WHO Collaborating Centre Event

October 22, 2020

Accountability and Transparency in Opioid Access and Use and COVID-19







Tim Mackey, PhD

UC San Diego – School of Medicine

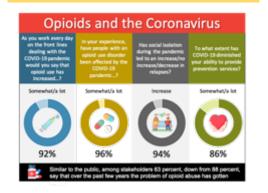
Overview of Research Areas



Detection and characterization of illicit online sales of opioids, controlled substances and other illicit drugs



Detection of various
COVID-19-related
issues including fake
treatments, symptom
reporting, and other
public health data



Preliminary data on opioid and COVID-19 related topics we are exploring in ongoing and future research activities





ACCOUNTABILITY AND TRANSPARENCY IN OPIOID ACCESS AND USE IN THE CONTEXT OF COVID-19

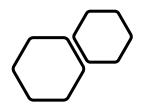
A MULTI-STAKEHOLDER WEBINAR SERIES

Accountability, Transparency,
Criminality, and Policy: A Case Study
of Illicit Online Opioid Diversion

Dr. Tim Mackey Associate Professor University of California, San Diego







Part 1: Opioids, Machine Learning, and Illicit Drug Diversion

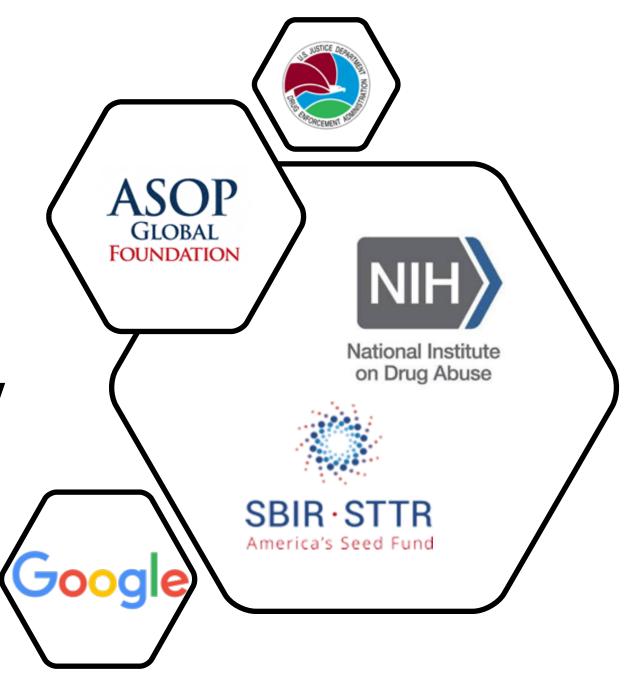
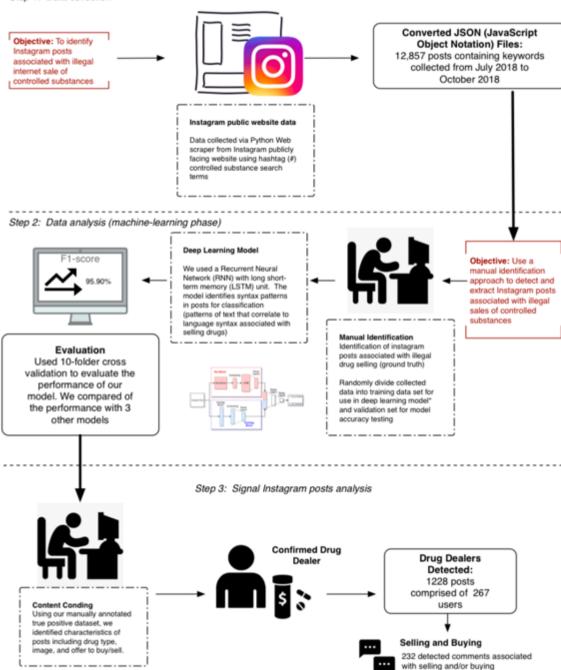
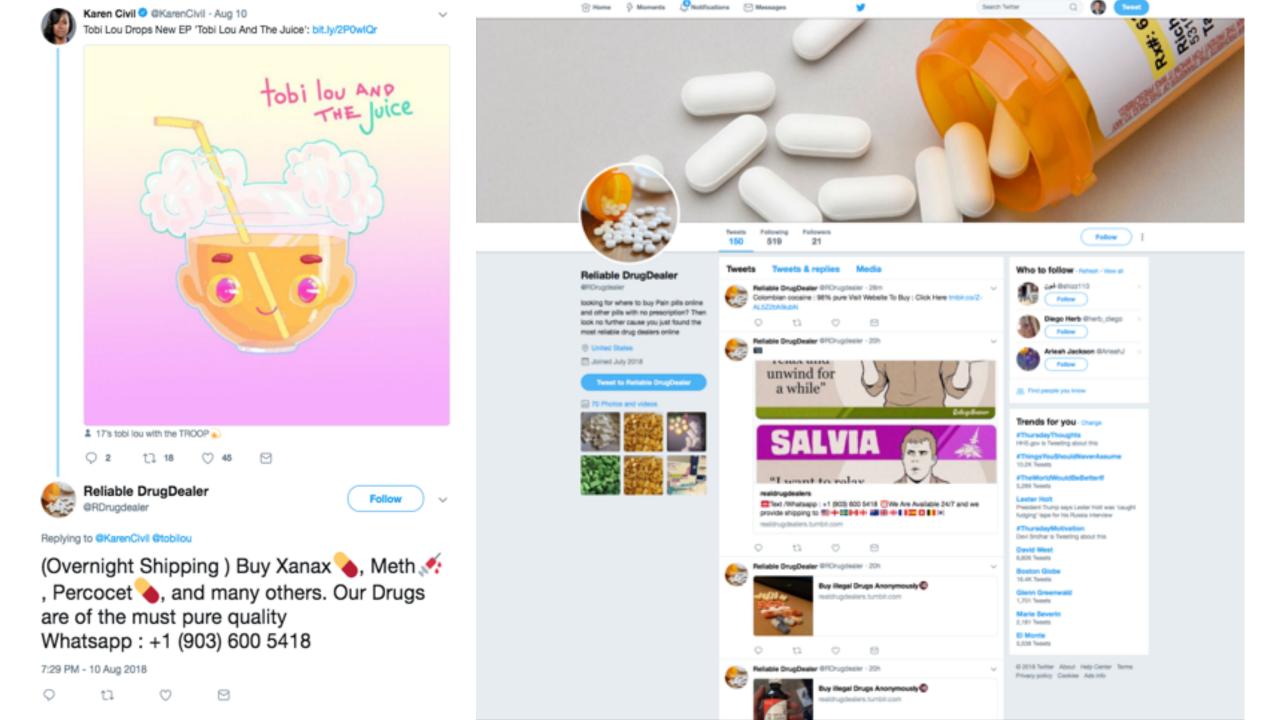


Figure 1. Summary of study methodology.

Step 1: Data collection



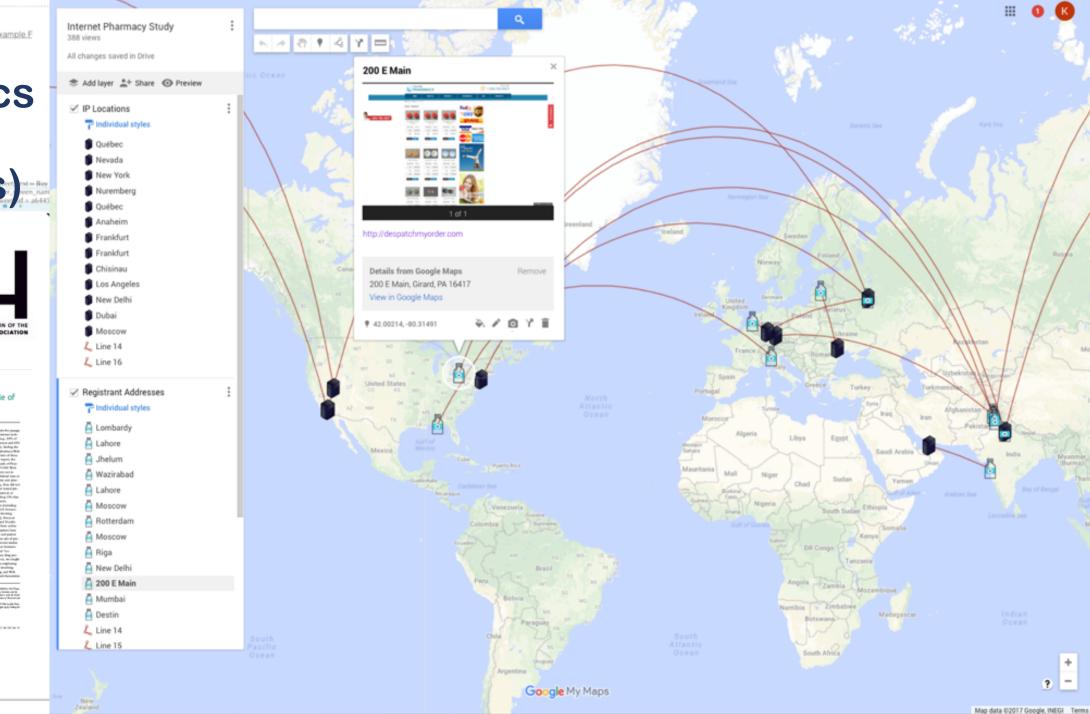
- Data Collection and Surveillance:
 Combination of use of public APIs and webscrapping to collect content from social media platforms (Facebook, Twitter, YouTube, Instagram, etc.), e-commerce platforms, search engines and the dark web.
- Analysis: Strategic approach using different approaches in big data including natural language processing (NLP), machine learning (including deep learning) coupled with manual annotation from subject matter experts.
- Reporting and Visualization: We conduct academic research to validate methods and findings, are building data visualization dashboards for specific use cases, and can conduct in-depth analysis for specific issues.



Web Example F **Forensics** Results

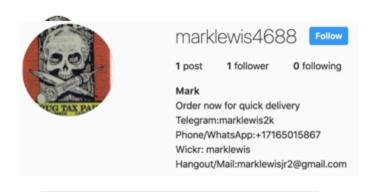


Twitter-Based Detection of Illegal Online Sale of Prescription Opioid



Select Digital Drug Dealer Results (categories)

EXAMPLES OF INSTAGRAM POSTS





chukoloriddie00123 #xanxiety #xanarchy
#xannaxgang

#xannyfamily #xannys #xanx #xanxiety ₩ #adderall® #adderall #adderallandred bull #oxy #oxyshred #oxytocin #oxycodine #oxycotton #inhaler #inhalemee #snort #snortingcoke #anabolicsteroids #steroid #nosteroids #steroid #nosober cONTACT AT TX +1(209) 806-3381 Whatsapp.+18143134198

Wickir .georgerandy

Figure 4. Examples of Instagram posts with suspected drug products (user information removed). The 5 unclassified pictures include (1) clear capsules with white crystalline granules, (2) cups with pink liquid, (3) blue and white capsules with no drug identification, (4) plastic bags of blue crystals, and (5) a bag of white crystals with a label "B".







(1)

(2)



(4)

(5)

AIC (LUSLASY)

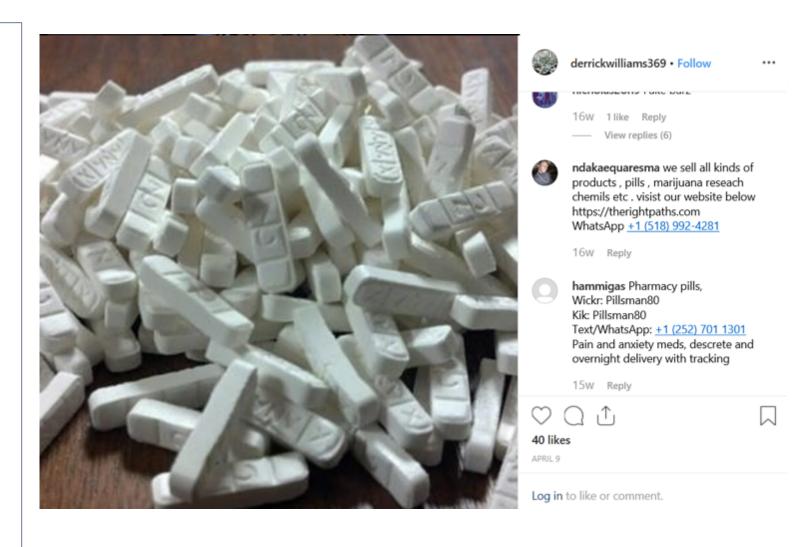
INSTAGRAM COMMENTS STUDY MACRO RESULTS (in review)



Number of Comments
 Detected: 5,462 comments
 comprised of 1,706 users
 including 160 interactions (e.g.
 expression of interest)

Themes Detected:

- 1. Delivery information
- 2. Access and pricing
- 3. Dealer2Dealer and D2C interaction
- Hybrids: Dealers who also have OLPs and spam-like content from OLPs?



Ramiro Nunnally 5 mor

YouTube

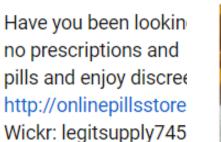
Shop +1 (330) 249-1381

BLOGGER

PAY FOR YOUR ORDER VIA BITCOINS AND GET 30 EXTRA PILLS OF YOUR CHOICE.

Showing all 9 results

HOME



Kik: legitsupply745 Call or Text: +1 (757)

Show less

REPLY

Snorting prescription pain pills is n 298,686 views



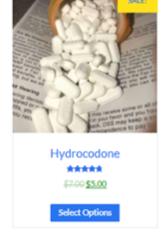
5/16 10 pm - Teens across the De high, but they're snorting and smol has more.

SHOW MORE



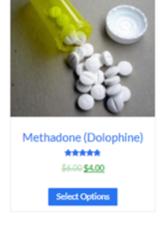
\$7.00 \$5.00

Select Options



Search

CONTACTUS ABOUTUS



Q



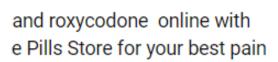
Default sorting

*I LOGIN 📤 REGISTER 😩 CART 😝 CHECKOUT

Call Us: +1 (330) 249-1381

Mail Us: info@onlinepillsstore.net

\$0.00





Percocet \$8.00 \$5.00

Select Options



Roxicodone **** \$10.00 \$6.00



Valium (Diazepam) **** \$6.00 \$4.00



Xanax (Alprazolam) **** \$8.00 \$6.00





vacy Filter RIBE

s Site

Is your dentist ripping you off? Hidden camera investigation... CBC News @

839K views





Comment/Reply Types

Drug Dealers



john cutter 5 years ago

QUALITY METHADONE, OXYCONTIN, AND OTHER PHARMACEUTICAL MEDICATIONS FOR SALE CONTACT AT cuttersinternational@gmail.com for more info on pricing and packaging.





REPLY

Online Pharmacy



rosebien lara 3 months ago

http://remeddypharmacy.com/product/buy-dilaudid-hydromorphone-online/





REPLY

User-mention

(Not selling but mention the place to buy)



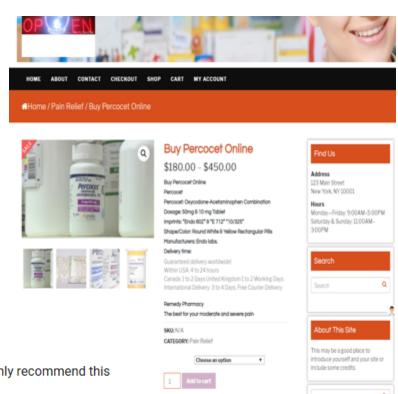
Maxime Maxime 3 months ago

I buy my qnxiety pills at www.legalpharmaonline.com for more than two years and I am satisfied with their products, I highly recommend this source





REPLY



DARKWEB SCANS





PRELIMINARY APPROACHES

Surveillance Strategy: Use of python

Reviews

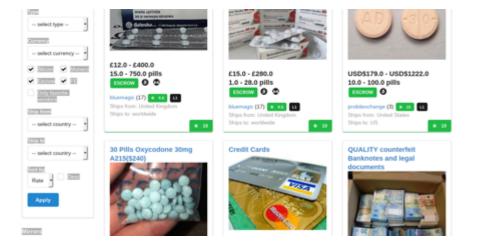


My experience with the vendor bluemagic was excellent. Very good communication. I received my order successfully in the window of time given. I tested the product and it is legit. Thanks!

Sandoz Oxycodone Oxycontin 80mg Genuine Pharmacy £142.0(11.0 pills)



Sandoz Oxycodone Oxycontin 80mg Genuine Pharmacy £290.0(28.0 pills)

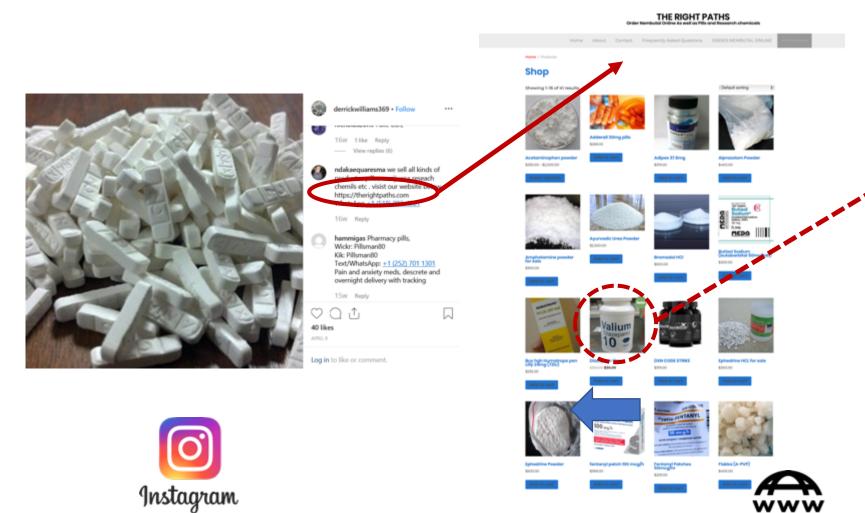


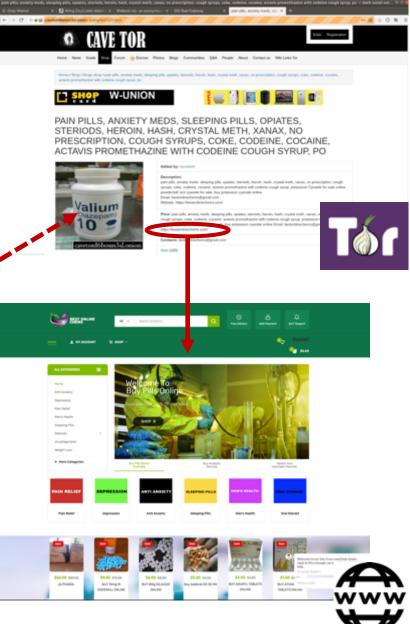
surveillance

Early Results: Large marketplaces (10K+ listings) – mid size (2K) – small (less than 1K), different countries of origin/language, transaction information, pricing based on volume, multiple languages

Common Links and Possible Connections

(social media-surface-dark)





English v Cart Sign In | Register

THE SCIENCES MIND HEALTH TECH SUSTAINABILITY EDUCATION VIDEO PODCASTS BLOGS STORE

COMPUTING

AI Scans Twitter for Signs of **Opioid Abuse**

Geotagged tweets using slang like "dummies," "Captain Cody" or other drug handles could help pinpoint clusters of opioid problems more quickly than traditional methods do

By Louis Dzierzak on October 30, 2017



##





One Woman Got Facebook to Police Opioid Sales On Instagram

Detection and Cha

Trump declares opioids a public health emergency - how robots can help

Published: Oct 27, 2017 10:00 a.m. ET







Home > Personal Finance





Some researchers say answers to the opioid crisis can be found on Twitter



BUZZFEEDNEWS / TITLE BUSIFIED Videos Guizzes Testy As/s More-

Service of Peace Service on the control of the cont

Aa 🛡

SHARE f in





WIRED

ONE WOMAN GOT FACEBOOK TO POLICE OPIOID SALES ON INSTAGRAM



CONTRACTOR NAMED IN COLUMN TWO IS NOT THE OWNER.

EILEEN CAREY SAYS she has regularly reported Instagram accounts selling opioids to the company for three years,

ilts. Last week, Carey confronted two Facebook, which owns Instagram, about the ter. Since then, but agram removed some sed one opioid-related hashtag and restricted

the hashtag #oxycontin on Instagram now ults. Other opioid-related hashtags, such as Appiates, Afentanyl, and Anarcos, surface a limited number of results along with a message stating, "Recent posts from [the hashtar] are currently hidden because the community



MOST POPULAR





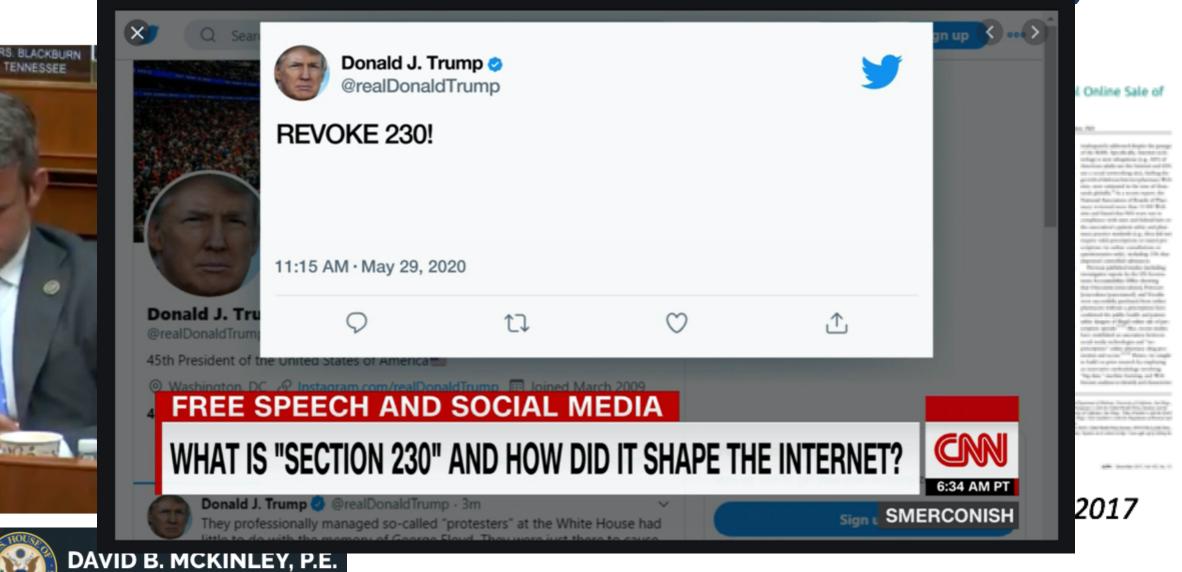




Social Networks Are Losing A Deadly Battle With Illegal Online Pharmacies

Every social media website reviewed by BuzzFeed News was host to dealers of opioids and other prescription medicine.

Policy Advocacy (Twitter Hearing Sept 2018)



Proudly Serving West Virginia's 1st District

Example Facebook Posts







Key Findings and **Future Directions**

Social Media has a problem: Despite claims of removals our studies found that both Twitter and Facebook have communities actively selling endangered species direct to the consumer in both English and Chinese.

Illegal Activity: Both social media platform terms and conditions and domestic and international law prohibit this activity, but self-policing is not working.

COVID-19 Connection: We are working with WWF US to explore the connection between wildlife trafficking and COVID-19 in these communities and will also continue to innovate on methodologies to better activate off-line investigations.

Environmental Conservation



Dite this article: Yo D. Cal M. and Markey TX 2020 The Blegal wildlife digital market; an malysis of Chinese wildlife marketing and sale in Facebook, Environmental Conservation

Accepted: 19 June 2020

his data: Escabook: online traffickins: social

Professor Tim K Mackey Email: tmackey@ucad.ed

The illegal wildlife digital market: an analysis of Chinese wildlife marketing and sale on Facebook

Qing Xu^{1,2}, Mingxiang Cai^{1,2,3} and Tim K Mackey^{1,2,4,5}

Ginbal Health Policy Institute, 8950 VIIIa La Jolla Drive, Suite A134, San Diego, CA 92017, LISR: "University of California, San Diego - Extension, Department of Healthcare Research and Policy, San Diego, CA, USA: Separtment of Computer Science and Engineering, University of California, San Diego, CA, USA; "Department of esthesiology, University of California, San Diego School of Medicine, San Diego, CA, USA and ¹Division of Infectious Disease and Global Public Health, University of California, San Diego School of Medicine, Department

At an estimated US\$19 billion, the illicit wildlife trade is a serious threat to global conservation efforts. This criminal enterprise is now digital, expanding its footprint to consumers internationally by using the Internet and social media platforms. Recent studies have detected illegal wildlife selling posts on the popular social networking site Facebook in several different languages, including Chinese. In order to further explore this challenge to conservation, this study used big data approaches to identify and characterize wildlife trading activity in Chinese language on Facebook using an automated web scraper. We focused on keywords associated with elephants, rhinos and hawkobill turtles. We collected 10 303 unique Facebook posts over a 45-day period and were able to identify 639 posts from 268 unique users, which we suspect of directly marketing the sale of wildlife products. We also identified other species including Tibetan antelope, bears and African spurred tortoises. Facebook community pages appeared to have the highest percentage (48.2%) of wildlife selling posts. We also identified 14 different countries and regions with suspected wildlife-selling users, most located in Taiwan. Furthermore, we observed that the language used by some sellers changed from descriptive text to emojis and other code words. Collective action is needed from governments, law enforcement, civil society and technology companies leveraging big data approaches to better detect and interdict online Chinese-language wildlife trafficking

An alarming number of wildlife species and parts are traded globally, threatening conservation efforts (Wilson-Wilde 2010). For example, 20 tonnes of pangolins and their parts are trafficked internationally annually, and c. 1 000 000 pangolins have been poached in the last decade

(TRAFFIC n.d.a). Populations of black rhino have been decimated f just 2410 in 1995, resulting in the species now being classified a Growing demand has intensified the numbers of threatened, vulnerable species (Butchart et al. 2010). The illegal wildlife trade has also increaraising concerns about health security and infectious disease spread et al. 2000). Despite these dual risks to animal and public health, an continues to be generated by this criminal enterprise yearly (Global I

With the rapid rise of information and communication technology the Internet are now conduits for the distribution, trafficking and (Rosen & Smith 2010, Herrel & Van der Meijden 2014, Guan & Xu 20 tified as a primary consumer destination, especially for ivory and rhin-TRAFFIC n.d.b). In 2017, the revised law of the People's Republic of C Wildlife came into effect and, combined with the efforts of the C Trafficking Online, the number of new wildlife product advertisement (Xin & Xiao 2019). However, wildlife product trading continues amo Chinese language speakers in other countries, including a rise in socia and sale (Xiao & Wang 2015, Xiao et al. 2017, Xin & Xiao 2019). Popula operated in China (e.g., QQ, WeChat) and platforms outside of Chi speaking populations (e.g., Facebook, Twitter, Instagram, etc.).

Mainland China, Hong Kong, Macao and Taiwan are the four s populated by Chinese speakers. All of these jurisdictions have domestic life conservation. In mainland China, endangered species trading is Animal Conservation Law of the People's Republic of China, and all s sales require a physical authorized store, with no wildlife allowed to e-commerce or social media. Other jurisdictions have similar legisl Wild Animals Protection Ordinance, Macao's Law No. 2/27 Enforce



Capuchin monkeys for sale in Ohio





versity Press on behalf of Foundation for ironmental Conservation.

Comment

Share





Part 2: COVID-19 Ongoing Research Projects



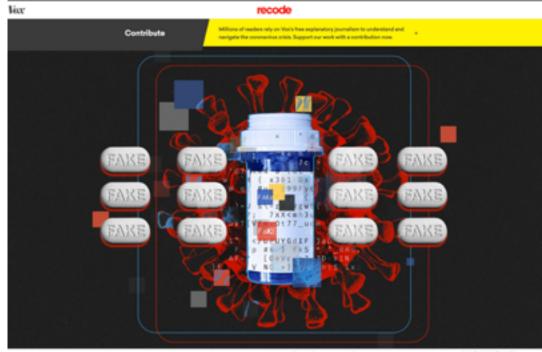
Post-Digital Pandemic

"Infoveillance"?: Using sources of Internet-mediated data to better understand public health concerns, including in the context of outbreaks and pandemics.

COVID-19 Frauds and Cybercrime:

Documented cases of COVID-19-related digital misinformation, cybercrimes, online frauds (e.g. robocalls, phishing scams, fake products sold online)

Ongoing Research: Using big data, machine learning, and data visualization to identify, characterize and assess different impacts of the COVID-19 pandemic using different sources of data (e.g. social media, online site, media, public health statistics, GIS, etc)



Coronavirus scammers are flooding social media with fake cures and tests

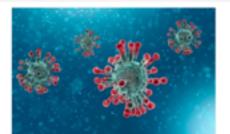
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* ARTIFICIAL INTELLIGENCE *

This machine-learning upstart trained software to snare online drug dealers. Now it's going after fake coronavirus test equipment peddlers

US govt-funded outfit hopes to kill off web quackery that puts us all at risk

By Karyanna Quach 10 Apr 2020 at 19:58



Machine-learning software to snare scammers hawking fake COVID-19 test kits on social media is being built by a finy startup funded by the US National Institute of Months. Blockchain Professor Adds Coronavirus To Curriculum As

Classes Go Remote



Adjunct professor Timothy Mackey of University of California San Diego - money



EARLY OUTBREAK POPULATION SENTIMENT AND BEHAVIOR



— Uncertain

——Scared, Worried and Nervous

-Calm and Optimistic

DIGITAL CONTACT TRACING (MARCH 2020)

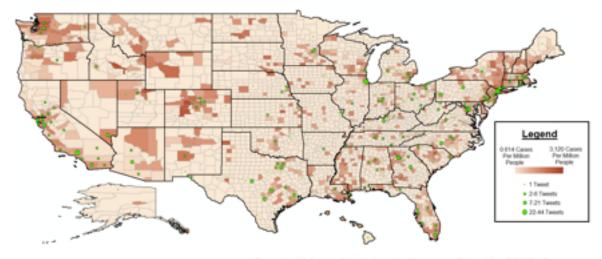
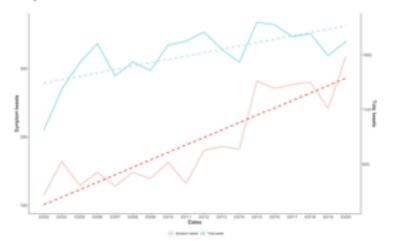
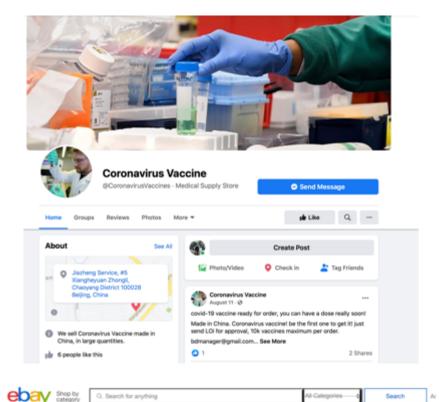


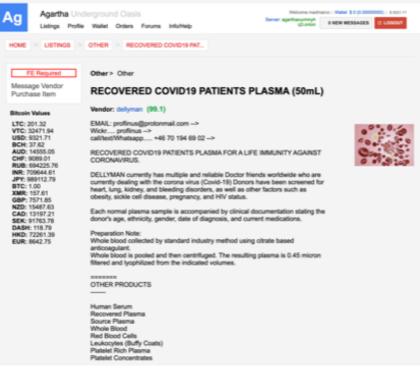
Figure 1: Volume of total signal twitter posts filtered for COVID-19 symptom terms and confirmed symptom posts plotted over the study period (March 3-20,

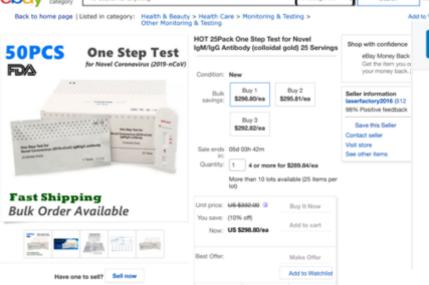


Themea	Posts	Example Conversation ^c	
	N (%) ^b		
Conversations	about sympto	oms	
Self-reporting of symptoms (first-hand)	3,465 (100%)	"1/I went to ER day before Asked by Dr why I was there I said "have Coronavirus symptoms." (I really do.) He laughed; asked what symptoms were. I gave all the Coronavirus symptoms. He said "I believe you have an upper respiratory virus. Let's give you a steroid shot."	
		"I was in the ER last night put into isolation in [LOCATION] (near [LOCATION]). Met their criteria to isolate. They said can't tell me if I have it or not bc can't test advises to isolate. Then promptly escorted out of the hospital w/o paying co-pay. Yes there's a problem"	
		"This is the moral quandry I had today. I have 2 of 3 symptoms. I was lin contact with someone who was in contact with someone who tested positive. I couldn't go to the er or urgent care as I was concerned about spreading it."	
Second-hand reporting of symptoms		"Contacted the er and [FACILITY NAME] in [CITY] because my daughter has a runny nose fever and a sore throat. I was told they're testing for everything else before testing for coronavirus. Is that backwards or am I trippin? #CoronaVirusSeattle"	
		"So my niece got taken to the hospital with signs of COVID in an ambulance. Very scared but I'm hopeful it's not that. Hopefully it's just a croupy cough and a fever or something, fingers crossed."	
Conversations about symptoms concurrent with other themes			
Symptom reporting and lack of access	512 (14.8%)	"Hey [NAME] why can't we get tested for COVID-19 in [LOCATION]? My wife has all the symptoms but ER said no testing unless you're admitted."	
to testing		"Friend stays in Metro Detroit. She had worries about having COVID-19 symptoms. She went to Beaumont for testing. Waited 2 hours to be sent away. No fever and no known contact with anyone with coronavirus. But how do you know with scanty testing?"	
Conversations about symptom and recovery	780 (22.5%)	"My spouse, 4 yr old and I are almost better now. We were sick about ten days. Don't know if it is Corona because we could not get a test. Fever lasted 3 to 4 days. No cough for us. Consistent headache, chills, sore throat. Reduced appetite for a few days Hydrate! Nap!"	









Free shipping 60-day returns

Timothy Mackey, MAS, PhD

Hi my friend, gald to know you. We are supplier of covid-19 rapid test kit in China, do you interest in it?



Cathy Min

HX Plastics Product Co.Ltd - 外贸经理 Rest of Hubei, China

View profile

Accept

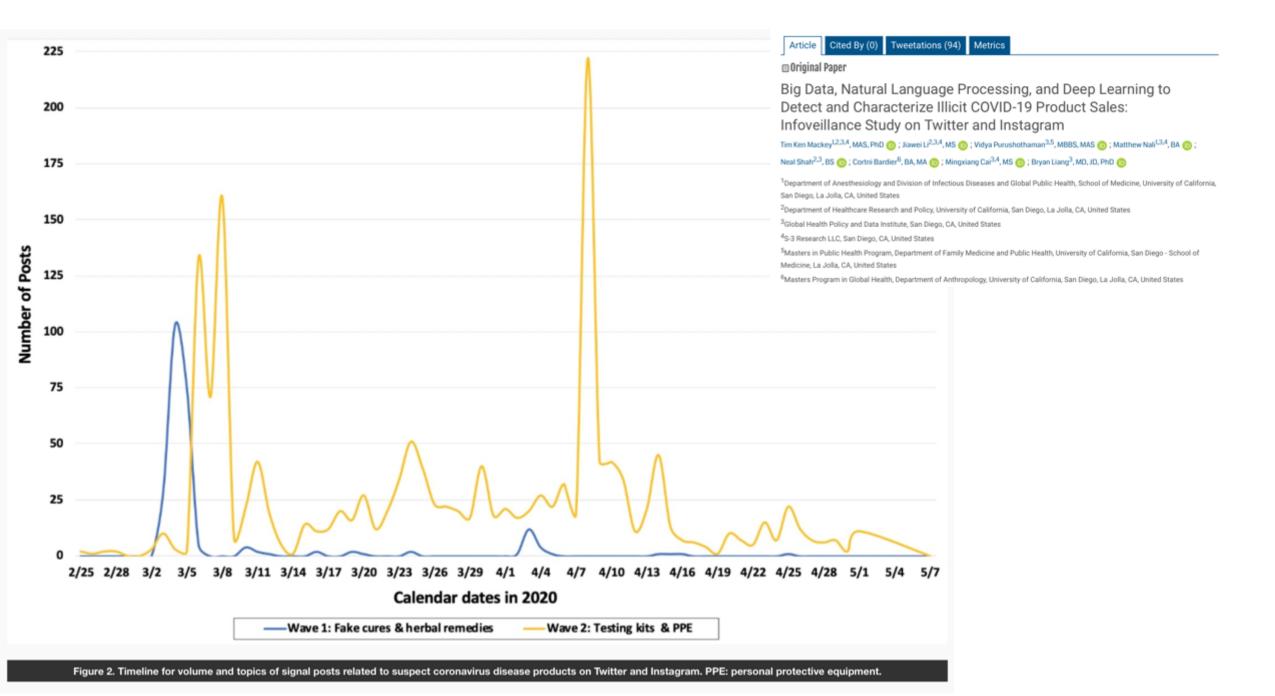


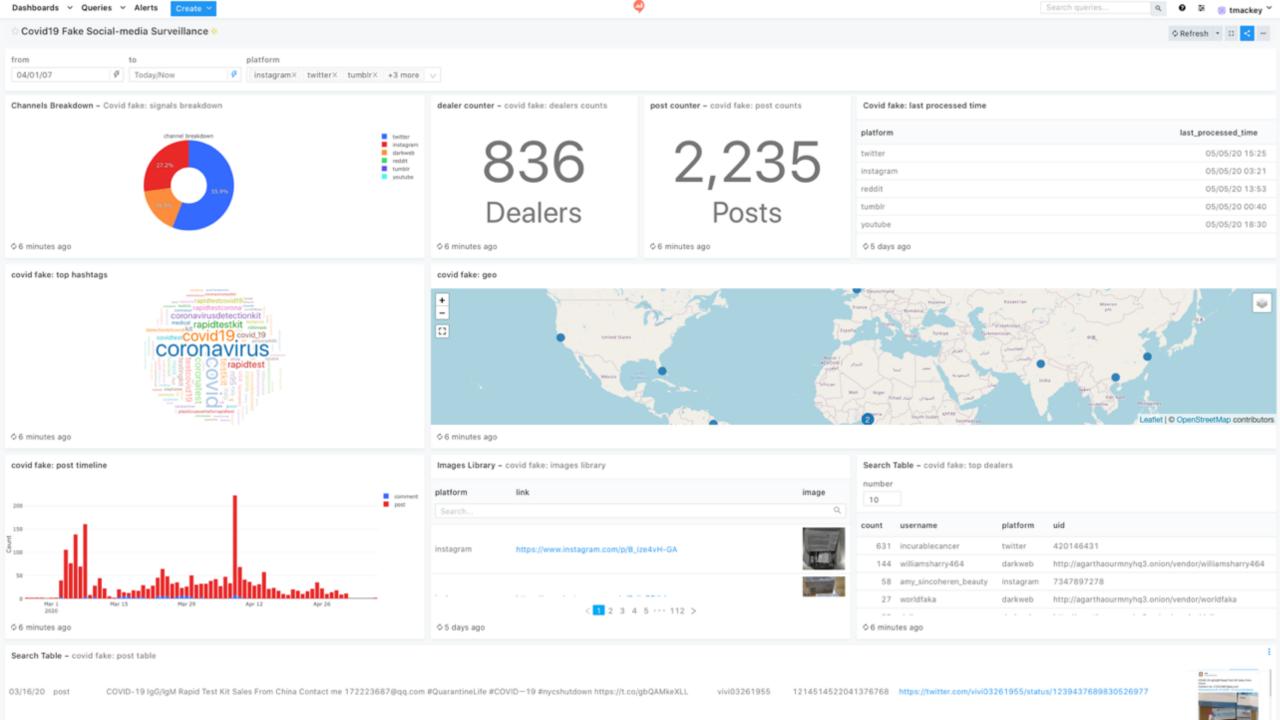


@cov19_updates The kits we provide are serious. For people who have concerns about being infected, and simply cannot wait for a hospital to tell them there are no more tests. #coronavirus #covid19 #pandemic #epidemic #covidtes #covistesting #quarantine #covidtes #covistesting #quarantine #guarantineand/shill #quarantine!#e



Covid-19 Coronavirus Updates @cov19 updates





Misinformation and Social Science Studies

Misinformation: Study in review that reviewed 1.1 million tweets after President Trump misinformation tweet about benefits of hydroxychloroquine. Primary finding, 84.0% promoted misinformation or positive sentiment about drug.

Networks of the "Liberate Movement": Pro liberate groups on Twitter are highly concentrated and have more focused message propagation compared to anti-liberate groups.

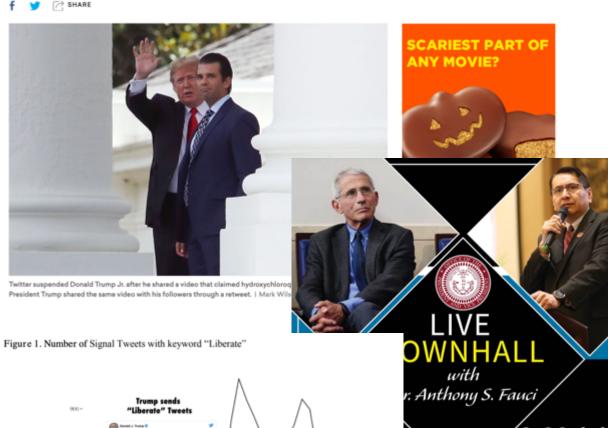
Vaccine Hesitancy: Facebook townhall on COVID-19 clinical trial for Navajo nation had 62% of comments related to vaccine hesitancy and 9.7% related to misinformation.

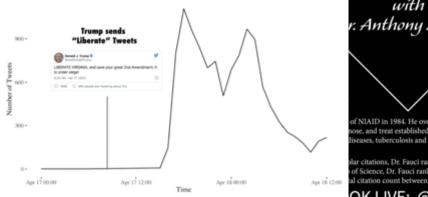
How Trump and his son helped make a Covid-19 conspiracy theorist go viral in a matter of hours

A doctor who thinks alien DNA is used in medicine now says hydroxychloroquine is the cure for Covid-19.

By Sara Morrison and Rebecca Heilweil | Updated Jul 28, 2020, 7:03pm EDT



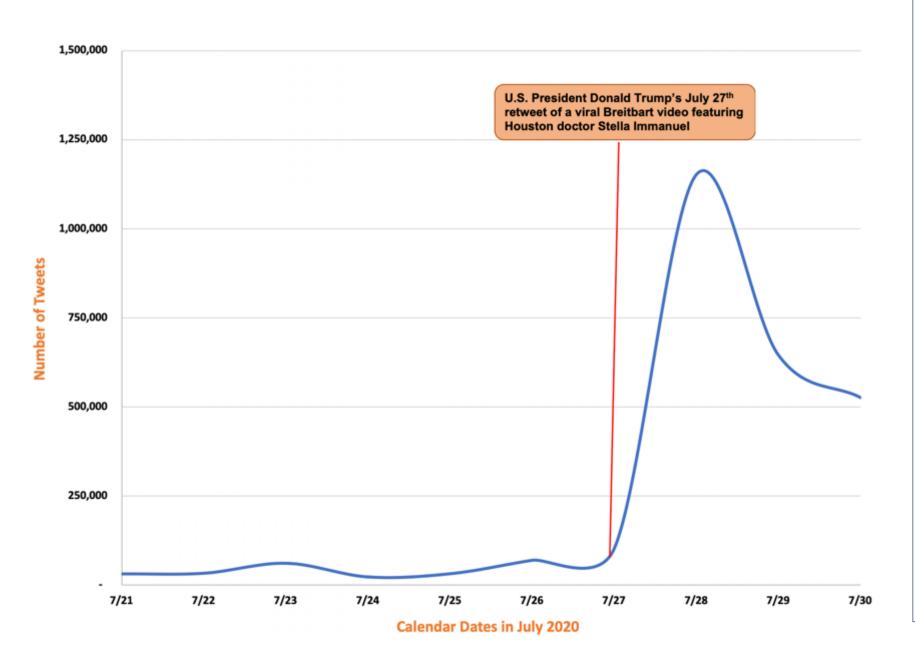




9:00 A.M.

NIAID in 1984. He oversees an extensive portfolio of basic and

OK LIVE: @NezLizer2018

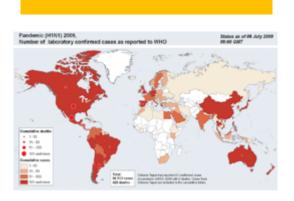


- Volume: 2.5 million tweets collected, 1.1 million reviewed
- Results: 956,590 either misinformation or positive sentiment, liked
 2.1 million times by
 280K unique twitter users
- Themes Detected (10 topics):
 - Reposting misinformation video with support
 - 2. Claims of efficacy
 - 3. Conspiracy theories

HISTORY OF GLOBAL SUPPLY CHAINS & OUTBREAKS?



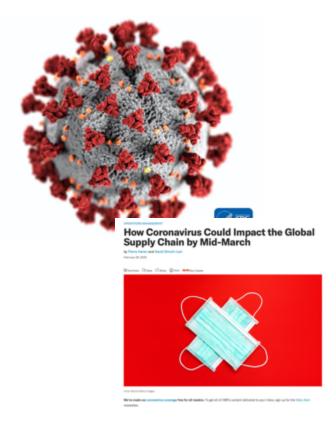




Worst infectious disease outbreak in modern history, 1/3rd of work population impacted; reliance on local supply chains, supply chain storage with pallets in 1925

First major outbreak in the era of globalization, primarily regional but impacted 26 countries; global GDP loss of \$US 54 billion, emergence of lean manufacturing, offshoring, and outsourcing

Estimated 60.8 million cases and 12K+ deaths in U.S. alone, worldwide pandemic; pandemic marked by travel restrictions, meat product bans, antiviral stockpiling, supply chain disruption



1918 – Spanish Flu

2003 - SARS

2009 - H1N1

Prediction thousands of companies to throttle down or shut down manufacturing. Retreat to national supply chains and exposing risks of globalized supply chains?

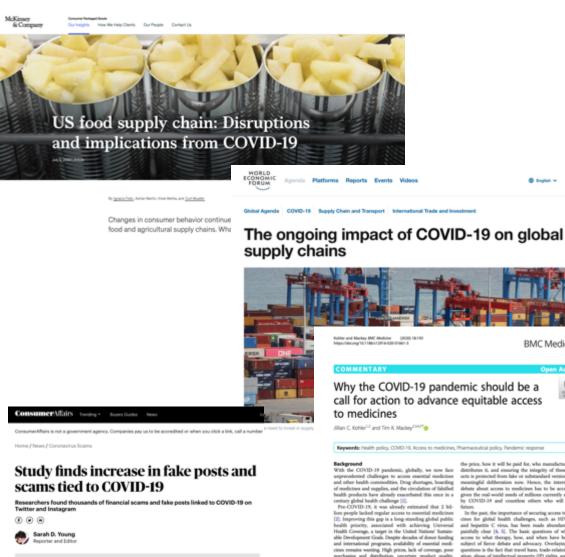
COVID-19 Supply Chain **Impacts**

Consumer Spending: Initial impact of panic buying/hording in combination with potential decrease in consumer spending has differential impact on different industries (e.g. travel, etc.)

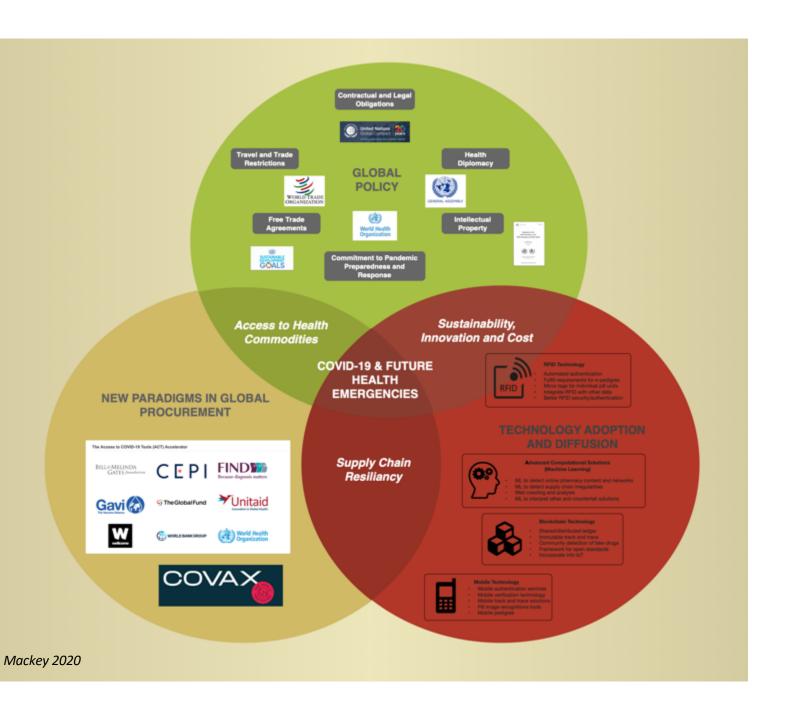
Travel, Movement, Social Distancing and Trade Restrictions: Impact of travel restriction on labor flows; social distancing on manufacturing capacity; trade and shipping bans on distribution and logistics; increasing digitization of supply chain channels?

Policy, Black Markets, and Nationalism?:

Concerns about trade retaliation and protectionism; fake COVID-19 and other products flooding supply chain; "vaccine nationalism"?







Next Generation Health Supply Chain and A2M Governance?

- Global organizations working to harmonize trade, IPRs, and foreign policy for pandemic response and preparedness
- New pooled procurement to ensure equitable access to health commodities?
- Role of technology in establishing sustainable and resilient global supply chains?

OTHER RESOURCES COVID-19

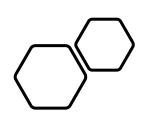
Published Papers: Focused on digital solutions to address COVID-19 challenges (detecting symptoms, addressing fake COVID-19 products, identifying behavioral patterns, geospatial trends) and policy issues (access to medicine)

Ongoing Projects: Examining impact of COVID-19 on SUD; project with NHK on early origins of outbreak in China; vaccine hesitancy studies; trade and COVID-19; other social media and big data analysis COVID-19 research

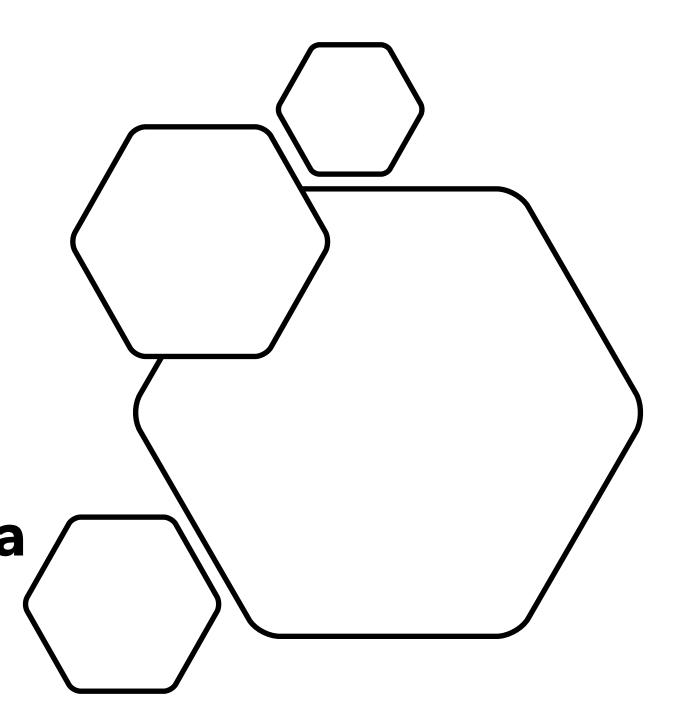
- Li J, Xu Q, Cuomo RE, Purushothaman V, <u>Mackey TK</u>. Data Mining and Content Analysis of Chinese Social Media Platform Weibo During Early COVID-19 Outbreak: A Retrospective Observational Infoveillance Study. *JMIR Public Health Surveill*. 2020;6(2):e18700
- Mackey TK, Purushothaman V, Li J, Shah N, Nali M, Bardier C, Liang BA, Cai M, Cuomo RE. Machine Learning to Detect Self-Reporting of Symptoms, Testing Access and Recovery Associated with COVID-19 on Twitter: A Retrospective Big-Data Infoveillance Study. *JMIR Public Health Surveill*. 2020;6(2):e19509.
- Kohler JC, <u>Mackey TK</u>. Why the COVID-19 Pandemic Should be a Call for Action to Advance Equitable Access to Medicines. *BMC Medicine*. 2020;18:193.
- Mackey TK, Li J, Purushothaman V, Nali M, Shah N, Bardier C, Cai M, Liang BA. Big Data, Natural Language Processing, and Deep Learning to Detect and Characterize Illicit COVID-19 Product Sales: An Infoveillance Study on Twitter and Instagram. *JMIR Public Health Surveill*. 2020; 6(3):e20794.
- Cuomo RE, Purushothaman V, Li J, Cai M, <u>Mackey TK</u>. Sub-national Longitudinal and Geospatial Analysis of COVID-19 Tweets. *PLoS One*. 2020; in press.







Part 3:
COVID-19 and
Opioids
Preliminary Data



COVID-19 and Opioids: Dual Public Health Emergencies?

Opioid Overdose: Increases SUD behavior, relapse, and opioid-related overdoses due to social, economic, and other treatment access-related stressors (deaths of despair) (data points: urine tests and ED non-fatal overdose)

Treatment: Lack of access to addiction specialty treatment services or naloxone prescribing. Potential closures of state and private SUD treatment centers (inpatient and residential), inability to admit new patients, and potential state revenue shortfalls for addiction treatment.

Related Health Risks: Opioid use impact on respiratory and pulmonary health that can impact susceptibility. Link to mental health and SUD, etc.

Illegal Sourcing: Lack of access to legitimate sources or treatment options may drive opioid users to illicit sourcing points both online and offline.

EDITORIAL

The Opioid Epidemic During the COVID-19 Pandemic

Danielle F. Haley, MPH, PhD; Richard Saitz, MD, MPH

Drug overdose deaths in the US increased in 2019, despite a slight decrease from 2017 to 2018; this increase was largely driven by illicitly manufactured fentanyl. The opioid epidemic has also been complicated by increasing use of methods in decreased with opioid-related overdose in 2020, compared with 2019, were more likely to be Black demic has also been complicated by increasing use of methods with 2019, while the use of records from March to June (63% vs 80%). While the use of records from March to June 1000 processes and the processes of t

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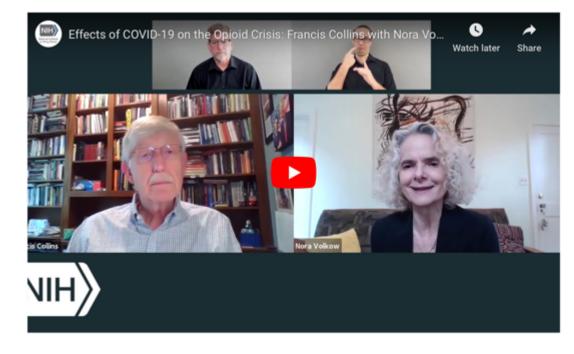
amphetamine in combination with opioids. It is likely that the emergence of coro-

navirus disease 2019 (COVID-19) and subsequent disruptions in health care and social safety nets combined with social and economic stressors will fuel the opioid epidemic. Reports from national, state, and local media suggest that opioid-related overdoses are increasing, ² but the absence of real-time national reporting of overdose-related mortality limits the ability to confirm these reports.

In this issue of JAMA, 2 studies report on indicators that reflect the opioid epidemic before and after the widespread emergence of COVID-19 in the US in March 2020: urine drug test results³ and emergency department visits for nonfatal opioid overdose.⁴

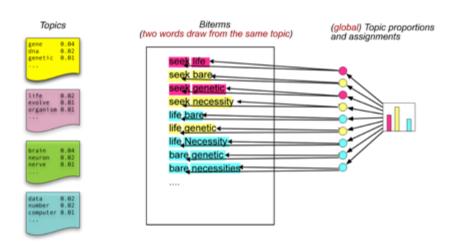
period. Patients diagnosed with opioid-related overdose in 2020, compared with 2019, were more likely to be Black (63% vs 80%). While the use of records from March to June across 2 years serves as a control for underlying seasonal variation in overdose, the generalizability of these findings is limited by the small sample size and reporting of a single emergency department. Patients with overdose may have gone to different emergency departments due to closures or ambulance diversion during the pandemic. The number of fatal overdoses was not yet available; therefore, it is possible that the proportion of overdoses that were nonfatal increased while the total (fatal and nonfatal) remained the same. This scenario is perhaps unlikely but could manifest in several ways: (1) increased availability and administration of naloxone; (2) more use with another person present (eg, in quarantine); or (3) use of less potent opioids due to drug supply changes.

A more definitive answer to the question of whether opi-



Preliminary COVID-19 Opioid Analysis

Biterm Topic Model (BTM)



- Model the generation of biterms with latent topic structure
 - a topic ~ a probability distribution over words
 - a corpus ~ a mixture of topics
 - a biterm ~ two i.i.d sample drawn from one topic

- **BTM+15:** A methodology we created using a combination of unsupervised topic modeling (BTM) and data mining (top 15 tweets per topic) to conduct untrained topic exploration.
- Twitter COVID-19 Data: 900 million tweets from March – October 2020 (filtered for COVID-19 keywords). Further filtered for 33 opioid-related slang terms (e.g. "oxy, "oxycotton", etc.)
- Thematic Coding: Separating clusters related to opioid use behavior and other topics of concern about the opioid crisis and COVID-19.

Xiaohui Yan, et al.

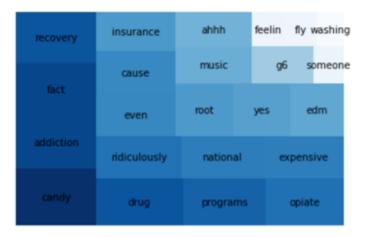
Preliminary Results

- Summary Statistics: 16,586 tweets comprised of 15,556 users retweet stats (max 1020; unique tweets 6200)
- Themes Detected (20 topics):
 - Drug dealing and COVID-19 mention
 - 2. Questionable behavior-related
 - 3. Opioid-related news/commentary
 - 4. Extreme satire about SUD
- Noise: "oxy" for "oxygen" in the context of COVID-19 treatment of cases and football team "Occidental College"; "bomb" and "morph" in news events or colloquial conversations

0.038675

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['candy', 'addiction', 'fact', 'recovery', 'drug', 'programs', 'opiate', 'ridiculously', 'national', 'expensive', 'even', 'cause', 'insurance', 'root', 'yes', 'edm', 'music', 'ahhh', 'g6', 'someone', 'feelin', 'fly', 'washing']

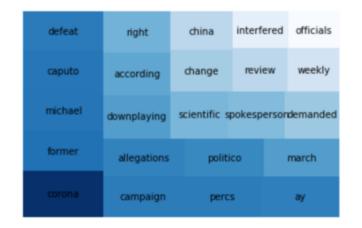




0.022656

3

['corona', 'former', 'michael', 'caputo', 'defeat', 'campaign', 'percs', 'ay', 'allegations', 'politico', 'march', 'downplaying', 'according', 'right', 'scientific', 'spokesperson', 'demanded', 'change', 'china', 'review', 'weekly', 'interfered', 'officials']





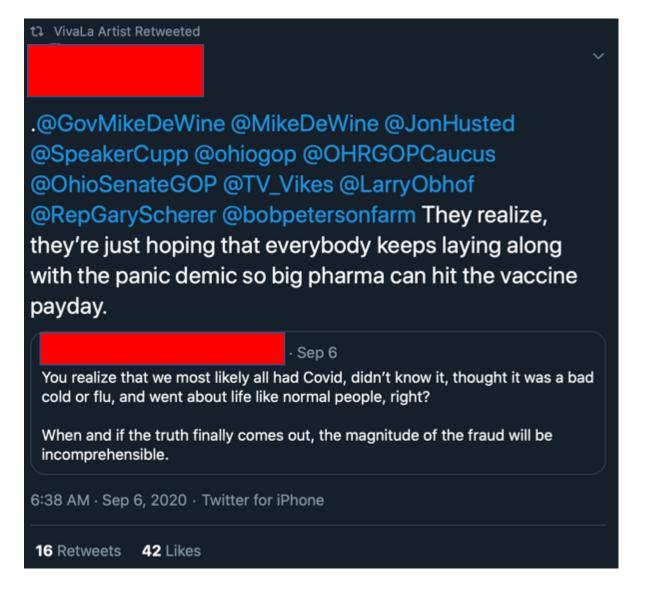
Example Themes

News Retweet: Demand for anti anxiety meds has skyrocketed since the pandemic But A shortage of some drugs a reluctance by doctors to prescribe them And stigma around dependency has fent laced Xanax bars selling for \$12 a pop on the Avenue https://t.co/EK7tR9JvVs

Plenty of xanax I.. 🧲 🛠 🙎 🖣 😁 🐚 📨 🟴 🚔 🔡 @marisac721 - Jul 19 How does one celebrate their birthday in the middle of a pandemic? *asking for Homie rollin of the percs myself! Show this thread 📵 Donald J. Trump 🕗 @realDonaldTrump - Oct 5 7:38 PM · Jul 19, 2020 · Twitter for Android I will be leaving the great Walter Reed Medical Center today at 6:30 P.M. Feeling really good! Don't be afraid of Covid. Don't let it dominate your life. We have developed, under the Trump Administration, some really great drugs & ta & on histus (25%) Retweeted knowledge. I feel better than I did 20 years ago! 9:00 PM - Oct 5, 2020 - Twitter for iPhone Ahhh yes. "Edm music". The root cause of our national opiate and drug pandemic. Not the fact that doctors literally give out Xanax and OxyContin like candy and addiction recovery programs are ridiculously expensive even with insurance. Edm music why did you do this to us? 6:10 PM · Jul 19, 2020 · Twitter for iPhone



Example Themes (GATM)





Next Steps

- Eliminate noise keywords and conduct more purposeful sampling of opioid-related keywords (available in separate dataset)
- Expand SUD-COVID-19 surveillance and data collection to additional social media and online platforms
- Join any SUD behavioral-related data to existing secondary datasets on COVID-19 and SUD public health stats of interest

Funding Opportunity Title	Emergency Awards: RADx-RAD Multimodal COVID-19 surveillance methods for high risk clustered populations (R01 Clinical Trial Optional)
Activity Code	R01 Research Project Grant
Announcement Type	New
Related Notices	September 23, 2020 - Notice of Change to RFA-OD-20-016. See Notice NOT-DA-20-081.
	August 28, 2020 - Notice of Correction to Eligibility in NIH Funding Opportunity Announcements. See Notice NOT- CD-20-171.
	NOT-OD-20-144 - Notice of Intent to Publish Funding Opportunity Announcements for the RADs-rad Initiative
Funding Opportunity Announcement (FOA) Number	RFA-OD-20-016
Companion Funding Opportunity	RFA-OD-20-019 - Emergency Awards: RADx-rad Data Coordination Center (DCC) (U24 Clinical Trial Not Allowed)
Number of Applications	See Section III. 3. Additional Information on Eligibility.
Catalog of Federal Domestic Assistance (CFDA) Number(s)	93.310, 93.121, 93.847, 93.307, 93.361, 93.879; 93.859, 92.279, 93.273
Funding Opportunity Purpose	NIH is issuing this Funding Opportunity Announcement (FOA) in response to the declared public health emergency issued by the Secretary, HHS, for 2019 Novel Coronavirus (COVID-19). This emergency FOA provides an expedited funding mechanism as part of the Reald Acceleration of Disaposition Selacial (RADIX-sela) initiative.



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THANKS





ACCOUNTABILITY AND
TRANSPARENCY IN
OPIOID ACCESS AND USE
IN THE CONTEXT OF
COVID-19

A MULTI-STAKEHOLDER WEBINAR SERIES

Accountability, Transparency, Criminality, and Policy: A Case Study of Illicit Online Opioid Diversion

Dr. Tim Mackey Associate Professor University of California, San Diego