

# Social media, digital data, and diagnosis in the Covid-19 pandemic

*NASAEM Workshop- Lessons learned from the COVID-19 Pandemic to improve diagnosis:  
Diagnosis and public health responsibility  
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Center for Digital Health



Penn Medicine

## Funding/disclosures

- **R01 (NHLBI) PI** Digital Phenotyping and Cardiovascular Health
- **R01 (NIMH) (PI)** Assessing the effectiveness of a Digital Platform to Support the Mental Health of HCW in the Response and Recovery Phases of Covid-19
- **K24 (NHLBI) (PI)** Mentoring and Patient Oriented Research in Cardiovascular Health and Digital Data Science
- **R21 (NIDA) (PI)** Online Reviews and SUD
- **OUAT Foundation (PI)** Mining Digital Media Data to Improve Psychiatric Evaluation and Treatment
- **R01 (NHGRI) (Co-I)** Patient Preferences for Collecting and Repurposing Genetic, Consumer and Health Care Information
- **IBC (Co-I)** Bold Solutions: Regional Health Equity Initiative
- **R01 (NIMH) (Co-I)** Development and clinical interpretation of machine learning emergency department suicide prediction algorithms using electronic health records and claims
- **R21 (NIMH) (Co-I)** Experiences and Outcomes of Suicidal Individuals with and without Autism in Emergency Departments Nationwide

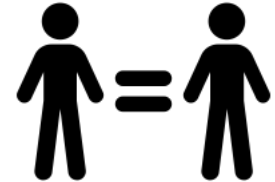
## **Penn Medicine Center for Digital Health**



**Data Mining and  
Collection**



**Digital  
Engagement**



**Digital Equity  
and Access**

## From: Digital technologies in the public-health response to COVID-19



# ***Infodemic***

**“A rapid and far-reaching spread of both accurate and inaccurate information about something, such as a disease. As facts, rumors, and fears mix and disperse, it becomes difficult to learn essential information about an issue”**

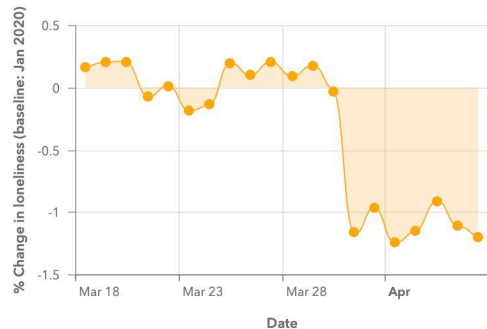
# The evolving role digital platforms in public health emergencies

*Merchant RM, Elmer S, Lurie N. Integrating social media into emergency preparedness efforts. NEJM 2011*

*Merchant RM, Lurie N. Social media and emergency preparedness in response to novel coronavirus. JAMA 2020*

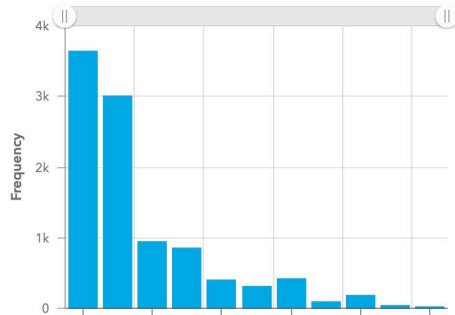
**Tracking symptoms, public sentiment**

## Change in Twitter Loneliness

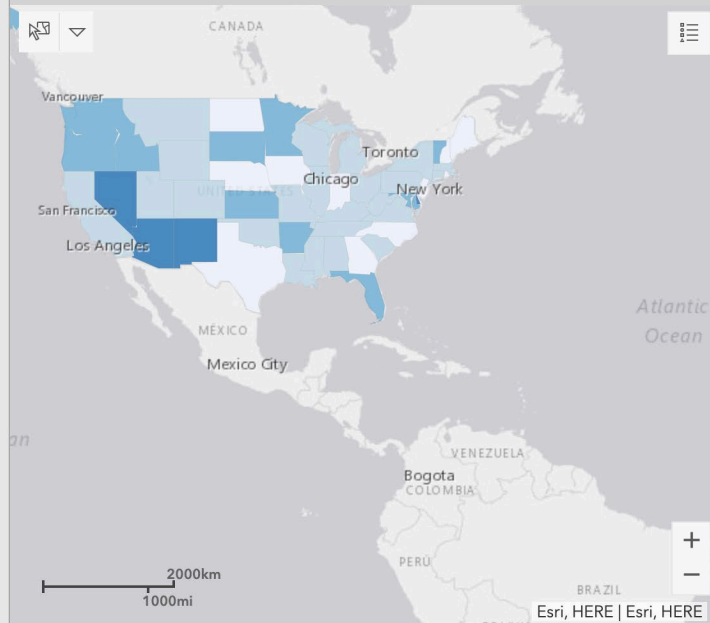


Loneliness expressions

## Top Symptoms on Twitter



## COVID19 Tweets per capita in the US



## Top Twitter topics in each state

patients, hospital, doctors, nhs :::: cases, there are, cases of, uk  
country, in india, beat, biggest :::: trump, pence, response, crisis

### Arkansas

trump, is a hoax, democrats, called :::: fear, no one, media, panic  
media, information, it would be, scare :::: because of the, online, right now,  
situation  
cure, world, made, imagine :::: iran, thread, died, die  
china, made, week, government :::: patients, hospital, doctors, nhs  
cases, there are, cases of, uk :::: vaccine, there is no, report, free

### California

trump, is a hoax, democrats, called :::: media, information, it would be, scare  
cure, world, made, imagine :::: fear, no one, media, panic

## Change in Panic Buying Topic



Panic Buying

Politics

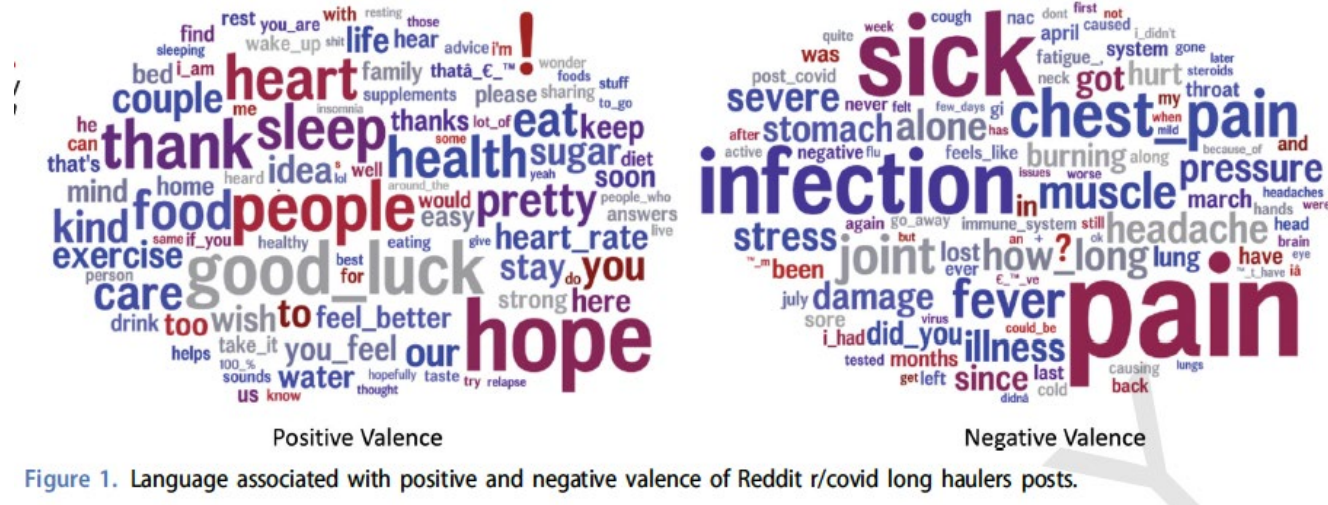
Economic Concerns

Deaths

Confirmed Cases



## Posts about long COVID-19: diagnosis and symptoms on social media



Southwick et al. The role of digital health technologies in COVID-19 surveillance and recovery: a specific case of long haulers. *Int Rev Psych.* 2021

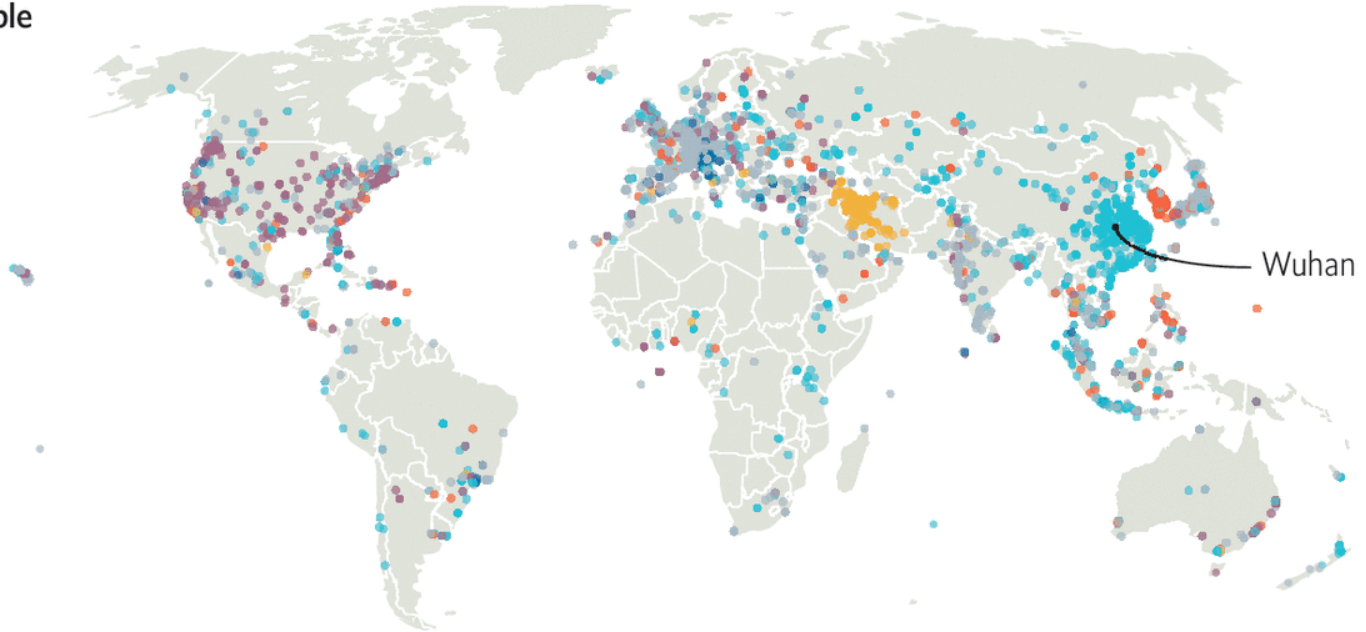
# Tracking disease

## Follow back

Locations Instagram users travelled to after visiting a location with 50 or more confirmed covid-19 cases

Location of possible virus exposure

- China
- Italy
- South Korea
- Iran
- United States
- Other

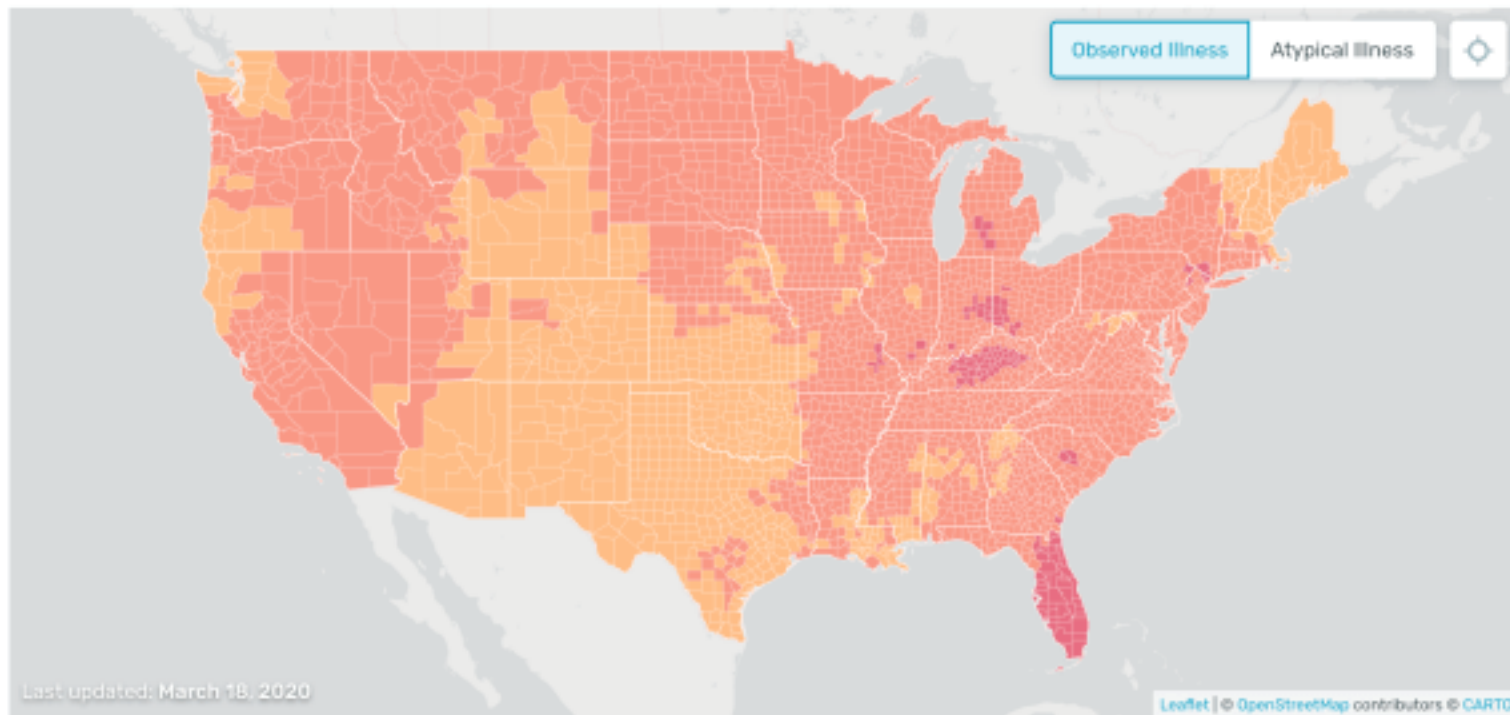


Sources: Public profiles on Instagram; *The Economist*

Look up influenza-like illness near you:

Search zip code or county name

Observed Illness Levels ?



<https://www.fastcompany.com/90479800/this-map-uses-smart-thermometers-to-detect-potential-surges-in-covid-19-cases>

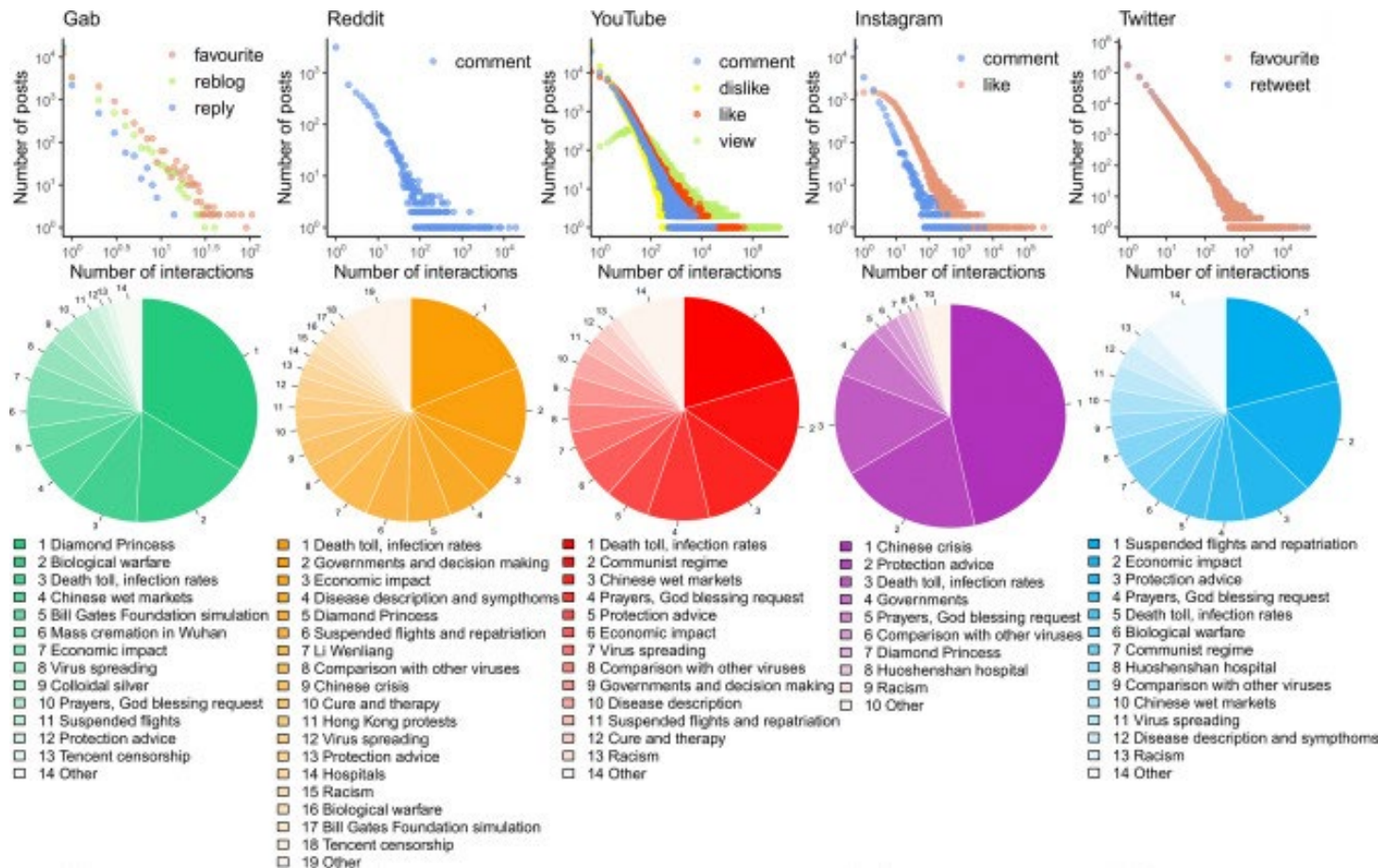
**Tracking (propagating) misinformation**

# Misinformation is a public health crisis

**Problem:** It has emerged about nearly every aspect of the pandemic including the origins of the virus (e.g. Bill Gates), treatments (e.g. bleach, mouthwash), and vaccine safety (e.g. microchips).

**Approaches:** find it, block it, replace it, label it, listen and learn from it, remove the sources, work with regulate tech companies fostering it.....

**Call to action:** There is a need to study it and evaluate the effectiveness of various approaches to addressing it



# Misinformation and social media

# 1/3

incorrect, misleading, or  
incomplete information about  
COVID-19 on Tiktok



Incorrect, Misleading

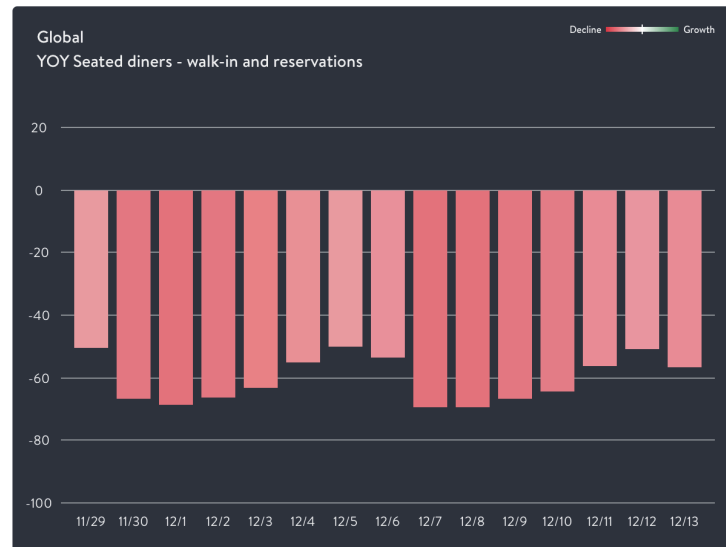
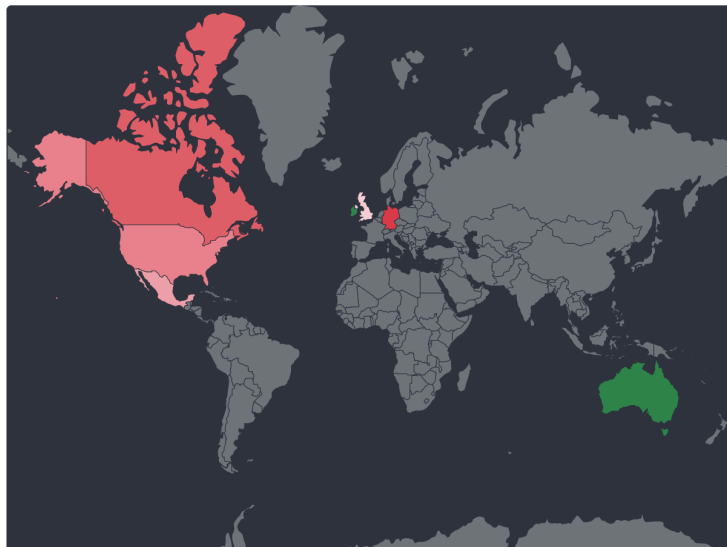


Intended to inform



# Tracking movement

## Seated diners



Name	12/13	12/12	12/11	12/10	12/9	12/8	12/7	12/6	12/5	12/4	12/3	12/2	12/1	11/30	11/29	11/28	11/27
Global	-56.6%	-51.02%	-56.38%	-64.2%	-66.81%	-69.58%	-69.23%	-53.55%	-50.01%	-55.01%	-63.18%	-66.15%	-68.61%	-66.55%	-50.36%	-51.3%	-57.23%
Australia	68.95%	82.49%	61.34%	54.36%	42.26%	30.66%	31.46%	72.58%	74.48%	62.37%	46.57%	36.73%	23.16%	32.31%	65.83%	74.95%	59.1%
Canada	-78.88%	-62.88%	-72.47%	-79.59%	-81.26%	-82.41%	-80.75%	-73.51%	-68.21%	-72.93%	-80.39%	-80%	-81.22%	-76.8%	-66.32%	-68.73%	-71.82%
Germany	-97.07%	-94.61%	-92.86%	-96.9%	-97.68%	-98.19%	-98.56%	-95.82%	-93.28%	-92.22%	-95.91%	-97.43%	-97.9%	-98.98%	-97.43%	-96.1%	-95.86%
Ireland	63.69%	50.33%	20%	7%	8.05%	15.25%	48.95%	66.87%	35.58%	10.12%	-86.32%	-92.55%	-95.35%	-98.97%	-99.81%	-99.68%	-98.95%
Mexico	-45.66%	-42.21%	-49.14%	-52.54%	-54.97%	-53.18%	-51.26%	-42.83%	-34.63%	-43.24%	-48.49%	-46.43%	-47.55%	-41.05%	-37.93%	-36.38%	-40.39%
United Kingdom	-24.04%	-15.52%	-36.21%	-47.32%	-50.77%	-53.69%	-52.06%	-26.93%	-22.08%	-38.1%	-52.33%	-59.83%	-96.05%	-94.36%	-92.33%	-90.38%	-92.36%
United States	-61.01%	-56.23%	-60.04%	-67.96%	-70.3%	-72.8%	-72.56%	-57.37%	-53.86%	-58.05%	-65.21%	-68.04%	-67.73%	-65.96%	-48.12%	-50.31%	-57.12%

# Tracking risk

# Digital contact tracing and COVID-19

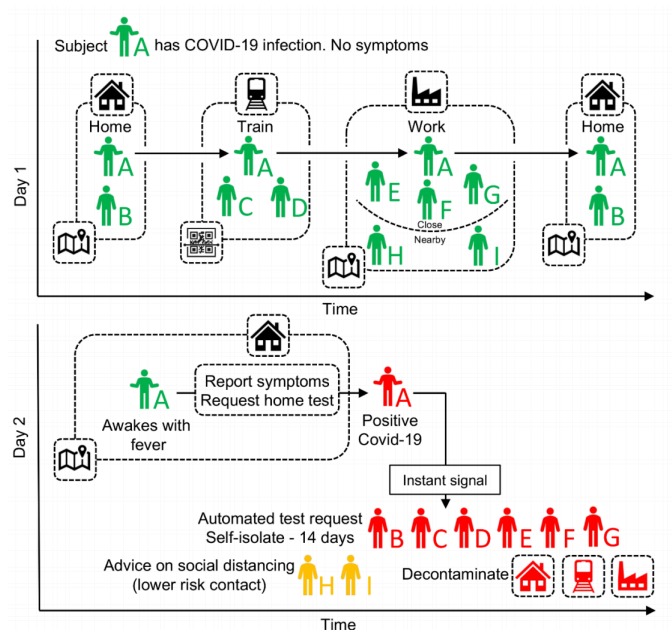
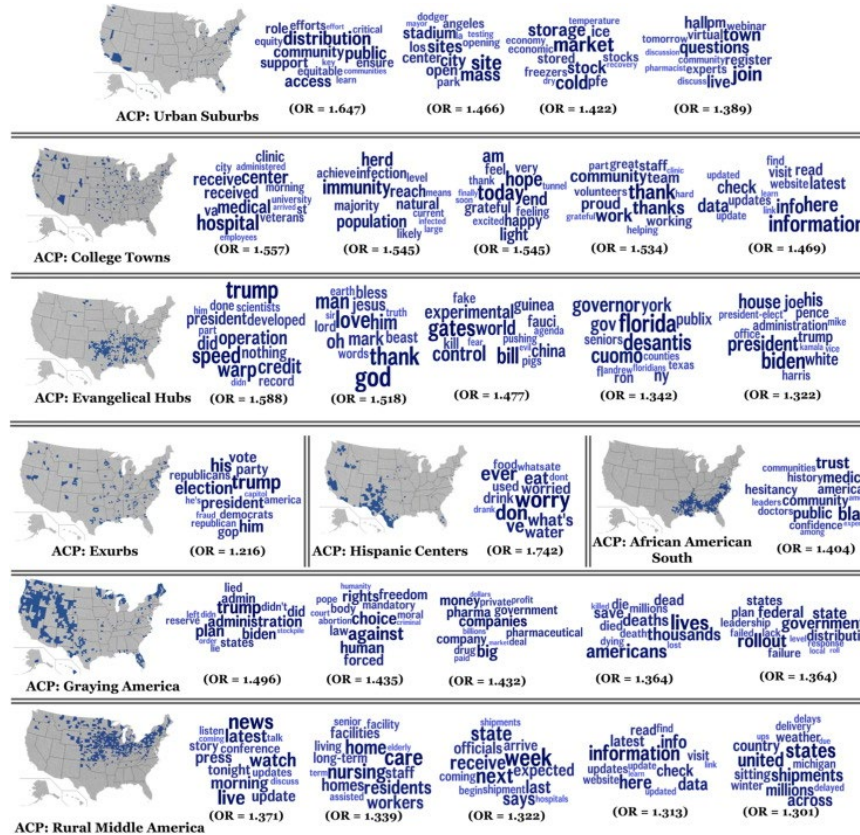


Fig. 4. A schematic of app-based COVID-19 contact tracing. Contacts of individual A (and all individuals using the app) are traced using GPS co-localisations with other App users, supplemented by scanning QR-codes displayed on high-traffic public amenities where GPS is too coarse. Individual A requests a SARS-COV-2 test (using the app) and their positive test result triggers an instant notification to individuals who have been in close contact. The App advises isolation for the case (individual A) and quarantine of their contacts.

# **Precision public health messaging**

# Precision messaging for public health preparedness





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**Penn Medicine News** @PennMedNews · Jan 4



A key strategy for reaching wider audiences could be partnering with trusted community leaders and influencers with large social media followings, argue [@RainaMerchant](#), [@Eugenia\\_South](#) and Nicole Lurie



“Public health organizations can also learn from social movements such as #BlackLivesMatter and #MeToo in elevating the ideas and experiences of young and often marginalized groups to shape a national dialogue that leads to change.”

Raina Merchant, Eugenia South, and Nicole Lurie  
*JAMA*



Penn Medicine



acc...  
tion

The image features two overlapping blue speech bubbles with white outlines. The top bubble is larger and contains the word 'Thank' in white sans-serif font. The bottom bubble is smaller and positioned to the right, containing the word 'You' in white sans-serif font. The bubbles overlap such that the 'You' bubble is partially behind the 'Thank' bubble.

Thank

You