DSL

Chemical Spills and Environmental Anxiety on Social Media: Linking Twitter Data with National Survey, 2010-2023

Sukie Xiuqi Yang
PhD students of Sociology and Demography,
University of Pennsylvania

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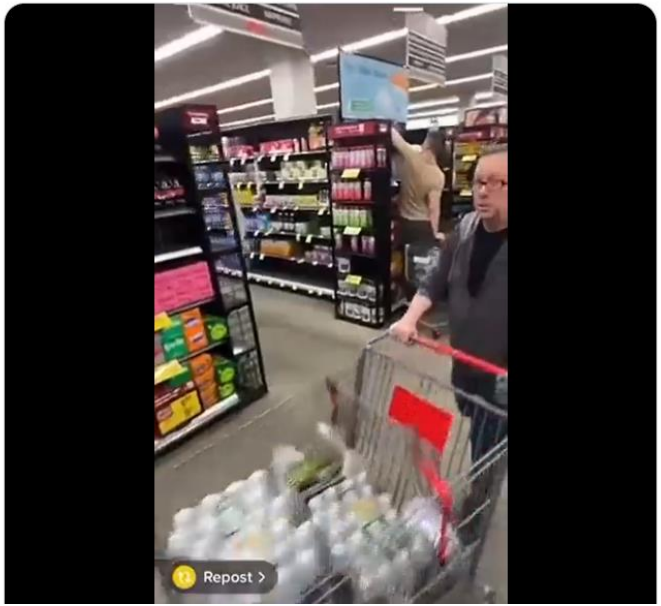
Penn Arts & Sciences

Mrgunsngear @Mrgunsngear · Mar 26

Unprepared **Philly** residents scrambling for **water** after the chemical **spill** in Bristol, PA....

Plan accordingly....

#Prepare **#water** #ready #prepper #bristol **#philly** #Pennsylvania #ChemicalSpill #Latex



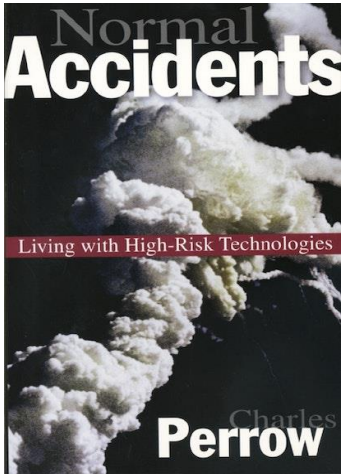
Charlie Flowe @DjFlowe · Mar 26

Me... after drinking **Philly tap water** at 12:01 AM Tuesday.
#philadelphia

8 161 1,086 63.4K

Theoretical background

- Post-industrialized society, complex system, and "normal" accidents (Perrow 1985)
  - An overheated bearing of a train; An equipment failure of a chemical plant
  - This type of technological/complex disaster is not well documented in International Disaster Dataset
- Social media environmental anxiety
- While environmental inequality in physical health has received considerable scholarly attention, few studies have examined environmental inequality in terms of mental health outcomes.



Hypotheses

- **“Where there's smoke there's fire”:** social media environmental anxiety is correlated with preceding environmental accidents.
- **“If men define situations as real, they are real in their consequences” (Thomas theorem):** environmental anxieties on social media have negative impacts on short-term mental health among people living in the place of incident.
- **“No man is an Island entire of itself”**: There is a spillover of environmental anxieties, and the mental health of those who do not reside at the incident site is also affected.

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Data

- Twitter data, 2010-2023 (515k)
  - "toxic spill" OR "chemical spill" OR "philly tap water" OR "philly water" OR "illinois tap water" OR "illinois drinking water" OR "indiana tap water" OR "indiana drinking water" OR "michigan tap water" OR "michigan drinking water" OR "ohio tap water" OR "ohio drinking water" OR "pennsylvania tap water" OR "pennsylvania drinking water" OR "wisconsin drinking water" -RT -polo -Chapel -vote –Infrastructure

- Survey data
  - National Health Interview Survey (annually, data released up to 2021)
  - Panel Study of Income Dynamics (PSID) (biennially, data released up to 2019)
  - Restricted geocoded information + date of the interview (criteria for merging)

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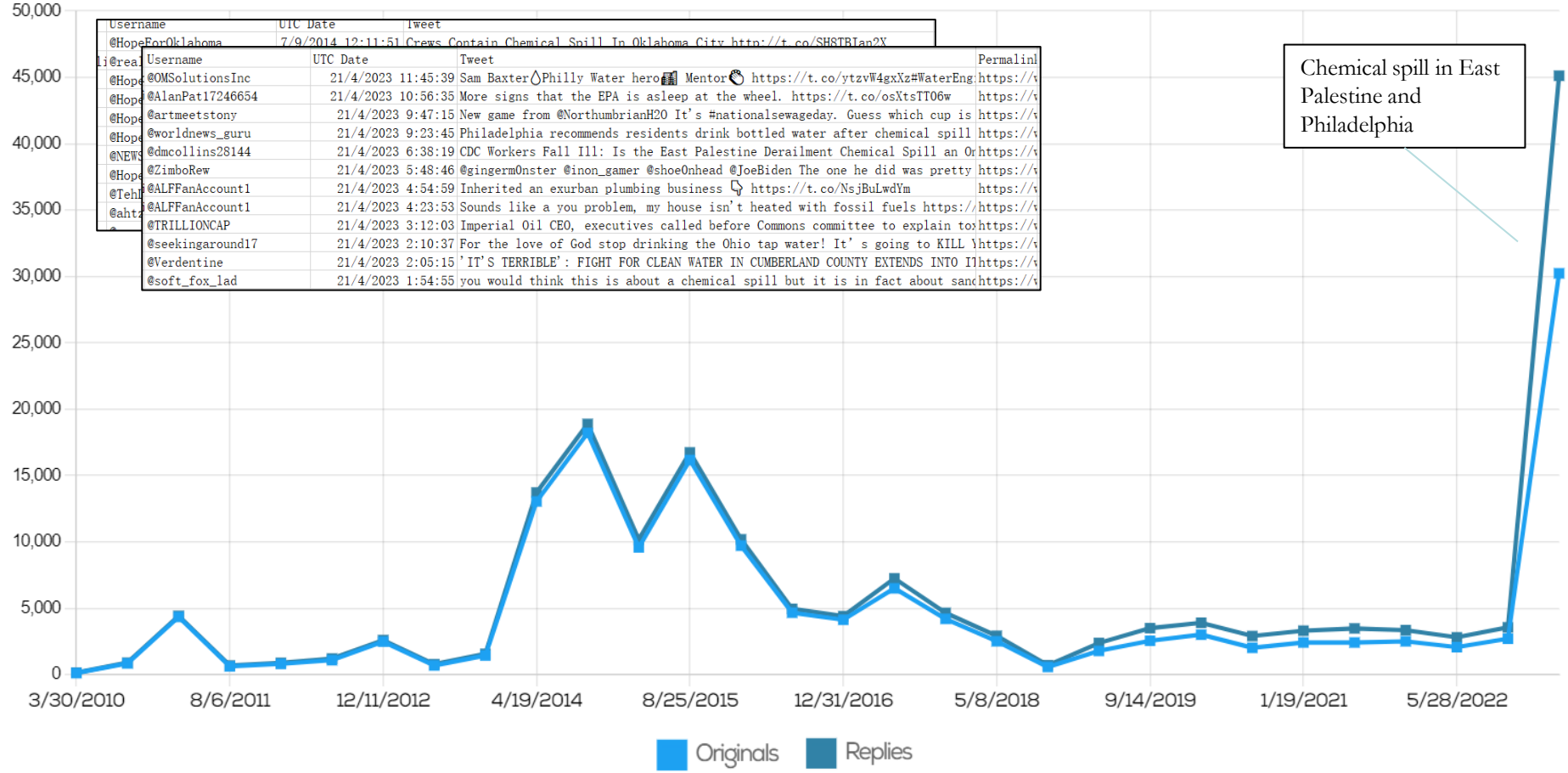
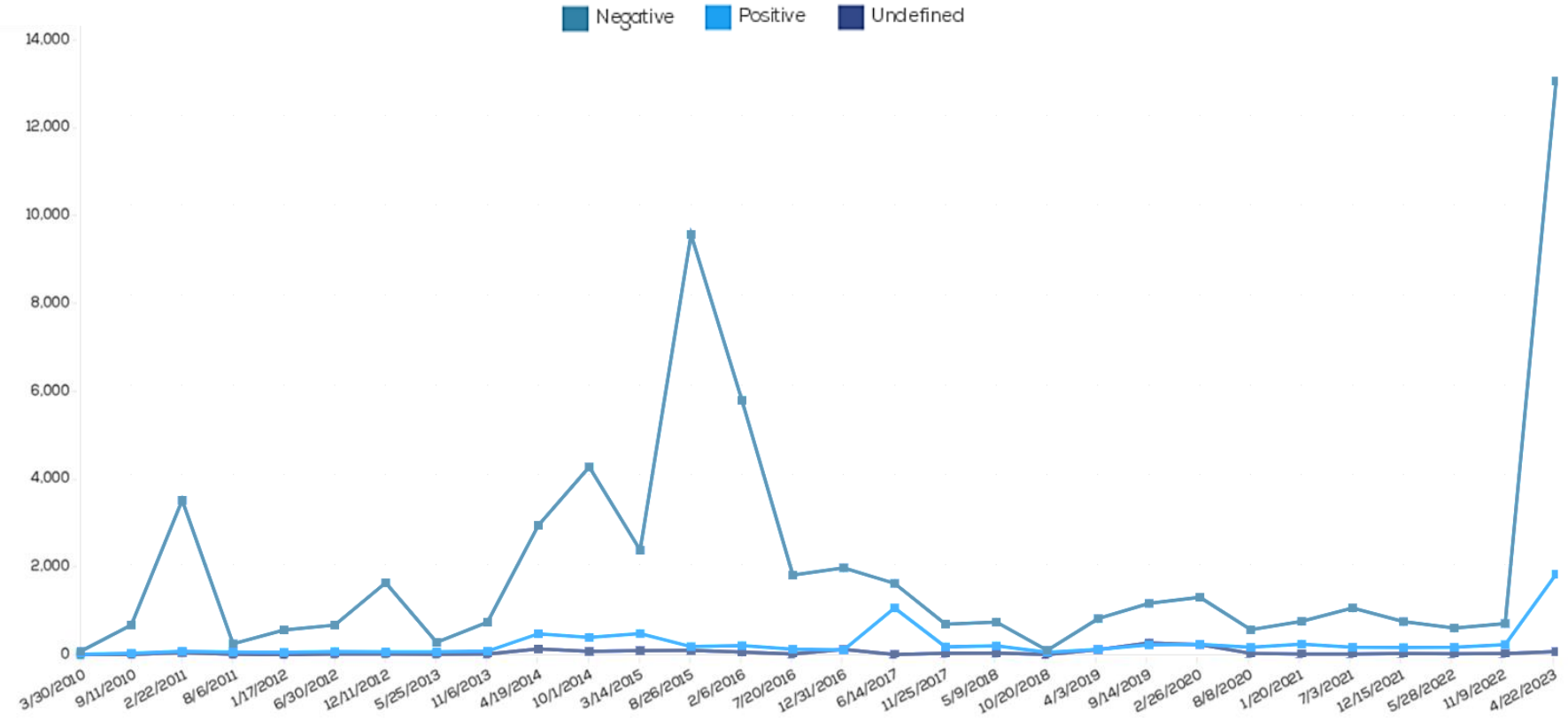
Count of tweets and retweets over time

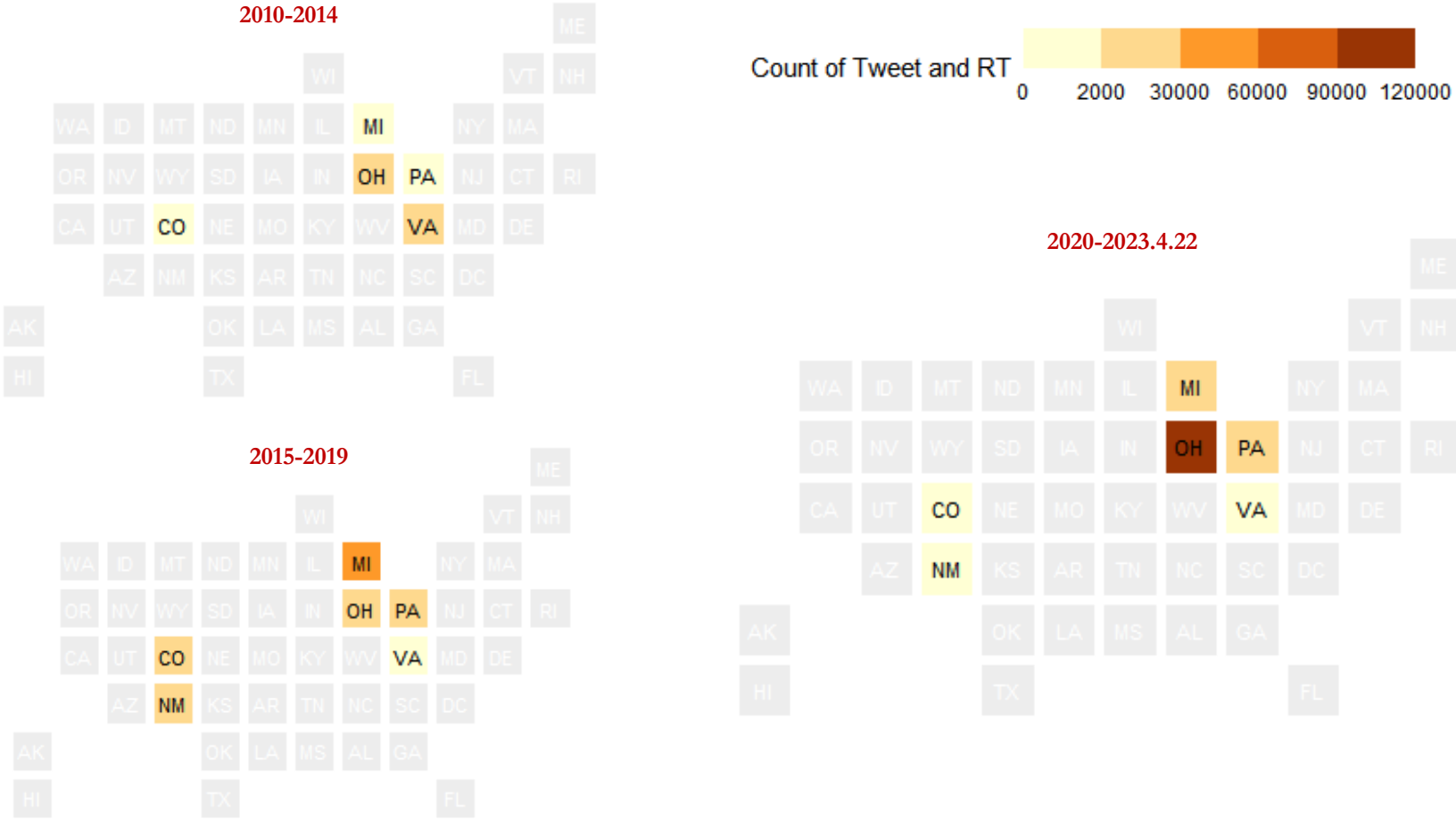
Username	UTC Date	Tweet	Permalink
@OMSolutionsInc	21/4/2023 11:45:39	Sam Baxter💧Philly Water hero🏭 Mentor🫵 https://t.co/ytzvW4gxXz#WaterEng	https://t
@AlanPat17246654	21/4/2023 10:56:35	More signs that the EPA is asleep at the wheel. https://t.co/osXtsTT06w	https://t
@artmeetstony	21/4/2023 9:47:15	New game from @NorthumbrianH2O It's #nationalsewageday. Guess which cup is	https://t
@worldnews_guru	21/4/2023 9:23:45	Philadelphia recommends residents drink bottled water after chemical spill	https://t
@dmcollins28144	21/4/2023 6:38:19	CDC Workers Fall Ill: Is the East Palestine Derailment Chemical Spill an Or	https://t
@ZimboRew	21/4/2023 5:48:46	@gingermOnster @inon_gamer @shoeOnhead @JoeBiden The one he did was pretty	https://t
@ALFFanAccount1	21/4/2023 4:54:59	Inherited an exurban plumbing business 👇 https://t.co/NsjBuLwdYm	https://t
@ALFFanAccount1	21/4/2023 4:23:53	Sounds like a you problem, my house isn't heated with fossil fuels https://	https://t
@TRILLIONCAP	21/4/2023 3:12:03	Imperial Oil CEO, executives called before Commons committee to explain to	https://t
@seekingaround17	21/4/2023 2:10:37	For the love of God stop drinking the Ohio tap water! It' s going to KILL Y	https://t
@Verdentine	21/4/2023 2:05:15	'IT'S TERRIBLE': FIGHT FOR CLEAN WATER IN CUMBERLAND COUNTY EXTENDS INTO I1	https://t
@soft_fox_lad	21/4/2023 1:54:55	you would think this is about a chemical spill but it is in fact about sanc	https://t



Sentiment of the tweets: predominately negative

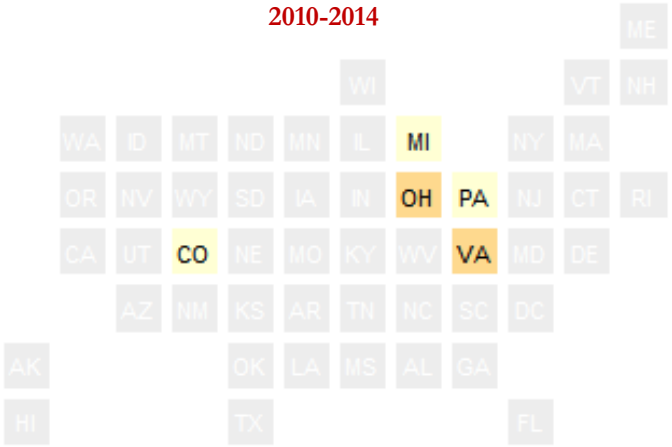


Tweets and re-tweets by period and by location: increased and concentrated

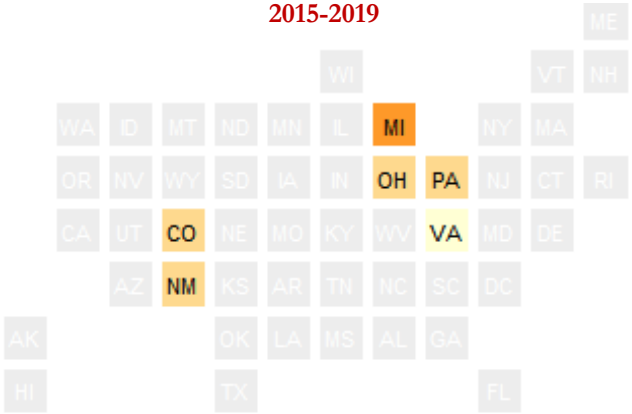


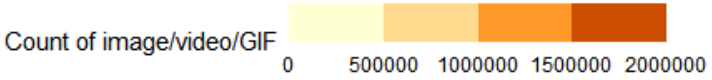
Inclusion of mixed media in Tweets by period and by location

2010-2014

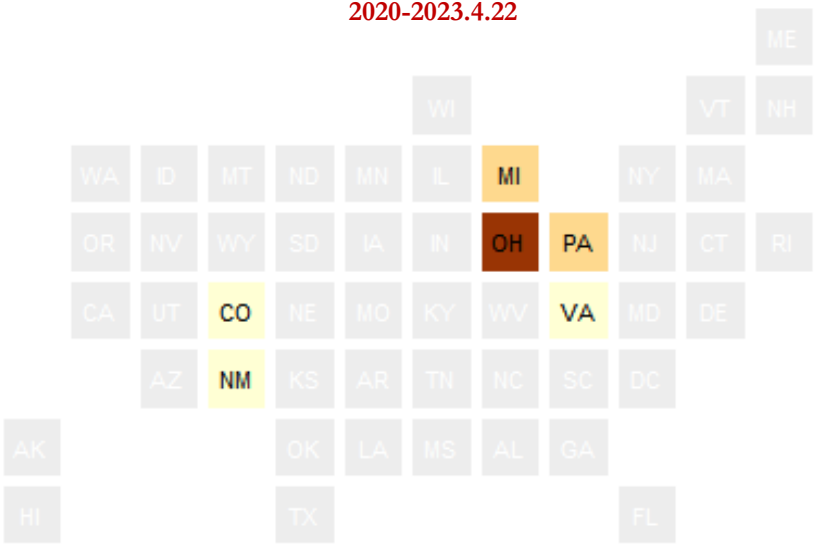


2015-2019



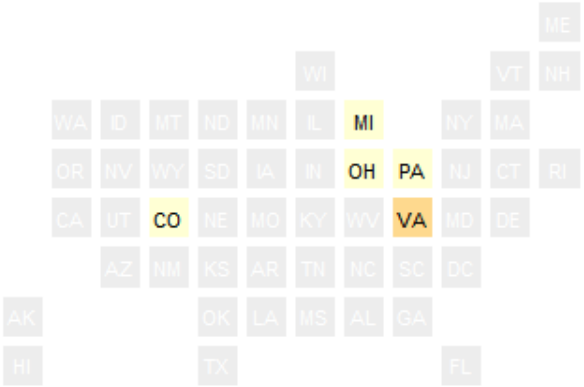


2020-2023.4.22



Count of the word “spill” by period and by location

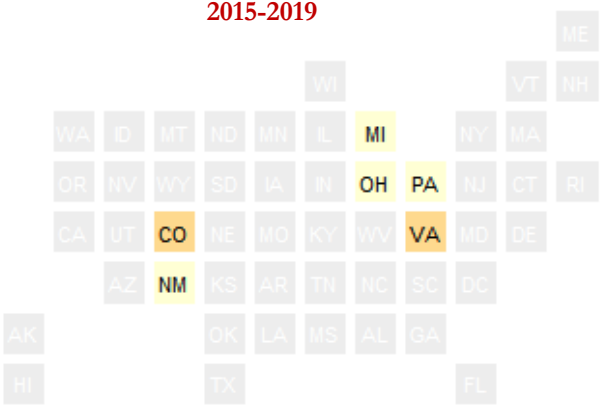
2010-2014



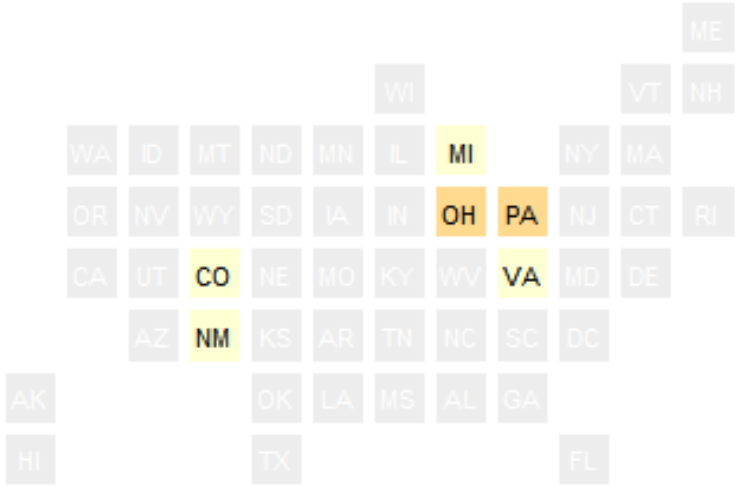
Count of the word 'spill'

0 30000 60000 90000 120000

2015-2019

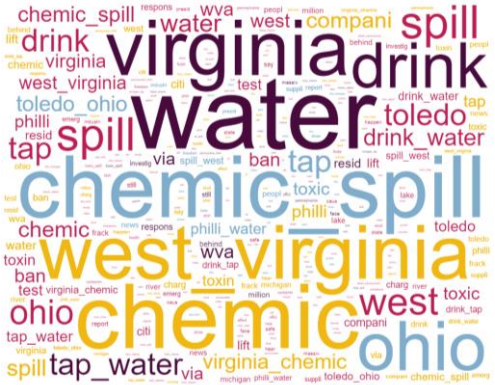


2020-2023.4.22



Word cloud of bi-grams terms by period

2010-2014

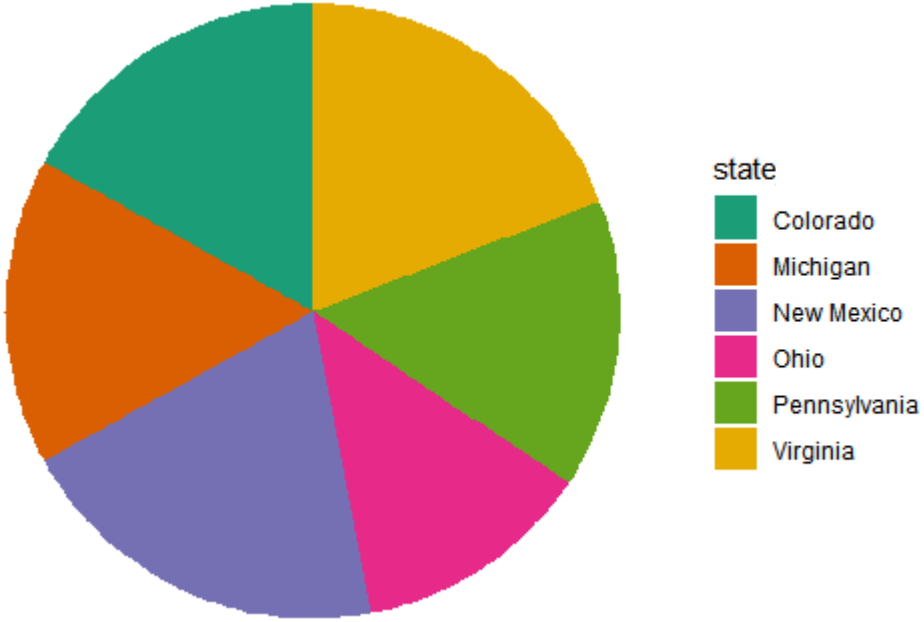


2015-2019

2020-2023.4.22

Linking Twitter data to survey data based on location and time

Proportion of mental health decline
(current mental health measure – baseline mental health measure and dichotomized)



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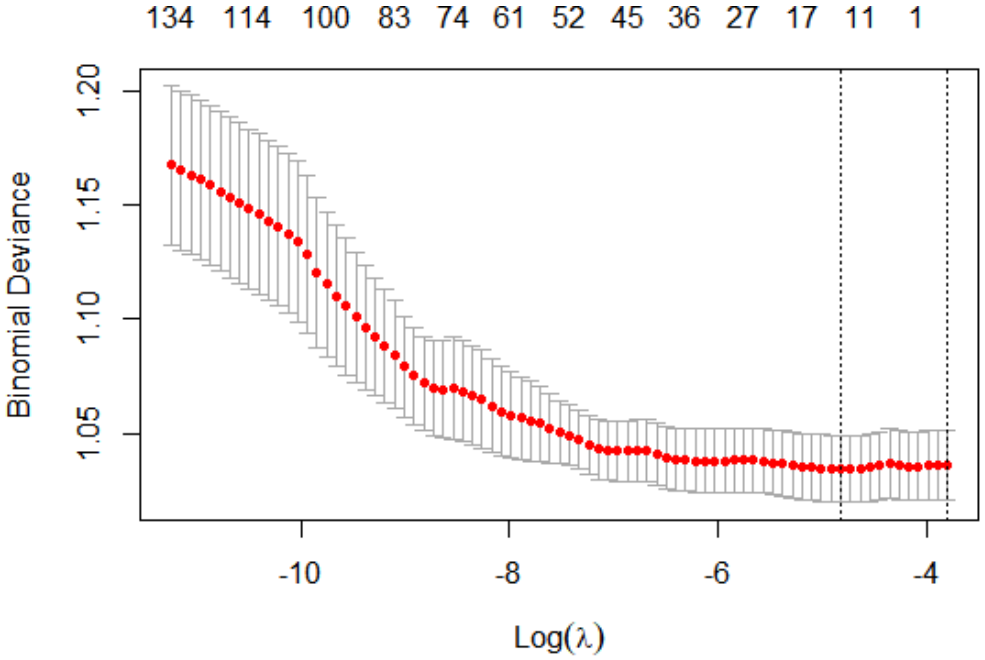
Any terms predict decline in mental health?

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Coefficients:
             Estimate Std. Error z value Pr(>|z|)
(Intercept) -1.254776   0.059701 -21.018   <2e-16 ***
first       -0.157326   0.088328  -1.781   0.0749 .
investig    -0.155348   0.110203  -1.410   0.1586
just        -0.060535   0.078989  -0.766   0.4435
live         0.204415   0.129116   1.583   0.1134
month        0.001177   0.053842   0.022   0.9826
need         0.105736   0.090169   1.173   0.2409
ohio        -0.011007   0.004844  -2.272   0.0231 *
peopl        0.006955   0.023868   0.291   0.7707
poison      -0.008130   0.045178  -0.180   0.8572
test        -0.014760   0.040838  -0.361   0.7178
today       -0.004648   0.046573  -0.100   0.9205
turn         0.079738   0.037400   2.132   0.0330 *
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Next steps

- Try linking the two datasets with different lags in time
- Try using more granular survey data
- To use ensemble methods, bagged several prediction from different machine learning methods to get better prediction