>
<td>StateFarm</td>
<td>636</td>
</tr>
<tr>
<td>POTUS</td>
<td>617</td>
</tr>
</tbody>
</table>

Trending Tweets November 5 – November 11

Tweets that are the most forwarded, either by retweet, reply, or quote:

- I got the COVID-19 vaccine today! My wing is feeling a little sore, but it'll give my body an extra protective boost that keeps me and others healthy. Ms. @EricaRHill even said I've been getting vaccines since I was a little bird. I had no idea! https://t.co/M2mdmmjZ0N
- Big Bird gets vaccinated, 1972
- Pennsylvania Gov. Tom Wolf has announced that vaccinated state employees will receive five additional days of paid time off.
- It's easy to get distracted by misinformation these days, but don't worry...Science has got your back. #ScienceWillWin https://t.co/aXVzAsfa6Z
- Dennis Prager: "During the AIDS crisis, can you imagine if gay men and intravenous drug users...had they been pariahs the way the non-vaccinated are? But it would've been inconceivable" https://t.co/GQeOq4X63u
- @BigBird @EricaRHill Good on ya, @BigBird. Getting vaccinated is the best way to keep your whole neighborhood safe.
- White House tells businesses to proceed with vaccine mandate despite court-ordered pause https://t.co/3pXnAS6LTV
- Natural immunity is broad, protective, and durable. Unlike vaccine-induced immunity. I am so tired of USG lies. "studies show that protection from reinfection is strong and persists for more than 10 months of follow-up" https://t.co/2hs6M6MrY
- Man, wait until anti-vax politicians find out about how R2-D2 and C-3PO tried to encourage vaccination... in 1978. Almost like this isn’t a new thing and programs that cater to kids want to keep them safe and healthy. https://t.co/Q5nIH5TV
- Pfizer CEO says people who spread misinformation on Covid vaccines are 'criminals' https://t.co/vsxL7oXUPo
General PA Conversation November 5 – November 11

PA Hashtag Cloud November 5 – November 11
Negative Attitudes November 5 – November 11

![Graph showing total mentions of negative attitudes towards vaccines, negative health impacts, COVID-19, pharmaceutical industry, and policies & politics from November 4 to November 10.]

Negative Hashtag Cloud November 5 – November 11

![Hashtag cloud displaying various negative hashtags related to COVID-19 and vaccines, such as #covid19, #novaccine, #medicalfreedom, and #pennsylvania.]
Trending Posts on Facebook November 5 – November 11

Trending Posts on Instagram November 5 – November 11
Trending Posts on Reddit November 5 – November 11

For More Information

- Director 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/
- Facebook: @IDeasCMU
- Twitter: @IDeaSCMU
- YouTube: IDeaS Center
- Ask to be on our Email-Distro Lists